15 BODY SYSTEMS

Living things are made up of systems that work together for the best chance of survival. Systems in plants support photosynthesis, using sunlight to produce energy and oxygen. Systems in animals take in food and process it to produce energy, and to support gas exchange, waste removal, sexual reproduction and more.

Organisms have evolved over billions of years, becoming extremely complex over this long time. When we investigate and learn about these systems, we discover the many intricate parts and functions of a living cell, and how they work together in multicellular organisms.

1 LEARNING LINKS

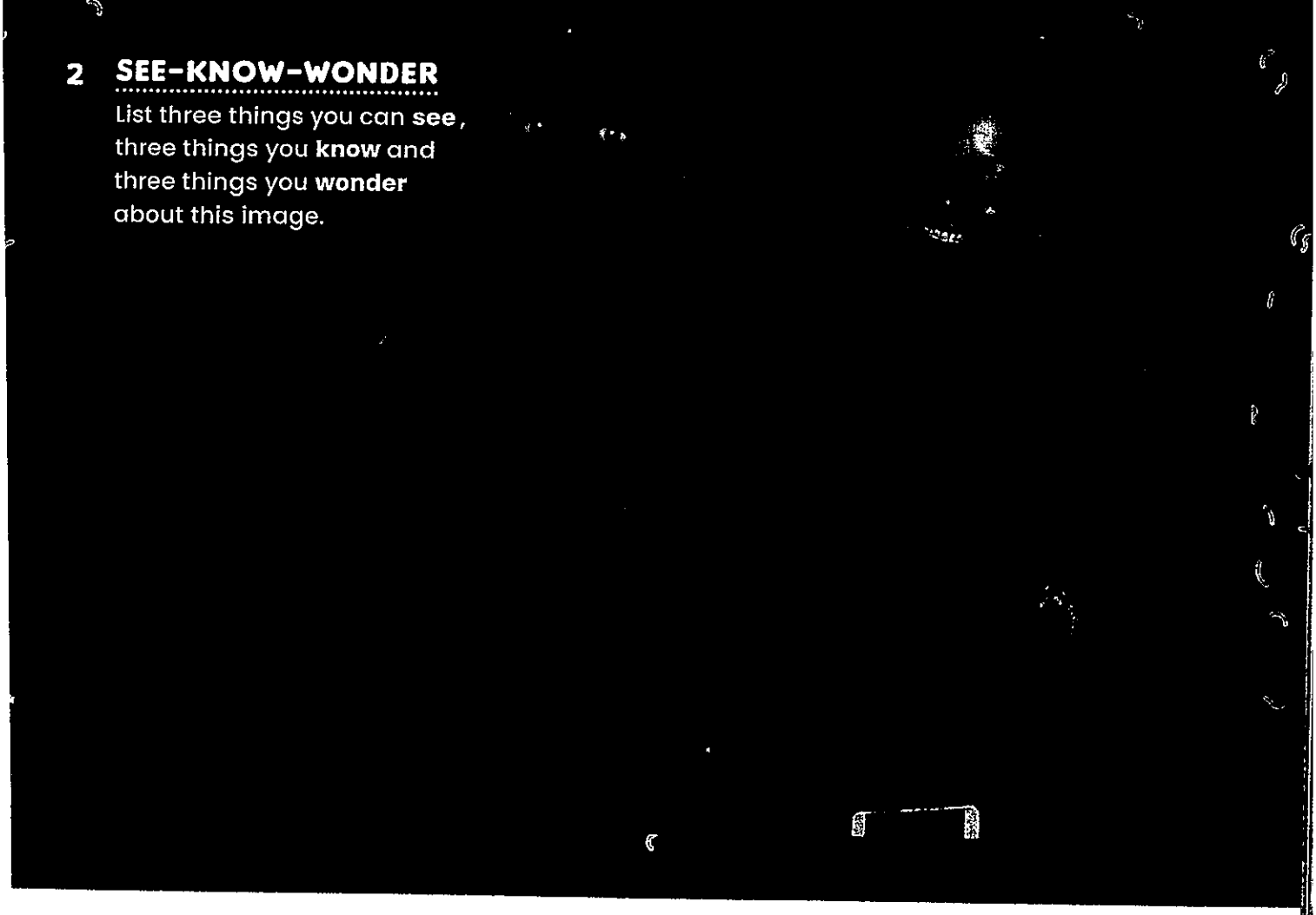
What do you already know about body systems?

How do the features and behaviours of plants and animals help them to survive in their environment?

What is the relationship between plants and animals?

2 SEE-KNOW-WONDER

List three things you can **see**, three things you **know** and three things you **wonder** about this image.



3 CRITICAL + CREATIVE THINKING

Variations: In how many ways can living things excrete?

Commonality: Find as many points of commonality as you can between your heart and your lungs.

Predictions: Write a series of predictions for a situation where half the plants on Earth could no longer photosynthesise.

4 THE MOST BABIES!

The woman who holds the record for having the most children is Mrs Vassilyev, a peasant woman from Russia who allegedly had 69 children. 69! This was said to include 16 pairs of twins, seven sets of triplets and four sets of quadruplets. The births apparently happened in a period between 1725 and 1765. (Historical records aren't always reliable, so it's important to be sceptical about this claim.) Still, Mr Vassilyev obviously did not think that 69 children was enough – he is said to have had 18 more children with a second wife.

15.1 RESPIRATION AND PHOTOSYNTHESIS

At the end of this lesson I will be able to:

- **identify** the materials required by multicellular organisms for the processes of respiration and photosynthesis.

aerobic respiration
how living organisms produce energy using oxygen

chlorophyll
the green pigment in chloroplasts that enables photosynthesis

chloroplasts
organelles in a plant cell that carry out photosynthesis

mitochondria
the organelles where respiration happens

photosynthesis
the chemical reaction, powered by sunlight, that plants use to change carbon dioxide and water into sugars and oxygen

stomata
pores in the surface of a leaf; the site of gas exchange in plants

LITERACY LINK

In exactly 20 words, explain how photosynthesis is different from respiration.

NUMERACY LINK

A garden bed is 20 m long and x metres wide. Each square metre of earth contains one plant. If the garden contains 3200 plants, what is the value of x?

Multicellular organisms are made up of many different types of cell, carrying out specialised functions for survival.

To perform these functions, cells need a constant supply of energy. Animal cells get their energy from food, and plant cells get their energy from sunlight. The energy from these sources is gained by cells using chemical reactions.

1 All cells need energy to survive

Without a continuous supply of energy, cells can't perform important functions, and they die. The only type of energy that cells can use is chemical energy. Chemical energy is stored in the bonds of glucose molecules and released when the bonds are broken.

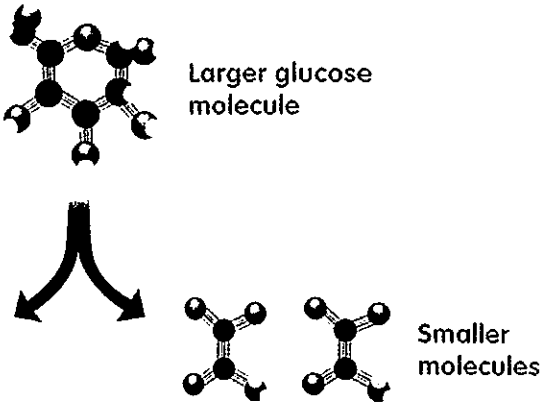


Figure 15.1 Chemical energy is released when the bonds of a molecule are broken.

A major source of chemical energy for multicellular organisms is obtained by breaking the bonds of glucose, a type of sugar molecule. Animals get most of their glucose from their food. Other organisms, such as plants, convert energy from the Sun into glucose.

What form of energy can cells use?

2 Respiration is how cells make energy

To release the energy from glucose and other energy-rich molecules, all living cells use the chemical process of respiration. Cells can carry out two main forms of respiration: **aerobic respiration**, which uses oxygen, and anaerobic respiration, which happens without oxygen.

Aerobic respiration provides multicellular organisms with most of their energy. It takes place mostly in cell organelles called **mitochondria**. Because energy is being released during respiration, the mitochondria are often called the powerhouses of a cell. The number of mitochondria in a cell is usually related to the functions of the cell.

The overall process of aerobic respiration can be summarised as:

glucose + oxygen → carbon dioxide + water + energy

In animals, glucose is obtained from food, and oxygen is taken in from the environment across special surfaces such as lungs or gills. Both substances move into the blood and then to the cells. Plants absorb most of the oxygen they use through their leaves.

In all living cells, the chemical energy produced during respiration is transported to the parts of the cell that need it, while the carbon dioxide and water are removed from the cell.

What is cellular respiration?

3 Photosynthesis is how plants make food

Plants rely on **photosynthesis** to make their own food, using light energy, water and carbon dioxide.

One of the main reasons they are able to do this is because their cells have special structures called **chloroplasts**. Chloroplasts contain **chlorophyll**, a green pigment that absorbs light energy.

The overall process of photosynthesis can be summarised as:

$$\text{carbon dioxide} + \text{water} \xrightarrow[\text{chlorophyll}]{\text{light energy}} \text{glucose} + \text{oxygen}$$

To fuel photosynthesis, light energy from the Sun is absorbed by chlorophyll within a plant's cells. This energy is then used to change water (absorbed through the roots) and carbon dioxide (absorbed from the surrounding air or water) into oxygen and glucose (or other sugars).

The glucose produced from this reaction is either used in respiration or stored for later use. The oxygen moves into the environment through special pores (openings) in the leaves called **stomata** or it is used during respiration.

What are the substances needed for photosynthesis?

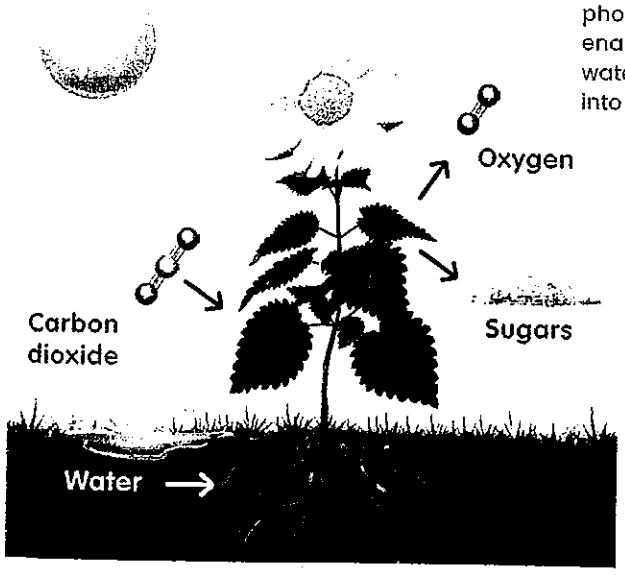


Figure 15.2 During photosynthesis, sunlight enables a plant to transform water and carbon dioxide into oxygen and glucose.

INVESTIGATION 15.1
Photosynthesis and respiration

CHECKPOINT 15.4

1 What form of energy is usable by cells?
2 Where is energy stored in molecules and how is it released?
3 Where do plants get the carbon dioxide and water for photosynthesis?
4 Where do animals get the glucose and oxygen for respiration?
5 Explain why oxygen is important in aerobic respiration.
6 Explain the role of chloroplasts in photosynthesis.
7 Identify these statements as true or false.
a The special pores on the surface of a leaf are called stomata.
b Carbon dioxide gas exits plant leaves into the atmosphere.
c During photosynthesis, water is split into hydrogen and oxygen gas.
d During photosynthesis, light energy is used to generate chemical energy.
e Photosynthesis is an energy-producing reaction.
8 Explain this statement: 'When you eat an apple, you are also eating a little bit of sunshine.'

SKILLS CHECK

- I can state the word equations for respiration and photosynthesis.
- I can explain where multicellular organisms obtain the materials required for respiration and photosynthesis.

15.2 BODY SYSTEMS IN ACTION

At the end of this lesson I will be able to:

- **explain** that the systems in multicellular organisms work together to provide cell requirements, including gases, nutrients and water, and to remove cell wastes.

body system
a group of organs working together

cell
the smallest functional unit of an organism

organ
a group of tissues with a specific function

tissue
a group of cells with a similar structure and function

LITERACY LINK

Identify three terms from this section that you are unsure of. Use the internet to write a definition of each in your own words.

NUMERACY LINK

Jermaine, a biologist, weighs 10 sheep hearts and records the following (all in grams):

239, 244, 244, 249, 250, 252, 255, 261, 265, 270

Calculate the mean, median and mode of this data set.

Body systems exist in almost every multicellular organism. These specialised organs and tissues have a common purpose.

For an organism to survive, each system must work with the others, often passing materials from one system to the next.

1 Cells work together as tissues, organs and systems

Unicellular organisms work alone – a single cell must carry out all of the major life functions. Multicellular organisms, such as humans, are made up of many different types of cell. More cells are available to share the workload, so different cells have specific functions.

Cells with similar functions form **tissues**, such as blood or muscles. Different tissues working together are **organs**, such as the heart, brain and lungs. Two or more organs connected and working together form a **body system**. The organs and tissues in each system are specialised to perform specific roles that serve a common purpose.

What is the link between a tissue and an organ?

2 Animals have several organ systems

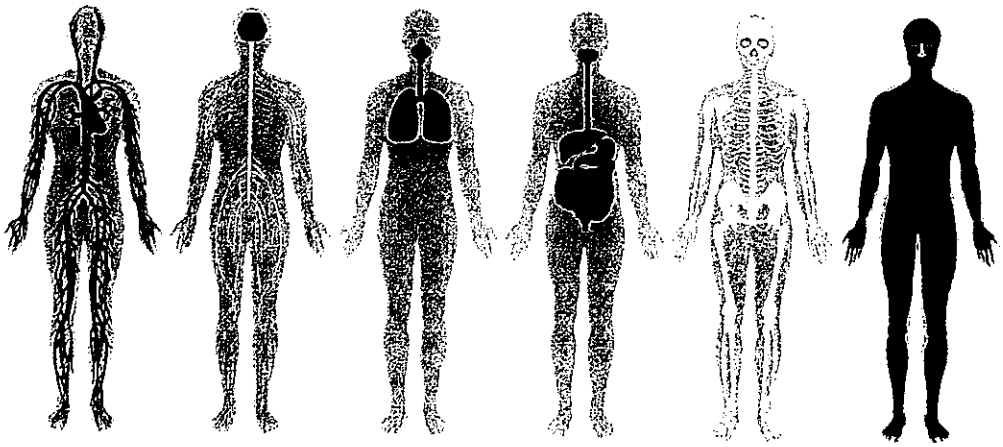
Multicellular organisms are incredibly diverse, so the number and type of body systems can differ between organisms. Most animals, such as humans, have 10 major body systems. These are the:

- *circulatory system* – moves nutrients, gases and waste products around the body
- *nervous system* – detects, processes and sends electrical signals
- *respiratory system* – exchanges gases with the environment
- *digestive system* – breaks down and absorbs food
- *musculoskeletal system* – allows movement and provides the body with shape and support
- *endocrine system* – produces the hormones that control growth and development
- *excretory system* – removes body wastes
- *reproductive system* – produces sex cells and supports pregnancy and birth
- *immune system* – makes the white blood cells that fight diseases and infections
- *integumentary system* – protects the body from damage.

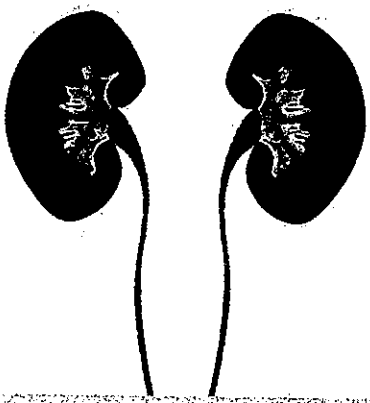
Some of these systems can be identified in other ways. For example, the body's skeleton and muscles can be considered separately as the skeletal and muscular systems, or together as the musculoskeletal system.

What are three examples of body systems in humans?

Figure 15.3 The human body consists of different systems that work together to provide cells with what they need to survive.



Circulatory system | Nervous system | Respiratory system | Digestive system | Skeletal system | Muscular system

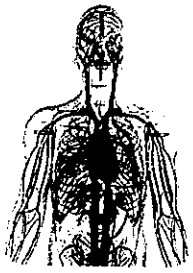


3 Body systems work together to meet cell needs

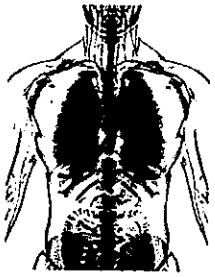
Body systems must work together to provide cells with everything they need to function and survive, such as gases, nutrients and water. One of the best examples of this is in the human body.

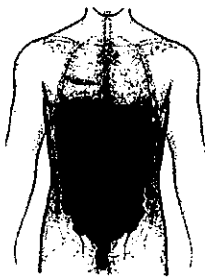
The human circulatory system is connected to every other system in the body. It transports nutrients, dissolved gases and waste products between cells. Without the circulatory system, other systems would not be able to function.

How do body systems work together to give cells what they need?

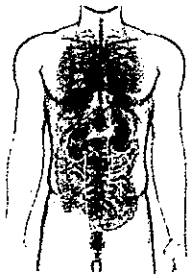


Oxygen and carbon dioxide are exchanged between the lungs and blood. The oxygen in the lungs is moved into the blood and delivered to the cells for respiration. The carbon dioxide produced by cells is taken to the lungs to be removed.





Food is broken down into nutrients by the digestive system. These nutrients are absorbed into the blood, where they are transported to the cells that need them.



Waste products produced from cellular processes move from the cells into the surrounding blood, to be removed by the organs of the excretory system.

CHECKPOINT

1 Order these terms (starting with the smallest structure) to match their organisation within multicellular organisms.

tissue, cell, organ, system

2 Describe the difference between an organ and a tissue.

3 Which system is responsible for the removal of wastes?

4 Suggest what could happen if something went wrong with the digestive system.

5 Cells require oxygen and water to survive. Suggest which body systems assist cells to obtain these materials.

6 Both the circulatory and respiratory systems are responsible for ensuring oxygen gets to our cells. Explain why.

7 Research common diseases and disorders that can affect the human heart. Prepare a short report summarising three of your choice.

SKILLS CHECK

- I can list the order of organisation from cells to systems.
- I can explain how systems work together to provide cell requirements, and provide a specific example.

15.3 CELL DIVISION

At the end of this lesson I will be able to:

- **outline** the role of cell division in growth, repair and reproduction in multicellular organisms.

KEY TERMS

cancer
the uncontrolled growth of cells in some part of the body, which then spread to other body parts

chromosome
a thread-like molecule of genetic information in the nucleus of a cell

meiosis
complex cell division, where new cells are not identical to the original cell

mitosis
simple cell division, where new cells are identical to the original cell

LITERACY LINK

Use the four key terms above to create a mind map. Link the terms with a line, writing along the line what the link is. You may add as many additional terms as you like.

NUMERACY LINK

An egg contains 23 chromosomes.

23 is a prime number; list all of the other prime numbers between 1 and 23.

You started your life as an egg cell fertilised by a sperm cell. This divided into two, then four, then eight, and so on, until you eventually became the roughly 32.7 *trillion* cells that you are today.

None of this would have been possible without cell division. Cells can divide by **mitosis** or **meiosis**. These processes are important for organisms to grow, repair body tissues and reproduce.

1 Organisms grow and mature as their cells divide

Growth happens when body tissues increase in size. This isn't due to cells getting larger, but to cells dividing to create more cells. As the number of cells in a tissue increases, the size of the tissue also increases, causing the organism to grow.

Growth is influenced by many factors, but it's the genetic material inside cells that usually determines the overall height and structure of an organism This is the reason that humans don't grow to the size of elephants!

Sometimes the genetic material inside cells is damaged by factors such as ultraviolet light or chemicals. This damage can cause them to divide uncontrollably, producing lots of unwanted cells. These cells eventually form lumps or growths called tumours, which can affect the function of surrounding tissues or organs. Some cells may spread to other parts of the body – this is called **cancer**.

What is uncontrolled cell growth called?

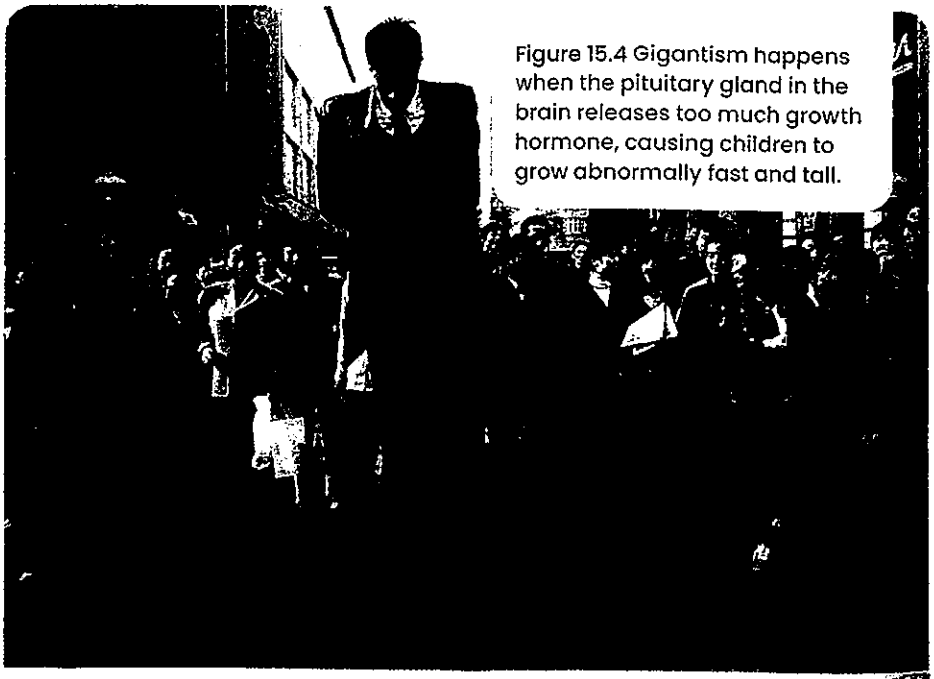


Figure 15.4 Gigantism happens when the pituitary gland in the brain releases too much growth hormone, causing children to grow abnormally fast and tall.

❷ New cells replace old or damaged cells

If you fall over and scrape an elbow or knee, it doesn't usually take long for the tissue to scab over and heal. This is because the cells you damaged were quickly replaced with new ones by mitosis.

Cells are constantly dividing to replace cells that are damaged or old. This important process makes sure cells in the body are healthy and can perform the functions needed for survival. Some cells, such as those cells of the stomach and intestines, only last a few days because they are exposed to really difficult conditions that wear them down. Others, such as liver cells, live much longer because they are less likely to be damaged.

Not all body cells can be replaced. Some cells, such as nerve and heart muscle cells, are unable to divide, meaning that any damage to these cells can be permanent.

Why do cells sometimes need to be replaced?

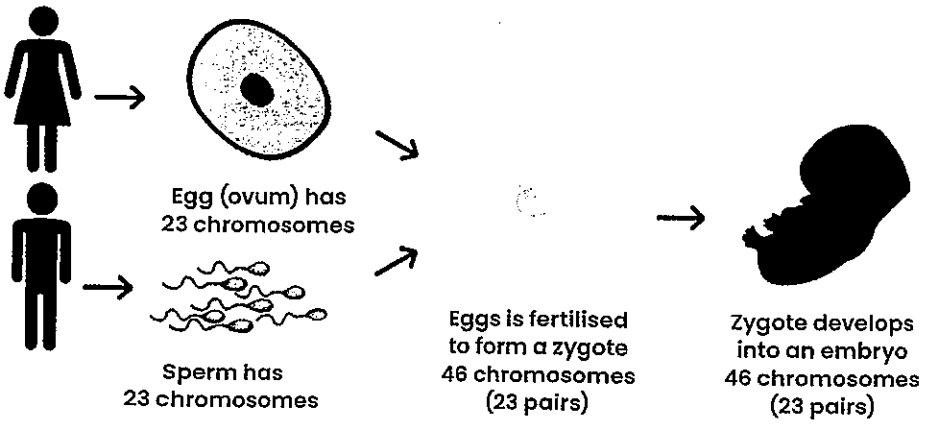
❸ Meiosis makes cells with half the full number of chromosomes

Much like other body cells, sex cells (called gametes) need to divide in order to reproduce. But instead of dividing once, they divide twice in a process called meiosis. This extra division produces sex cells that have half the usual number of **chromosomes** found in other cells of the body.

When an egg cell is fertilised by a sperm cell, the number of chromosomes is restored – two halves make a whole. Therefore, most organisms begin life with a full set of chromosomes. Meiosis ensures that organisms don't have too many chromosomes.

What process is used by sex cells to reproduce?

Figure 15.5 A normal human body cell contains 46 chromosomes. Meiosis produces either egg (ovum) or sperm cells which have 23 chromosomes each. When a sperm fertilises an egg, the full number of chromosomes is restored.



CHECKPOINT 15.3 ✓

1. Explain why cells need to divide.
2. What is one of the main factors that influences the growth of an organism?
3. Why do tumours form?
4. Describe the difference between mitosis and meiosis.
5. Identify these statements as true or false.
   a. Organisms grow because their cells increase in size.
   b. When cells are damaged, meiosis creates new ones.
   c. All body cells can be replaced in cell division.
   d. Sex cells have a full set of chromosomes after they divide.
   e. All cells have the same life expectancy.
6. Cells need to be replaced when they are damaged. Explain what could happen to an organism if this didn't happen.

CHALLENGE

7. It is thought that one day scientists will be able to use stem cells to regrow human body limbs. Conduct research to find out the answers to these questions:
   a. What are stem cells?
   b. How are stem cells different to other cells in the body?
   c. Name one place in the human body where stem cells could be found.
   d. What are some of the medical benefits of stem cells?
   e. Why is stem cell research controversial?

SKILLS CHECK

- I can outline the role of cell division in growth, repair and reproduction in multicellular organisms.

15.4 FLOWERING PLANTS

At the end of this lesson I will be able to:

- **describe** the role of the flower, root, stem and leaf in maintaining flowering plants as functioning organisms.

pistil
the female reproductive organs of a flower (anther and filament)

pollen
the fine, powdery substance in the flowers of plants, which contains male sex cells

pollination
the movement of pollen from the male part of the plant (anther) to the female part (stigma)

stamen
the male reproductive organs of a flower (anther and filament)

stomata
pores in the surface of a leaf; the site of gas exchange in plants

LITERACY LINK

If plants photosynthesise, do they need to respire? Write your answer as a short report.

NUMERACY LINK

The seeds of a desert cactus take up to six years to grow into new plants.

If a year is 365 days, how many days go by in 6 years?

Most flowering plants have a shoot system and a root system. Together, these systems help plants to grow and reproduce.

A shoot system contains organs that you would usually find growing above the ground, such as leaves, stems and flowers. The root system contains organs that usually grow underground, such as roots.

1 Flowers contain the reproductive organs of plants

The main purpose of flowers is reproduction. Flowers contain the sexual reproductive organs of plants. Many flowers contain both male and female reproductive organs.

The male organs of a flower are the **stamen**. It is made up of the:

- *filament* – the stalk that supports the anther
- *anther* – the organ that generates **pollen**, a fine powdery substance that contains the male sex cells of the plant.

The female organs of the flower are the **pistil**. It is made up of the:

- *stigma* – the organ where pollen germinates
- *style* – the stalk that connects the stigma and ovary
- *ovary* – the organ that stores the female sex cells (ova or eggs).

For plants to reproduce, the pollen coating the anthers needs to be moved to the female parts of the flower to fertilise the ovum. This is called **pollination**.

Sometimes this movement is assisted by the wind or rain, but it usually requires the help of pollinating birds and insects, such as bees. Plants attract these organisms by producing flowers that are bright and colourful, smell nice and contain sugary nectar that the birds and insects eat.

Once fertilised, the ova (eggs) become seeds and the ovary swells and enlarges to become a fruit. The seeds in fruit can grow into new plants when conditions are suitable. For some plants, this can take years to happen.

What is the main purpose of flowers?

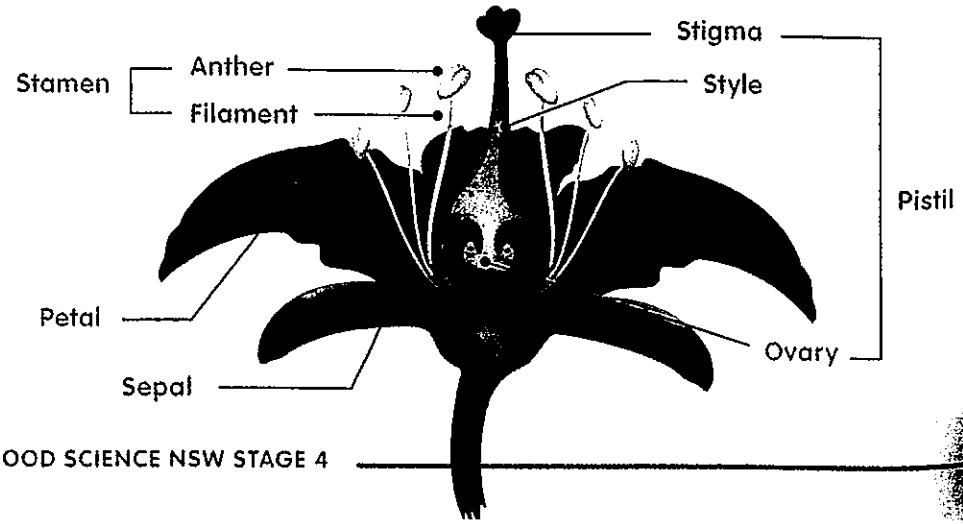


Figure 15.6 Flowers contain the reproductive organs of the plant. The pistil contains the female parts and the stamen contains the male parts.

❷ Stems and roots are for support, transport and growth

INVESTIGATION 15.4
Dissecting a flower

People tend not to think about the stems and roots of flowering plants – it's the pretty, sweet-smelling flowers that get all the attention. But the stem and roots perform many vital functions, and plants would collapse and die without them.

The stem is the main body of the plant. It does similar things for the plant that the skeletal and circulatory systems do for humans. These include:

- *support* – helping a plant to stand up and hold the weight of leaves, flowers and fruit
- *transport* – connecting the root and shoot systems of the plant. Water, sugar and other substances move through the stem to provide each system with its requirements
- *growth* – allowing buds to grow from the stem and form into new branches, leaves or flowers.

Roots absorb water and other nutrients from the soil. Water is necessary for photosynthesis and provides the plant with the fluid that dissolves and moves substances around its structure.

Another function of roots is to anchor a plant to the ground. Without roots, trees would fall over in strong winds, and marine plants would wash away in ocean currents.

What are the main functions of the stem and roots of a plant?

❸ Photosynthesis happens in leaves

Leaves could be called the solar panels of plants, because their main role is to perform photosynthesis. Leaves have many features that make them perfect for carrying out this process. They are often flat, which increases their surface area, allowing them to absorb more sunlight. They are thin, so carbon dioxide can travel easily into the cells from the environment. Plants contain green pigments called chlorophyll which absorb light energy from the Sun. Veins in plants allow water and other substances needed for photosynthesis to travel to the leaf cells.

If you look at a leaf under a microscope, you will probably notice round pores called **stomata**. These open and close to allow plants to exchange gases, such as oxygen and carbon dioxide, with their environment. Water can also pass through these pores and water loss is sometimes an unwanted consequence of gas exchange.

What is the main function of leaves?

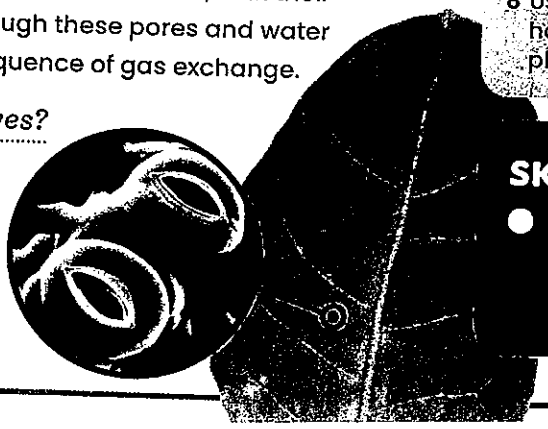


Figure 15.7 Stomata are tiny pores on the surface of leaves that allow plants to exchange gases with their environment.

1 Which body system of a plant contains organs that are usually found above the ground?

2 What are the male organs of a flower called?

3 What are the female organs of a flower called?

4 Describe how a fruit is formed.

5 What would happen to most plants if they didn't have a stem?

6 Photosynthesis needs carbon dioxide, water and sunlight energy. Explain how leaves help a plant to obtain these resources.

7 Roots are usually found underground, so they don't receive the light necessary to carry out photosynthesis. Explain why they are still really important to the process of photosynthesis.

8 Use the internet to describe how insects and birds assist plants to reproduce.

SKILLS CHECK

- I can describe the main roles of the flower, stem, leaf and root in the body system of a flowering plant.

15.5 MUSCLES, BLOOD AND BONES

At the end of this lesson I will be able to:

- **describe** the role of the circulatory and musculoskeletal systems in maintaining a human as a functioning multicellular organism.

blood vessel
tube such as a vein or artery that carries blood in the body

cartilage
connective tissue that holds bones together

tendon
connective tissue that connects muscle to bone

LITERACY LINK

Interview someone in your class who has broken a bone or damaged a muscle. Find out what happened, how long it took to mend and what the experience was like.

NUMERACY LINK

A man's heart beats 115 417 times one day.

Write this number in words.

We all rely on body systems to move. These systems are made up of specialised organs and tissues, such as bones and muscles, working together.

Like other processes in the body, movement requires a constant supply of energy. The circulatory system is vital to this energy production because it supplies all cells with oxygen for respiration.

1 The circulatory system moves materials around the body

Your heart, **blood vessels** and blood make up your circulatory system. This system delivers oxygen, nutrients and other substances to every tissue in your body. It also helps your body to remove waste products, such as carbon dioxide.

Oxygen passes from the lungs into the blood, and is then transported through veins to the heart. An adult human's heart can beat more than 115 000 times a day, making it the hardest working muscle in the body.

The heart has two 'filling' chambers, called atria, and two 'pumping' chambers, called ventricles. Entry to these chambers is controlled by special valves. Oxygen-rich blood comes in through the atria, is pumped out through the ventricles, and is then distributed through arteries to the rest of the body.

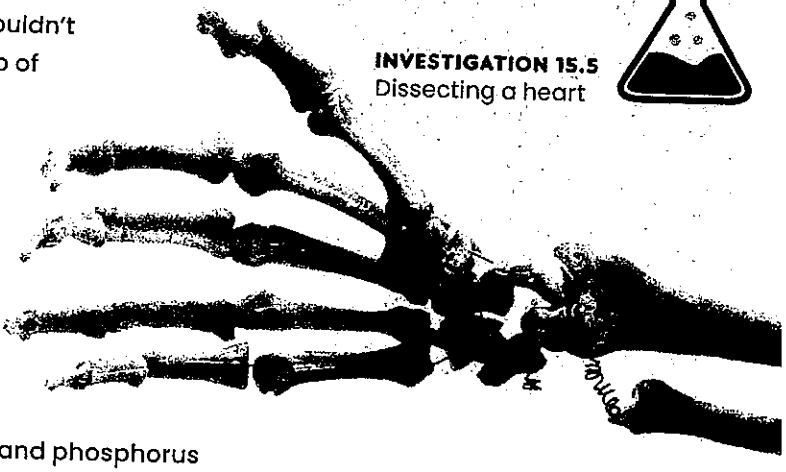
Figure 15.8 The heart pumps blood throughout the body.

What does the circulatory system do?

2 The skeletal system supports and protects the body

The human skeletal system consists mostly of bones and **cartilage** – a connective tissue that holds the bones together. Bones are made up of living cells and so they need oxygen and nutrients to survive, grow and repair.

Human bones come in all shapes and sizes. More than half of them are in the hands and feet. The largest bone is called the femur, and it is in the top part of the leg. The smallest bones – the stapes– are in the ears.



INVESTIGATION 15.5
Dissecting a heart

Functions of the human skeleton include:

- *support* – Without a skeleton, the human body wouldn't be held upright and would collapse into a big blob of tissue and water.
- *protection* – The brain is protected by the skull, the vertebrae protect the spinal cord and the ribs protect the heart and lungs.
- *muscle attachment* – Muscles are attached to the bones by special fibres called **tendons**.
- *blood cell production* – Red blood cells and other blood components are made in the marrow at the centre of bones.
- *mineral storage* – Vital elements such as calcium and phosphorus are stored in the bones and released when they are needed.

What does the skeletal system do?

3 The muscular system allows the body to move

The main role of the muscular system is movement. Without working muscles, you wouldn't be able to walk around, your heart wouldn't beat, and food would take much longer to break down and move through your digestive system. Muscles let you smile when you're happy and frown when you're not.

Much like the bones of the skeletal system, muscles can vary in size and shape. The largest muscle in the human body is the gluteus maximus – this is the scientific name for a muscle in the buttocks. The smallest muscles are in the ear.

Muscles work by contracting and relaxing. When muscles contract, the fibres in them shorten and thicken. When they relax, the fibres become longer and thinner. Many muscles work in pairs to coordinate body movements – when one contracts, the other relaxes. When the biceps of your arm contracts, the triceps on the opposite side of your arm relaxes, pulling the forearm up. When the biceps relaxes, the triceps contracts, pulling the forearm down.

What does the muscular system do?

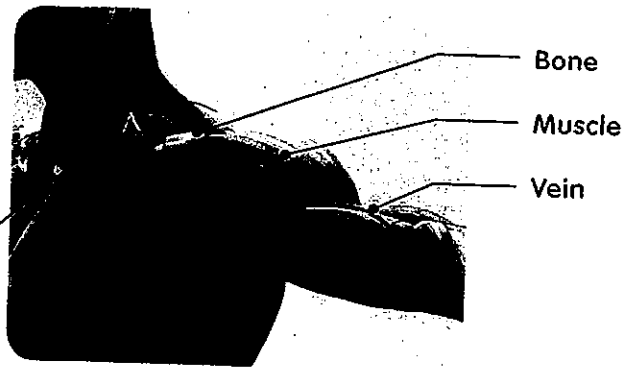


Figure 15.9 Muscles, bones and blood work together in systems that maintain essential functions.

CHECKPOINT 15.3

1. What organs make up the circulatory system?
2. Explain how the muscular and skeletal systems work together in the body.
3. What does the circulatory system transport around the body?
4. One of the roles of the skeletal system is organ protection. Suggest why.
5. What is the difference between a vein and an artery?
6. Where are the biggest and smallest muscles in the body?
7. Give three examples of muscles in the human body and where they are located.

CHALLENGE

8. Use the internet to research voluntary and involuntary muscle movements. Make a summary of each.

SKILLS CHECK

- I can describe the role of the circulatory system.
- I can describe the role of the skeletal system.
- I can describe the role of the muscular system.

15.6 ENERGY IN, WASTE OUT

At the end of this lesson I will be able to:

- **describe** the role of the digestive, excretory and respiratory systems in maintaining a human as a functioning multicellular organism.

digestion
the physical and chemical processes that break down food in the body

enzyme
a chemical that speeds up a reaction (e.g. digestion of food)

excretion
the elimination of cellular waste from the body

LITERACY LINK

Summarise the roles of the respiratory, digestive and excretory systems into one sentence each.

NUMERACY LINK

Farmer Farrah feeds each of her cows 20 kg of feed each day. If she has 13 cows, how much feed will she need each day to keep her herd healthy?

Did you know that cows have four stomachs? They need them to break down the tough plant material they eat.

Humans have just one stomach, and as part of the digestive system it works closely with the excretory system to take food in, get all the things the body needs and get rid of the rest. The respiratory system does something similar, taking in oxygen and then getting rid of carbon dioxide.

1 The digestive system releases the nutrients in food

Think of your most recent meal and why you ate it. Were you hungry? Did it just look yummy? Did you want to obtain the nutrients for important cellular processes? If you answered 'yes' to the third question then your mind and your body are on the same page!

Humans and other animals need to consume food to obtain the nutrients inside it. These are essential for energy production, growth, tissue repair and basically all other cellular processes. However, food can't just move directly into the cells. It first needs to be broken down into smaller molecules during **digestion**.

The digestive system in humans is made up of specialised organs that break down food using mechanical (physical) and chemical processes. Digestion begins in the mouth, as the teeth mechanically break food into smaller pieces while **enzymes** work on reactions that dissolve them. The food breaks into smaller and smaller pieces as it travels through the stomach, and then the nutrients move into the small intestine, where they are absorbed through the walls into the bloodstream. Any undigested matter is expelled from the body.

What does the digestive system do?

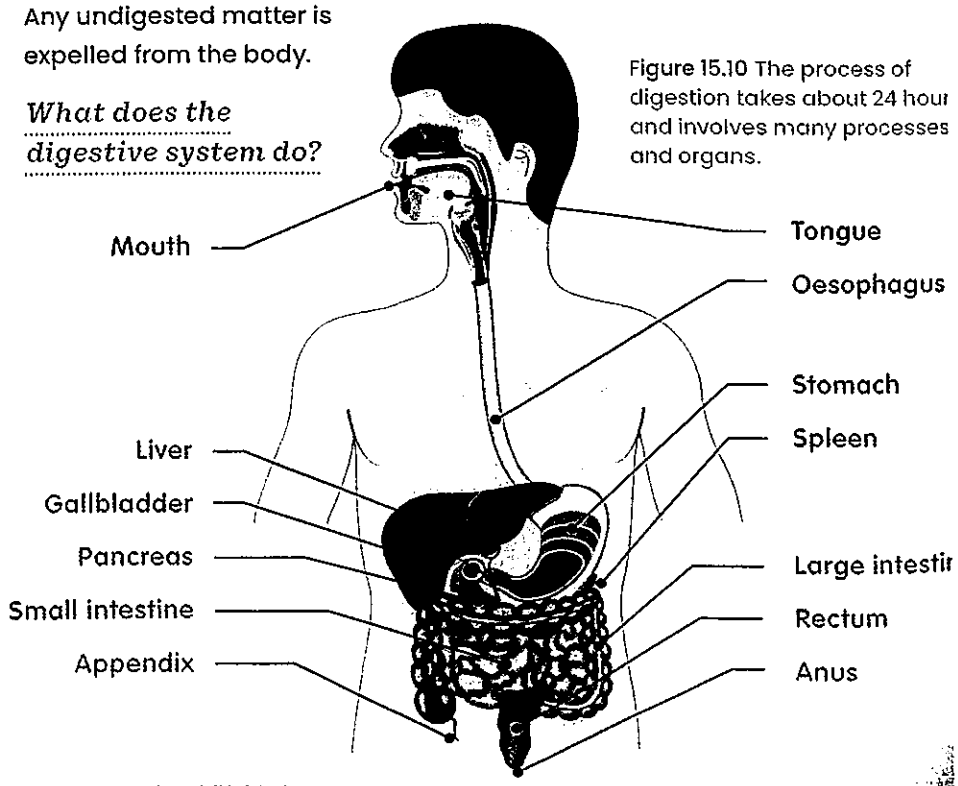


Figure 15.10 The process of digestion takes about 24 hour and involves many processes and organs.

❷ The excretory system removes waste from the body

Cells are constantly undergoing chemical reactions. These reactions produce cell wastes that need to be removed from the body before they build up and cause harm. The elimination of cell waste from the body is called **excretion**. Most wastes leave the body in faeces or urine, although some leave in sweat or the breath.

Specialised organs remove different types of cellular waste, and these organs make up the excretory system. Many parts of the human body have some role in excretion, including the skin, lungs and liver. However, there are some specific organs that make up the excretory system:

- The kidneys are two bean-shaped organs behind the lower part of your abdomen. They filter all blood to remove harmful wastes. These wastes are then excreted in urine.
- The urinary bladder is the organ that collects the urine excreted by the kidneys.
- The large intestine is where undigested food particles collect. Any remaining usable water is absorbed through the wall of the intestine, and the remaining solid waste is excreted through the rectum and anus as faeces.

What does the excretory system do?

CHECKPOINT 15.6 ✓

1. What is the main purpose of the digestive system?
2. The lungs are more like sponges than balloons. Suggest why.
3. What is the role of the kidneys in excretion?
4. Which body system contains the bronchi, and where in the body are they located?
5. Explain how the excretory system ensures the human body is able to function effectively.
6. Give some examples of how wastes can leave the body.

CHALLENGE

7. The trachea is surrounded by C-shaped rings of cartilage. Use the internet to research the purpose of these rings.

❸ The respiratory system processes oxygen

Your respiratory system gathers and processes oxygen, a molecule essential to life. You breathe in (inhale) oxygen with air, and release carbon dioxide and water vapour when you breathe out (exhale). This gas exchange is only possible because of the special structures of the respiratory system.

During inhalation, air enters the nostrils or mouth and moves into the *trachea* (windpipe). It then travels into two branching *bronchi* and into smaller passageways called *bronchioles*. From here, the air is passed into clusters of tiny air sacs called *alveoli*. Each alveolus is moist, thin and contains many tiny blood vessels called capillaries.

Oxygen from the air moves through the walls of the alveoli and into the capillaries, where it is then transported in the blood to the cells for aerobic respiration. At the same time, carbon dioxide and water move from the blood into the airways, where they then take the opposite route to leave the system during exhalation.

What does the respiratory system do?

SKILLS CHECK

- I can describe the role of the digestive system.
- I can describe the role of the excretory system.
- I can describe the role of the respiratory system.

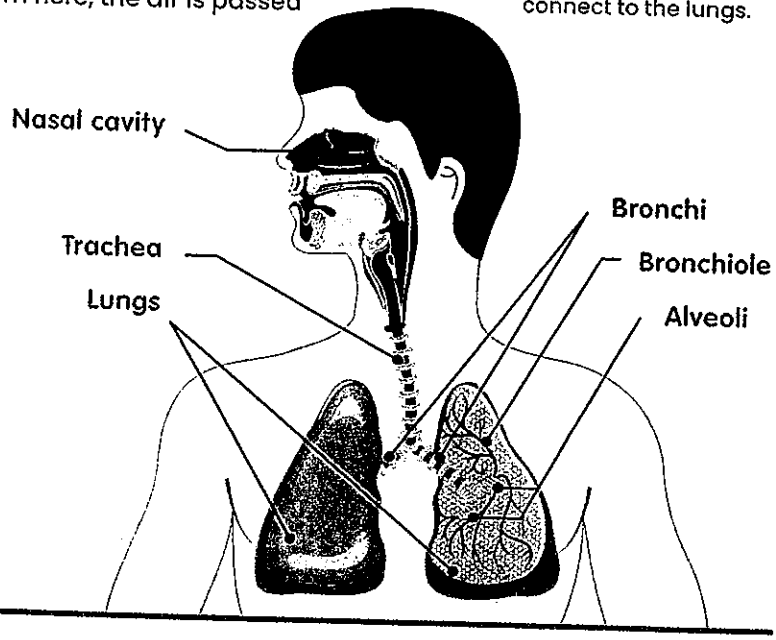


Figure 15.11 The human respiratory system is made up of airways that connect to the lungs.

15.7 HUMAN REPRODUCTION

At the end of this lesson I will be able to:

- **outline** the role of the reproductive system in humans.

embryo
an early stage of development of a baby

fertilise
join a sperm with an ovum

foetus
a later stage of development of an unborn baby

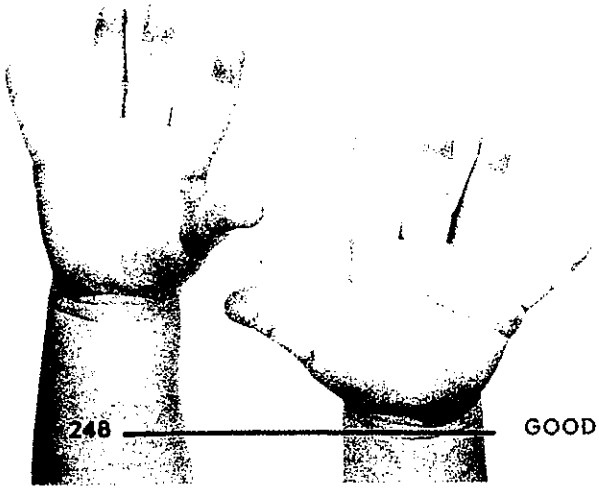
zygote
the first single cell of new life

LITERACY LINK

Identify three adjectives (describing words) in this section. Suggest an alternative word for each adjective you identify.

NUMERACY LINK

The average development period for a human baby is 40 weeks. How many days are there in 40 weeks?



Most humans have either a male or female reproductive system.

To produce a new human, a sperm from a male must find its way to a female ovum (egg) and wiggle inside.

❶ The human reproductive system produces new life

The function of the human reproductive system is the production of new life. Before technology such as IVF, new life always began with sexual intercourse between a male and a female. If sexual intercourse happens around the time of ovulation, then the male sex cell (sperm) has a chance to **fertilise** the female sex cell (ovum). The new single cell, or **zygote**, quickly divides and becomes a ball of cells called an **embryo**.

About five days after fertilisation, the embryo moves out of the fallopian tube into the uterus. It then embeds itself into the lining of the uterus, where it receives nourishment from the blood vessels and can develop into a **foetus**. The foetus then grows and develops, receiving nutrients and removing wastes from the mother via the placenta and the umbilical cord.

A human baby develops in the uterus for about 40 weeks. After this, different hormones make the muscles of the uterus contract to push the baby out through the vagina. The amniotic sac bursts, fluid is expelled and then the baby is born. About a third of births in Australia are by caesarian section, where a baby is removed surgically through its mother's abdomen.

What is the role of the human reproductive system?

❷ The male reproductive system

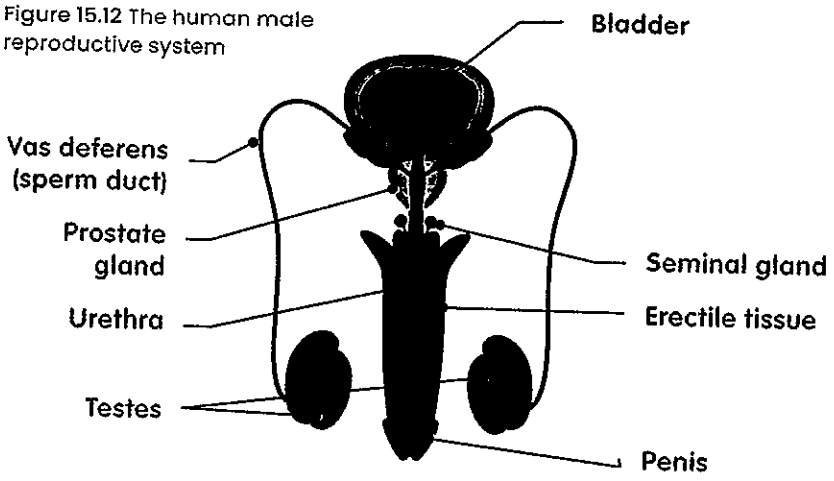
Humans mostly have the same organs – we all have hearts, lungs and brains. The only system that differs between humans is the reproductive system, because male humans have different reproductive organs than female humans.

The testes produce sperm (male sex cells) and the male hormone testosterone. They are in the scrotum, which provides them with some protection and allows them to stay at the right temperature while outside of the body.

When ejaculation happens, sperm move from the testes through the vas deferens (sperm duct) to the seminal gland, where seminal fluid is added. This fluid contains mainly water and glucose to moisten and feed the sperm. The prostate and Cowper's glands both add male hormones. The fluid is now known as semen. Semen travels through the urethra, a tube within the penis, to the outside.

What are the key parts of the male reproductive system?

Figure 15.12 The human male reproductive system



3 The female reproductive system

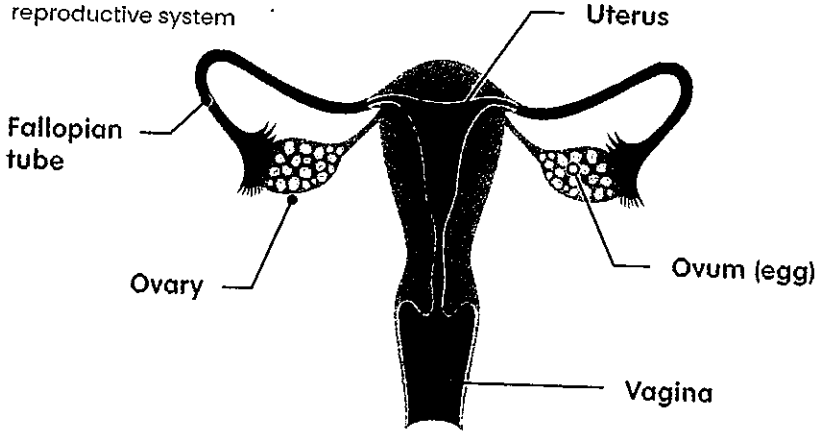
The ovaries are the main organs of the female reproductive system. They produce ova (eggs) and the female hormone oestrogen. In a fertile female, one ovum is usually released from one ovary each month, during ovulation.

The ovum moves down the fallopian tube. If the egg does not meet a sperm, it continues down the fallopian tube and moves through the uterus. Hormones have made the lining of the uterus thicken with blood and tissue.

If fertilisation does not happen, the ovum moves out through the vagina. The uterus lining breaks down and also moves out through the vagina. This is known as menstruation or a period. On average, this happens once every 28 days after the beginning of puberty and lasts until menopause, which usually happens between the ages of 45 and 55.

What are the key parts of the female reproductive system?

Figure 15.13 The human female reproductive system



CHECKPOINT 15.7

1 Describe the role of the human reproductive system in one sentence.

2 What are the male and female sex cells called?

3 How long does the time from conception to birth usually take?

4 Sperm have tails called flagella – suggest why.

5 What substances make up semen?

6 What is menstruation and why does it happen?

7 In which part of the female reproductive system does the embryo embed and become a foetus?

CHALLENGE

8 Find out how long pregnancy is for different mammals such as a gorilla, a chimpanzee, a cat, a dog and an elephant.

SKILLS CHECK

- I can describe the role of the human reproductive system.
- I can compare the female and male reproductive systems.

Multicellular organisms make energy through the process of cellular respiration.

Animals gain their energy from glucose and oxygen.

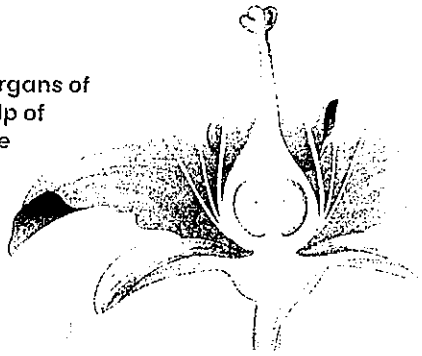
glucose oxygen carbon dioxide water energy

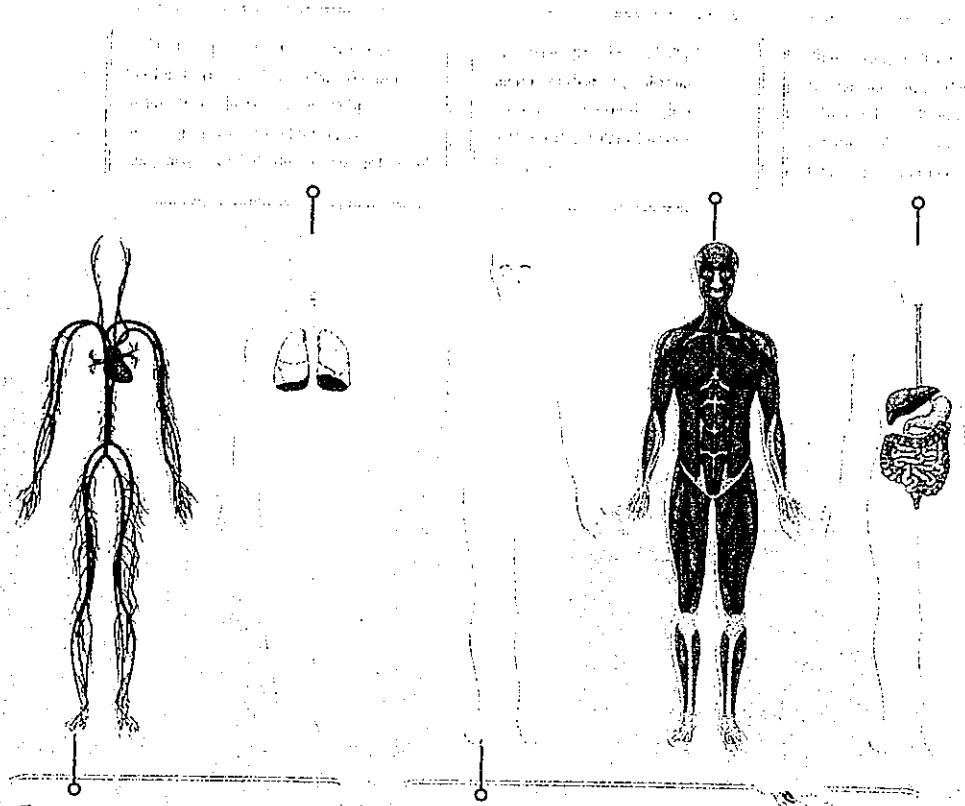
Plants use to capture energy from light and produce it from carbon dioxide and water.

carbon dioxide water chlorophyll light energy glucose oxygen

Cells combine to make tissues, organs and organ systems. Animals can have more than ten major body systems that work together to support life.

Flowers contain the reproductive organs of plants. They reproduce with the help of wind, water or animals, which move pollen from the male to the female organs during pollination.





Organisms grow and mature as their cells divide. New cells replace old or damaged cells.

Unlike other cells, sex cells (gametes) divide twice in meiosis, producing cells with half the usual number of chromosomes.

The excretory system removes waste from the body through faeces, urine, sweat and breathing.

The male reproductive system generates sex cells, which fertilise the eggs created by the female reproductive system to create new life.

★ FINAL CHALLENGE ★

LEVEL 1 ★☆☆ ☆☆☆ 50xp

LEVEL UP!

1. Bones must be both strong and rigid as well as somewhat flexible. Suggest why.
2. What do the equations for photosynthesis and cellular respiration have in common?
3. Why do the muscular and skeletal systems need to work so closely together?

LEVEL 2 ★★☆ ☆☆☆ 100xp

LEVEL UP!

4. What is the role of the flower in a flowering plant?
5. Draw a labelled diagram of the various parts of a flowering plant.
6. Explain how the respiratory and circulatory systems work together.

LEVEL 3 ★★★ ☆☆☆ 150xp

LEVEL UP!

7. Describe the physical and chemical differences between the food that goes into your mouth and the waste that is eliminated.
8. What is respiration? When does it happen? Where does it happen?

LEVEL 4 ★★★ ★☆☆ 200xp

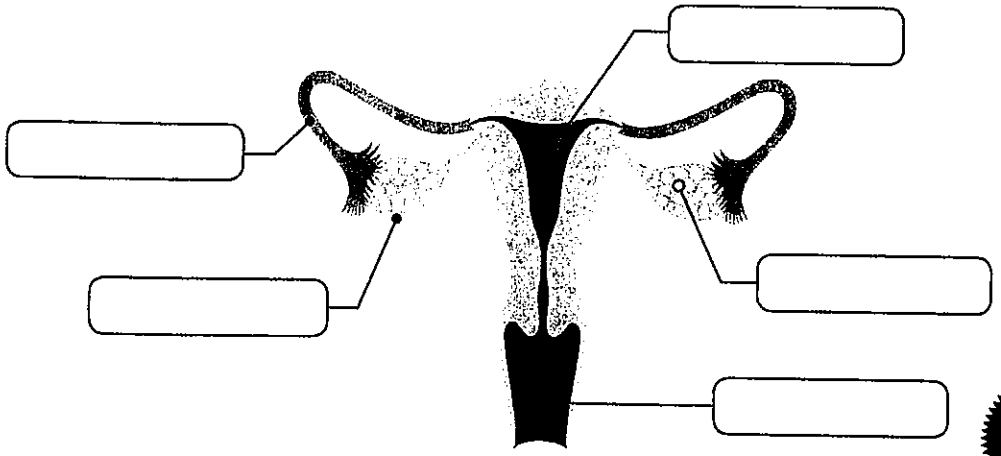
LEVEL UP!

9. Describe the role of the excretory system and suggest what could happen to someone with kidney failure.
10. Give an example of two body systems that work together and discuss how they do so.

LEVEL 5 ★★★ ★★★ 300xp

LEVEL UP!

11. Explain why the male testes must be outside the human body.
12. Label this diagram of the female reproductive system:

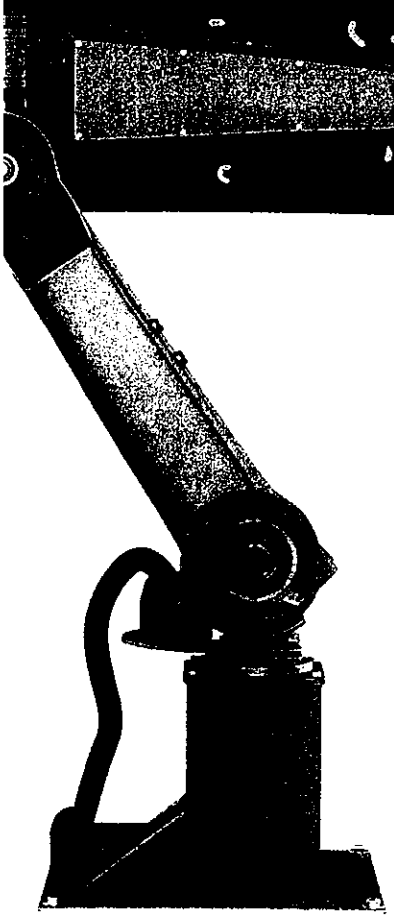


BIOTECHNOLOGY

16

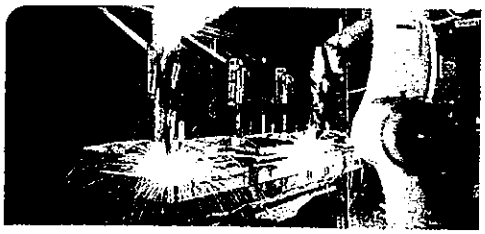
Developments in science and technology happen every day. Many new tools and devices improve our lives in countless ways. Discoveries shape our knowledge and opinions, paving the way for even more advances, especially in medicine and biotechnology.

What scientific and technological discoveries are you most excited about? The search for 'super-Earths' (rocky planets twice the size of ours)? The progression of artificial intelligence and robotics? Growing replacement organs in laboratories? Gene mapping and editing? The future of science and technology seems limited only by our imaginations.



1 LEARNING LINKS

What do you already know about biotechnology?



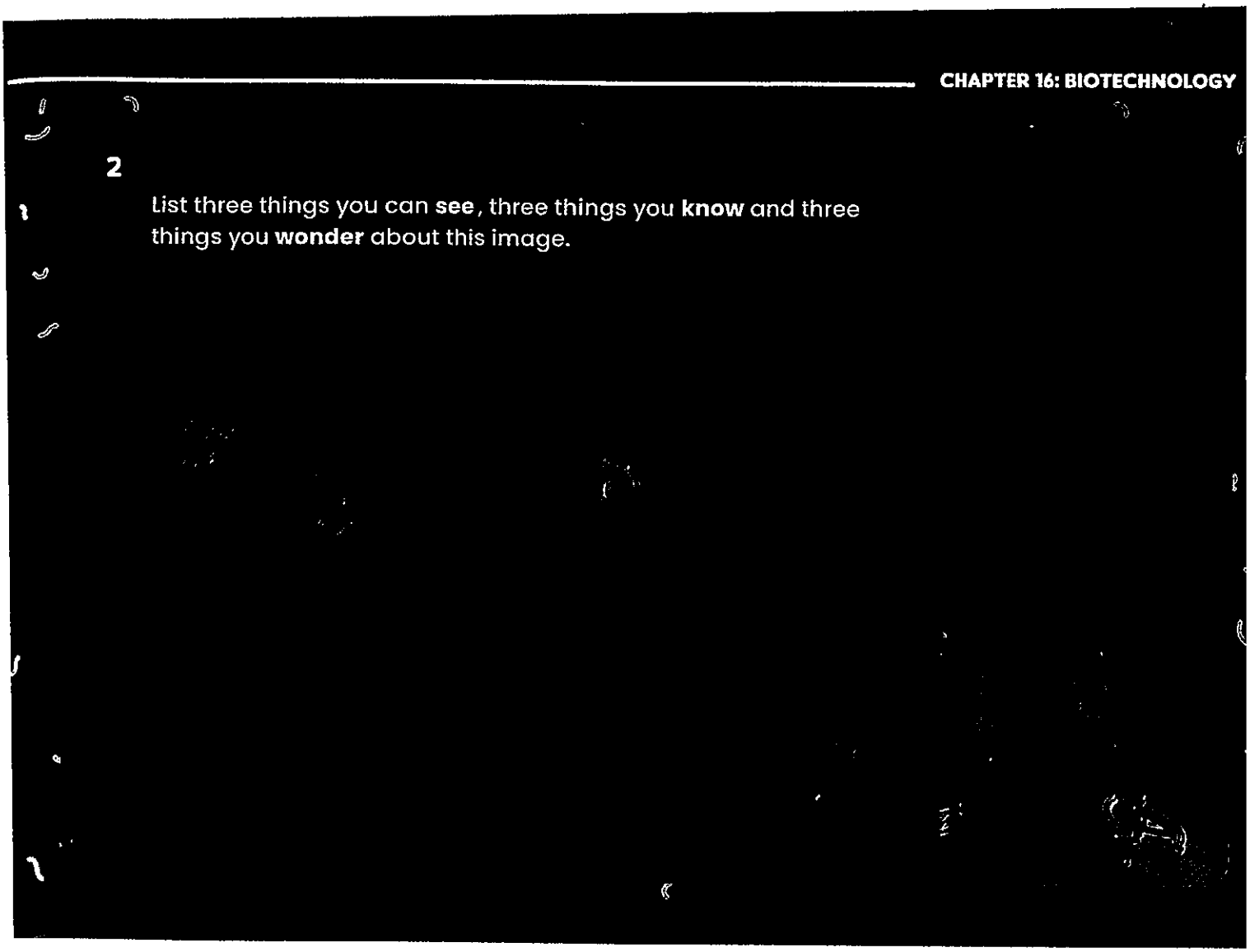
How do social and environmental influences affect product design?

What scientific and technological issues are relevant in daily life?

What attitudes do people hold towards science and technology?

2

List three things you can **see**, three things you **know** and three things you **wonder** about this image.



3 CRITICAL + CREATIVE THINKING

B-A-R: What would you make *bigger*, *add* and *replace* for a bionic leg?

Commonality: Write as many points of commonality as you can between the spread of disease and an organ transplant.

The ridiculous! Try to substantiate (prove/support) the following statement: 'The world would be better without sanitation and waste treatment'.

4 THE LONGEST!

The longest organ transplant chain in history involves over 100 kidney donors and recipients. It started in 2013 in Alabama, in the USA. The average wait for a kidney is more than five years, so this long transplant chain helps many people.

In the USA, an organ transplant chain begins with one person who decides to donate an organ because they want to help others. The person who receives the organ may have a relative who wanted to help them but they weren't the right match. Instead, this relative then donates their organ to another patient and the chain goes on.

16.1 TREATING DISEASES

At the end of this lesson I will be able to:

- **describe** at least one example of how changes in scientific knowledge have contributed to finding a solution to a human health issue.

bacteria
tiny, single-celled organisms that can live in a range of environments

immune
resistant to a particular illness or disease

transmissible
able to be passed from one person to another

virus
a tiny infectious agent that multiplies in its host

LITERACY LINK

Write an opinion piece about the ethics of Edward Jenner testing his smallpox vaccine on an eight-year-old boy.

NUMERACY LINK

10 people are infected with a transmissible disease, and 4 more are infected every day.

Write an equation to model the spread of the disease, and calculate how many people in total are infected after 17 days.

Nothing has caused more loss of human life than **transmissible** diseases. Historically, during some disease outbreaks, 10% of the world's population was wiped out.

Scientists have been vital in treating diseases, in some cases completely eliminating them. They have made vaccines and antibiotics, and educated people about how diseases spread, saving millions of people from suffering and death.

1 Transmissible diseases are passed from person to person

Have you ever been home sick with 'the flu'? Sometimes people say that when they just have a bad cold, but the real flu is a disease called influenza. This is a transmissible disease – one that passes from person to person. Diseases are transmitted in different ways – some transmit through skin contact, others through tiny droplets in the air, or several other ways.

There are different types or strains of influenza, and some are stronger and more dangerous than others. In 1918, a strain called the Spanish flu killed 3–5% of people on Earth. That was between 50 and 100 million people! One of the reasons so many people tragically died was that there was no vaccine available to make people **immune** to influenza.

What is a transmissible disease?

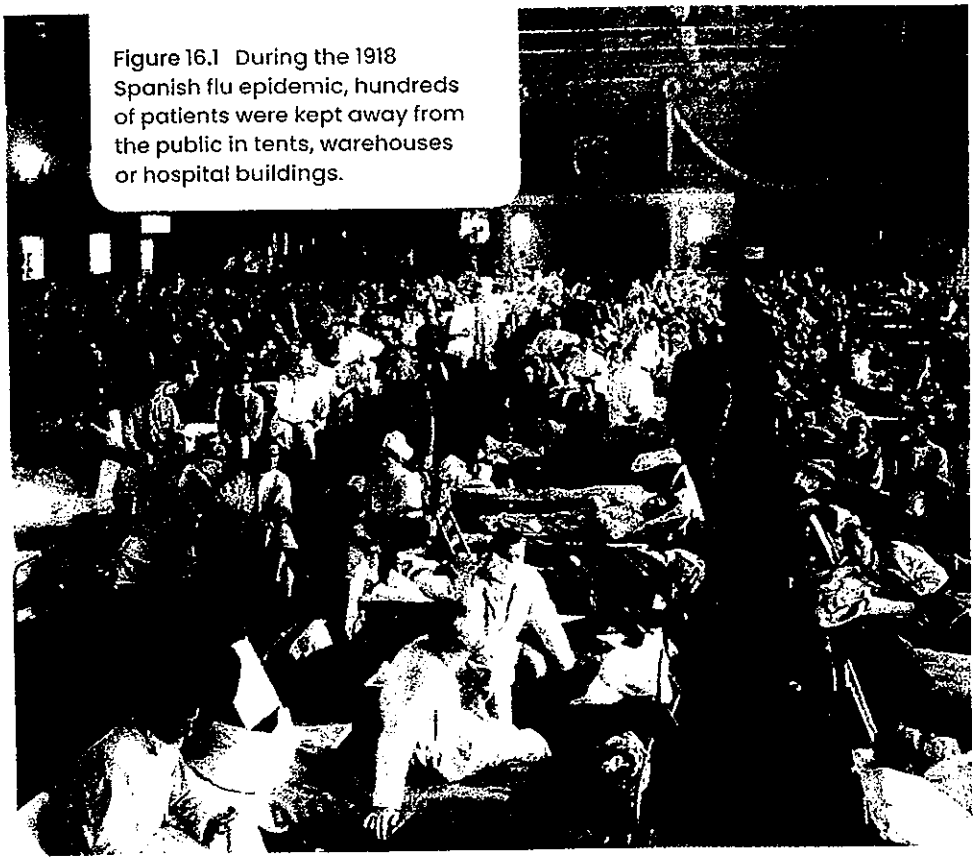


Figure 16.1 During the 1918 Spanish flu epidemic, hundreds of patients were kept away from the public in tents, warehouses or hospital buildings.

2 Vaccines can prevent people from catching diseases

INVESTIGATION 16.1
The contagion game

Vaccines are medicines that can prevent people from catching diseases in the first place. The vaccine is similar to the disease itself, so when a person is injected with it or swallows it, their immune system acts to fight it off. The person's body then usually 'remembers' the disease and becomes immune to it. If the person comes in contact with the disease again, they can remain healthy.

The first vaccine was discovered and developed at the end of the 18th century by English doctor Edward Jenner. He lived at a time where a disease called smallpox was killing millions of people all around the world.

Jenner noticed that people who had been exposed to cowpox – a very similar but much less dangerous disease – were immune to smallpox. One day he borrowed the eight-year-old son of his gardener and experimented on him. He rubbed pus from cowpox blisters into an open wound on the boy's arm. Jenner's experiment worked, and the boy became immune to smallpox!

How was the vaccine for smallpox developed?

3 Antibiotics treat diseases caused by bacteria

Have you have ever cut yourself and then noticed the wound is red and hot? It may have been infected with **bacteria**. Medicines called antibiotics can treat many infections like this. Antibiotics are also able to treat illnesses such as tuberculosis and pneumonia, which in the past have killed millions of people.

The earliest antibiotics used types of fungus, such as mould, to fight bacteria. There are records showing the use of mould in treating infections in Ancient Greece and Egypt. People at that time may not have known the science behind it, but they knew that it worked. British scientist Alexander Fleming was the first person to work out why moulds could treat infections, and he invented the first antibiotic medicine, penicillin from a fungus, in 1928. Australian scientist Howard Florey and British scientist Ernst Chain did more research to make this medicine in large amounts, so that it could treat many people.

Antibiotics have limitations, because they only work on bacteria. Diseases such as colds and influenza are caused by **viruses**, tiny infectious agents even smaller than bacteria, so antibiotics have no effect on them. Sometimes antibiotics are used too much or when they shouldn't be, which can cause them to lose their effectiveness. Many doctors suggest avoiding the use of antibiotics unless they are absolutely necessary.

What can be treated with antibiotics?

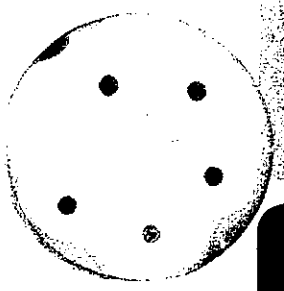


Figure 16.2 The pale green bacteria cannot grow near the small discs of test antibiotics.

1 Scientific knowledge has led to many improvements in human health. Identify at least two of the ways that now exist to fight disease.

2 Explain in your own words how vaccines work.

3 There are many types of diseases that humans can have.
a With a partner, list as many different diseases as you can.
b Separate the diseases from part **a** into two columns: 'transmissible' (those you can catch from someone or something) and 'non-transmissible'.

4 Explain why antibiotics are not useful to treat influenza.

5 Imagine you are the Prime Minister of Australia. Devise a plan to ensure the safety of all Australians in case of a disease outbreak. What are the three most important aspects of your plan?

SKILLS CHECK

- I can describe at least one way that scientific knowledge has contributed to solving a human health issue.

16.2 THE IMPORTANCE OF CLEAN WATER

At the end of this lesson I will be able to:

- **explain** how evidence from a scientific discovery has changed understanding and contributed to solving a real world problem, e.g. hygiene, sewage treatment or biotechnology.

hygiene
ways of doing things that support health and prevent disease, often through cleanliness

sanitation
facilities and services to ensure safe treatment of human waste (urine and faeces)

sewage
wastewater and human waste (urine and faeces)

waterborne
carried or existing in water

LITERACY LINK

Create a poster that gives tips on good hygiene for primary-aged students. Ensure your poster is easy to understand.

NUMERACY LINK

A chemist tests 11 samples of bottled water for contaminants and records the following percentages:

0, 0, 0, 0, 1, 1, 2, 2, 3, 4, 4, 11

Remove the outlier from this data set, then calculate its mean, median and mode.

We use water for many things: to produce food, to make goods in factories, and for cleaning and drinking. Clean water is essential for health.

The biggest cities in the world began in places with easy access to water. People living downriver often had health problems, because people upstream were polluting the water with waste. **Waterborne** diseases such as cholera still cause the death of millions of people each year in places that do not have effective ways to get rid of wastes.

1 Sanitation programs keep water safe and clean

Sanitation is about keeping the environment – especially water – clean and free of disease. As well as removing and treating wastes such as sewage, it includes making sure water is safe for people to drink. Without good sanitation, people can be exposed to waterborne diseases, viruses, bacteria and parasites such as intestinal worms.

Good sanitation programs educate people about the importance of **hygiene**. Do you wash your hands after using the bathroom? Do you have regular showers or baths? Do you help your family by doing the dishes and wiping surfaces? All of these questions promote good hygiene, keeping people healthy and preventing the spread of disease.

In the 19th century, English doctor John Snow identified that the disease cholera came from contaminated water. Previously, it was thought that the disease was due to 'bad air'. His research led to important findings in germ theory, disease transmission and sanitation, and improve health around the world.

What does sanitation involve?

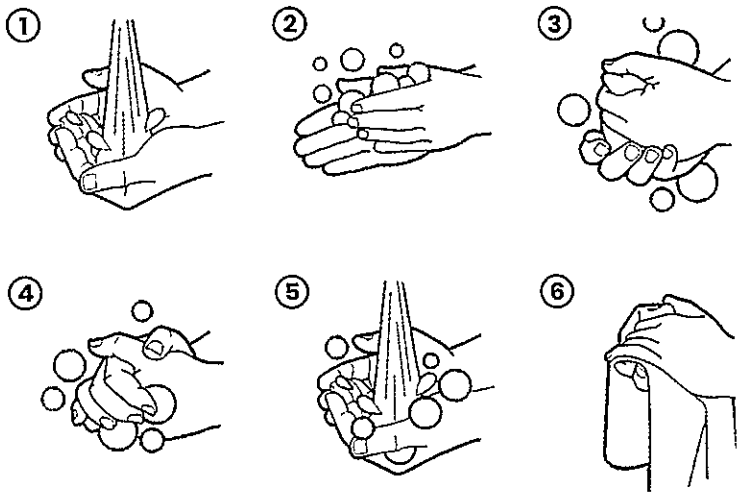


Figure 16.3 Washing your hands maintains health and hygiene, not just for yourself but for everyone and everything you contact.

❷ Sewage is treated before it is released to the environment

INVESTIGATION 16.2
Treating muddy water

Can you imagine life without a toilet? In the 19th century, many people would throw their waste straight out of the window onto the street, or directly into waterways. Aside from smelling really bad, this is dangerous! Wastes such as urine and faeces can contain viruses, bacteria and parasites. These cause serious diarrhoea, particularly in children. This leads to millions of deaths each year in developing countries where sanitation is poor.

In the late 19th century, British chemist Edward Frankland did some experiments to treat **sewage** with chemicals. He wanted to make the sewage safe to release into the environment. He found that by treating the sewage and then letting it sit for a while, he was able to make it safe to release.

Frankland's discoveries led to the development of large sewage treatment plants, which are used throughout Australia. The sewage is treated in a number of steps, starting with removing objects such as nappies, plastics and cotton buds. Air is pumped in to encourage bacteria to start doing the hard work of breaking everything down.

How is sewage treated to make it safe?

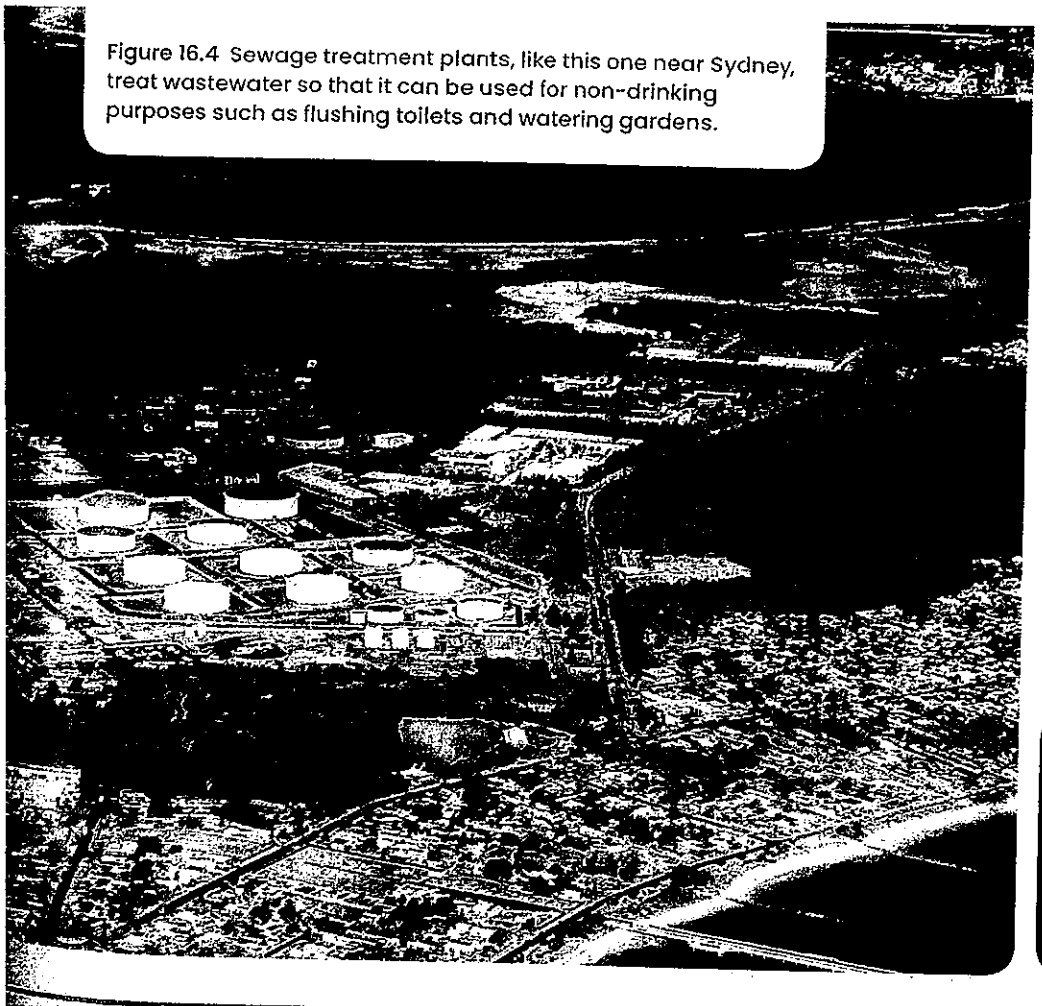


Figure 16.4 Sewage treatment plants, like this one near Sydney, treat wastewater so that it can be used for non-drinking purposes such as flushing toilets and watering gardens.

1 What kinds of contaminant can be found in sewage and wastewater?

2 What is an example of a waterborne disease?

3 Explain how the work of John Snow and Edward Frankland led to important improvements in human health.

4 Explain why good hygiene is critical to ensuring good health.

5 Many people in developing countries still lack basic sanitation. Explain how you would go about assisting these communities to improve their sanitation practices.

6 Explain the difference between hygiene and sanitation.

7 Figure 16.4 shows a sewage treatment plant. Write three things you can see when you look at the image, three things you know and three things you wonder.

8 Create a six- or eight-panel cartoon strip that describes some of the main steps of sewage treatment.

SKILLS CHECK

- I can explain how the understanding of sanitation has improved ways of waste management such as sewage treatment.

16.3 ORGAN TRANSPLANT TECHNOLOGY

At the end of this lesson I will be able to:

- **describe**, using examples, how developments in technology have contributed to finding solutions to a contemporary issue, e.g. organ transplantation.

embryo
an early stage of life where the parts of an unborn organism are still being developed

ethical
relating to principles about what people think is 'wrong' and 'right'

Nobel Prizes
world-famous awards given each year for academic, cultural and scientific advances

stem cell
a cell that can produce a different type of cell and divide to make more cells

LITERACY LINK

Defend or criticise this statement: 'Embryonic stem cells should not be used to create organs for organ transplantation'.

NUMERACY LINK

The chance of Ruben's body accepting his new kidney is 84%. What is the chance of his body rejecting the transplant?

Organ transplantation allows organs, such as the heart, kidneys and skin, to be given to someone who needs an organ because theirs is no longer working.

The biggest medical challenge in organ donation is an organ being rejected after someone receives it. Developments in technology mean that donations are now more successful.

1 Technology has improved organ transplant medicine

Transplanting organs from one person to another has been tried again and again over hundreds of years, but not very successfully. As doctors and scientists learnt more about the body, organ transplants became more successful.

One problem for organ transplants is keeping the organs fresh and healthy after being removed from the donor. Currently, organs are kept in cold storage during transfer, but this can damage them. In recent medical technology, scientists have made a system that copies the conditions inside the human body, keeping organs fresh and capable of 'surviving' as they're moved from the donor to the recipient.

How has technology led to more successful organ transplantation?

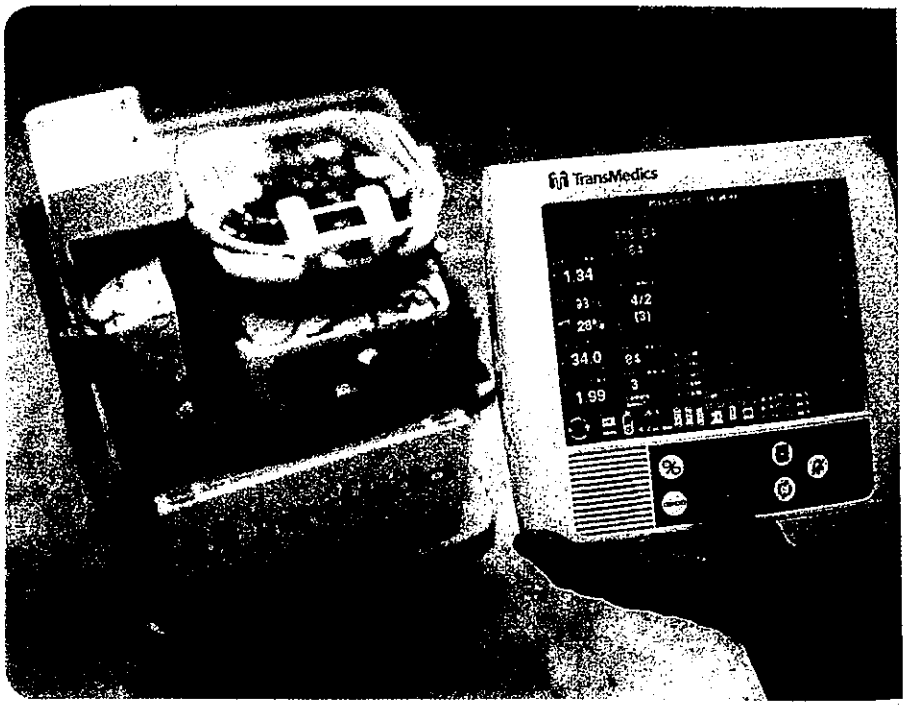


Figure 16.5 Instead of freezing organs, the TransMedics Organ Care System copies the conditions within the human body, keeping the organ alive.

❷ The human body tries to reject transplanted organs

As with any surgery, things can go wrong during organ transplants. The major cause of problems during transplants is actually the human immune system. The human body is always on the lookout for things that shouldn't be there – that's how our immune systems protect us. Unfortunately, these things include cells from something that would be helpful – in this case, a donor organ.

To avoid this, doctors try to find a very close match between donor and recipient, and anti-rejection medication can be used. The medication tries to stop the body from attacking the new donor organ.

Peter Medawar, a British scientist, worked out why a person's body rejects an organ. This led to the first anti-rejection medication, and he received a **Nobel Prize** for his work in 1960.

Why does the body try to reject donor organs?

❸ Stem cells may allow new organs to be grown

Current research into the use of some types of cell is exciting for the future of organ transplant. **Stem cells** are cells that can produce any other type of cell. They exist in some places in an adult human body, but some of the most powerful stem cells come from **embryos**.

The benefits are huge – imagine if you could grow a new beating heart out of your own stem cells! You wouldn't have to worry about organ rejection either. The new heart would have the same DNA as you, so your body would identify the heart as yours.

There are **ethical** concerns, though. If embryonic stem cells are used, the embryo is destroyed afterwards. Some people consider this to be loss of life, because the embryo could have developed into a baby.

How could stem cell science change organ transplantation?

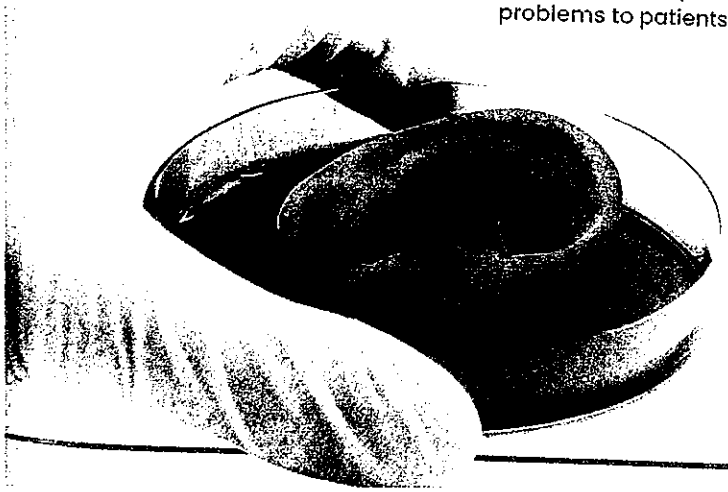


Figure 16.6 In the near future, it may be possible to grow new organs in a laboratory, ready to transplant without problems to patients.

CHECKPOINT

1 List some of the organs that can be transplanted.

2 Describe how organs are currently transported for organ transplantation.

3 Describe some of the risks of organ transplantation.

4 Describe at least two ways that developments in technology have led to improvements in organ transplantation.

5 Explain why the immune response of trying to kill foreign cells is usually an important and useful thing for the body to do.

6 What do you think the job of the immune system is in the human body? Give an example with your explanation.

7 Explain how stem cells could be used to make improvements in organ transplantation.

8 Would you donate your organs? Conduct research to create a list of pros and cons of organ donation.

SKILLS CHECK

- I can explain how developments in technology have led to improvements in organ transplantation.

16.4 OPINIONS ABOUT ORGAN TRANSPLANTS

At the end of this lesson I will be able to:

- **give examples** to show that groups of people in society may use or weight criteria differently in making decisions about the application of a solution to a contemporary issue, e.g. organ transplantation.

controversial
creating public disagreement and debate

ethical
relating to principles about what people think is 'wrong' and 'right'

humane
compassionate and sympathetic

LITERACY LINK

Create a pamphlet aimed at encouraging people to consider organ donation. Include information about the importance of organ donation and what is involved in becoming a donor.

NUMERACY LINK

22 467 people responded to a recent survey on their opinions on organ transplants.

Round 22 467 to the nearest hundred.

Choosing to be an organ donor, or to receive a transplanted organ, isn't always a straightforward decision. Different groups in society have different beliefs and opinions about organ transplantation.

There are more people waiting for transplants than there are organs available, so animal organs are sometimes used. Also, some people sell organs illegally.

1 Organ transplantation raises concerns

There is a huge gap between how many organs are available and how many people need them. In NSW, only about 17 in every million people donate an organ. This raises several **ethical** questions. How do we best select who receives an organ? Should we use organs from children?

Some people – living donors – choose to donate an organ such as a kidney while they are still alive. Some decide that their organs may be donated to others after they die. For potential living donors, there can be pressure to donate an organ, and this can cause stress and relationship issues. The family of a person who has died may be too distressed to agree to the organ donation planned by that person.

What are some of the issues with organ transplantation?

2 Organ trafficking is a worldwide problem

When there is a need for organs, this is a chance for the illegal sale of human organs. This is also known as organ trafficking or trade.

Organ trafficking can affect disadvantaged people who may need money for themselves and their families – they may sell an organ such as a kidney and become sick or die. Cases of kidnapping and stealing organs have been reported all around the world. The price for some organs has been reported to be as high as $150 000, or even more.

Why does organ trafficking happen?

Figure 16.7 The illegal buying and selling of human organs is a major problem in some parts of the world.

3 The use of animal organs is controversial

There are many more people needing organs than there are donors. Some people support the use of animal organs, like those of pigs or baboons, for transplants. This is a field of medical research called *xenotransplantation*. The Greek prefix *xeno* means 'foreign' or 'different'.

Using animal organs in transplantation has never been entirely successful, because the human body rejects them. The use of animals in science and medicine has always been **controversial**. People concerned about the **humane** treatment of animals may not agree with animal organ transplants.

Why is the use of animal organs controversial?

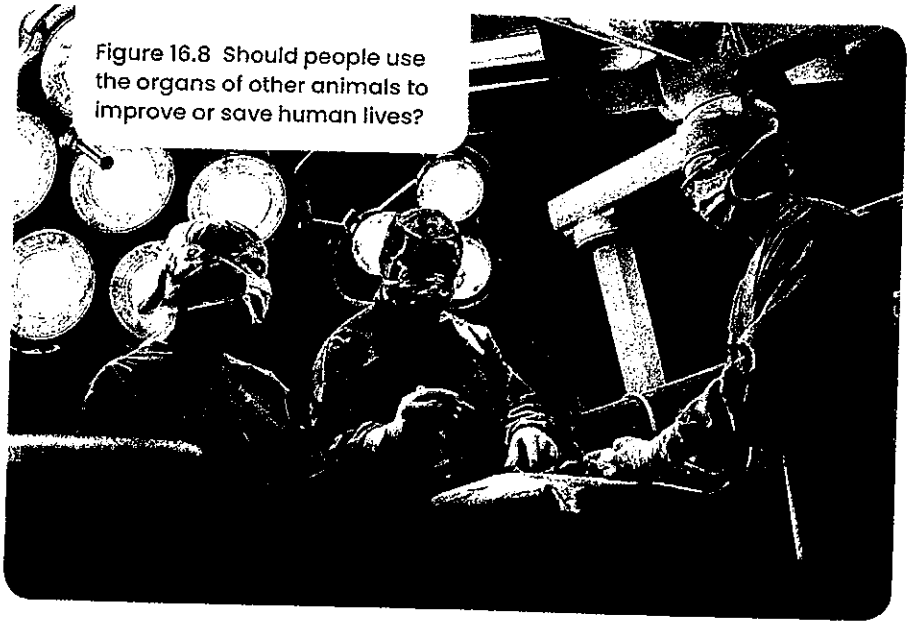


Figure 16.8 Should people use the organs of other animals to improve or save human lives?

4 Some cultures and religious groups have concerns about organ transplants

Different cultures and religious groups have different attitudes about many things, including medicine. They may have different ways of thinking about the value of organ transplantation.

In many religions there is no objection to organ donation and organ transplantation. Some groups support it, seeing organ donation as an act of generosity or compassion. For some there are moral or spiritual concerns. For example, some people believe that the body of a person who has died must remain complete, in readiness for an afterlife. Others may accept an organ donation if the organ no longer contains blood from the donor.

How can culture or religion affect decisions about organ transplantation?

CHECKPOINT 16.4

1 Describe at least three ethical considerations about organ transplantation.

2 Explain why the illegal trade of organs exists.

3 Explain why these groups may be hesitant to undergo organ transplantation.
- **a** Indigenous Australians
- **b** Romani people
- **c** those of the Jehovah's Witness faith

4 Explain why the use of animal organs can be controversial.

5 Create a list of positives and negatives in relation to organ transplantation.

6 Some people consider the use of pig organs for transplantation to be more acceptable than the use of organs from primates such as baboons, even though primate organs are a closer match to our own. What is your opinion? Defend or criticise the use of pig organs over primate organs.

7 Research organ trafficking and prepare a short report on the illegal trade of organs.

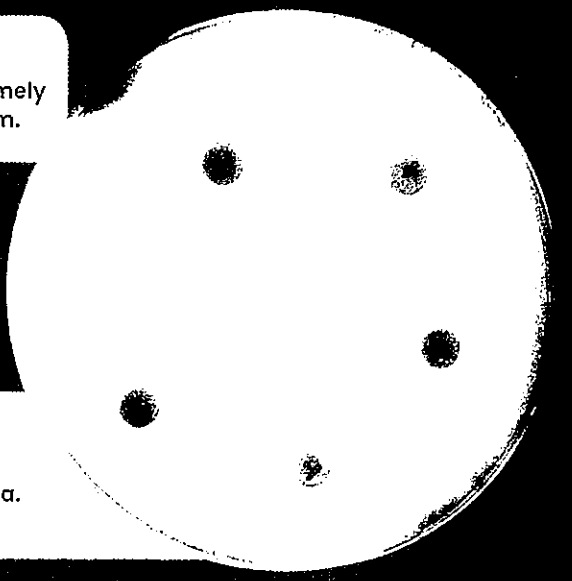
SKILLS CHECK

- I can describe how different groups in society make decisions about organ transplantation.
- I can give examples of the concerns of at least two groups of people in society.

CHAPTER SUMMARY

Biotechnology
Transmissible diseases are passed from person to person. They can be extremely dangerous, but modern medical science has developed ways to combat them.

◀ Vaccines prevent people from catching diseases.

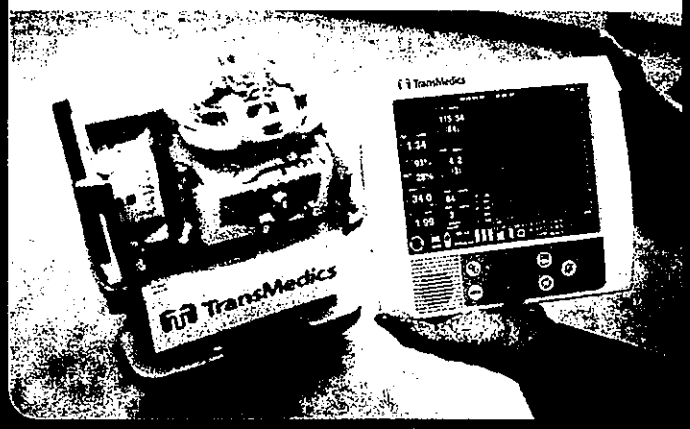


Antibiotics ▶ treat diseases caused by bacteria.

▼ Waterborne diseases like cholera still cause deaths in places that lack adequate sanitation.

▼ Sewage is treated to reduce its environmental impact. Bacteria break down the organic waste in sewage water so that the water can be recycled for non-drinking purposes.

▼ Many different organs and tissues can be transplanted, from hearts and eyes to bone marrow and skin. Modern organ transplant technology allows donor organs to be preserved and kept healthy.



The illegal buying ▶ and selling of human organs is a major problem in some parts of the world. Some cultures and religions have concerns about organ transplants, while other people may have ethical concerns.

★ FINAL CHALLENGE ★

LEVEL 1 ★☆☆ ☆☆☆ 50xp LEVEL UP!

1. Give a definition of biotechnology in your own words.
2. Complete the following sentence: sanitation is not only ensuring that human waste like urine and faeces is safely disposed of, but also...
3. Give some basic advice for avoiding transmissible diseases.

LEVEL 2 ★★☆ ☆☆☆ 100xp LEVEL UP!

4. Match the terms below to their definitions.

Transmissible	Cells that can produce other kinds of cells and keep dividing.
Immune	Practices that support health and stop the spread of disease.
Sewage	Capable of being passed from one person to another.
Stem cells	Resistant to a particular illness or disease.
Hygiene	Waste water and excrement.

LEVEL 3 ★★★ ☆☆☆ 150xp LEVEL UP!

5. Explain why antibiotics will not help someone who has a cold.
6. Explain how the discovery of the vaccine has improved human life.
7. Describe the difference between a vaccine and antibiotics.

LEVEL 4 ★★★ ★☆☆ 200xp LEVEL UP!

8. Explain how waste is treated and made safe in Australia.
9. The Spanish flu wiped out around 3–5 % of the world's population; suggest how this was possible.
10. Describe some of the historic problems with organ transplants that are now being addressed or improved due to improvements in technology.
11. Explain stem cell science, including what stem cells are and how scientists hope to use them in the future.

LEVEL 5 ★★★ ★★★ 300xp LEVEL UP!

12. Describe some implications or considerations of organ transfer under the following sub-headings:
    a ethical
    b cultural
    c legal

3 MIXTURES

If you eat pasta at home then you've probably seen mixtures in action. You may have filtered pasta from water or thickened a sauce by evaporation. If you had a soft drink with your pasta, you may have drank a mixture called a solution.

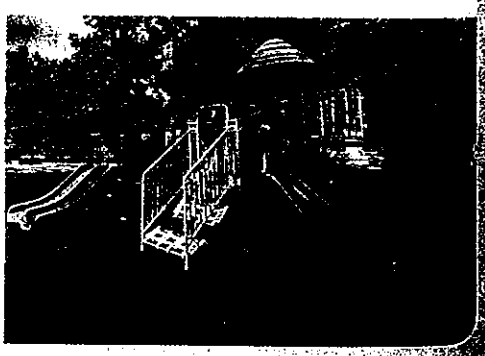
Mixtures can be separated. When we make foods, chemicals and medicines, we use separation techniques such as distillation and chromatography. We use separation to sort recycling from waste, clean up oil spills, and we separate the parts of blood and dyes to help solve crimes.

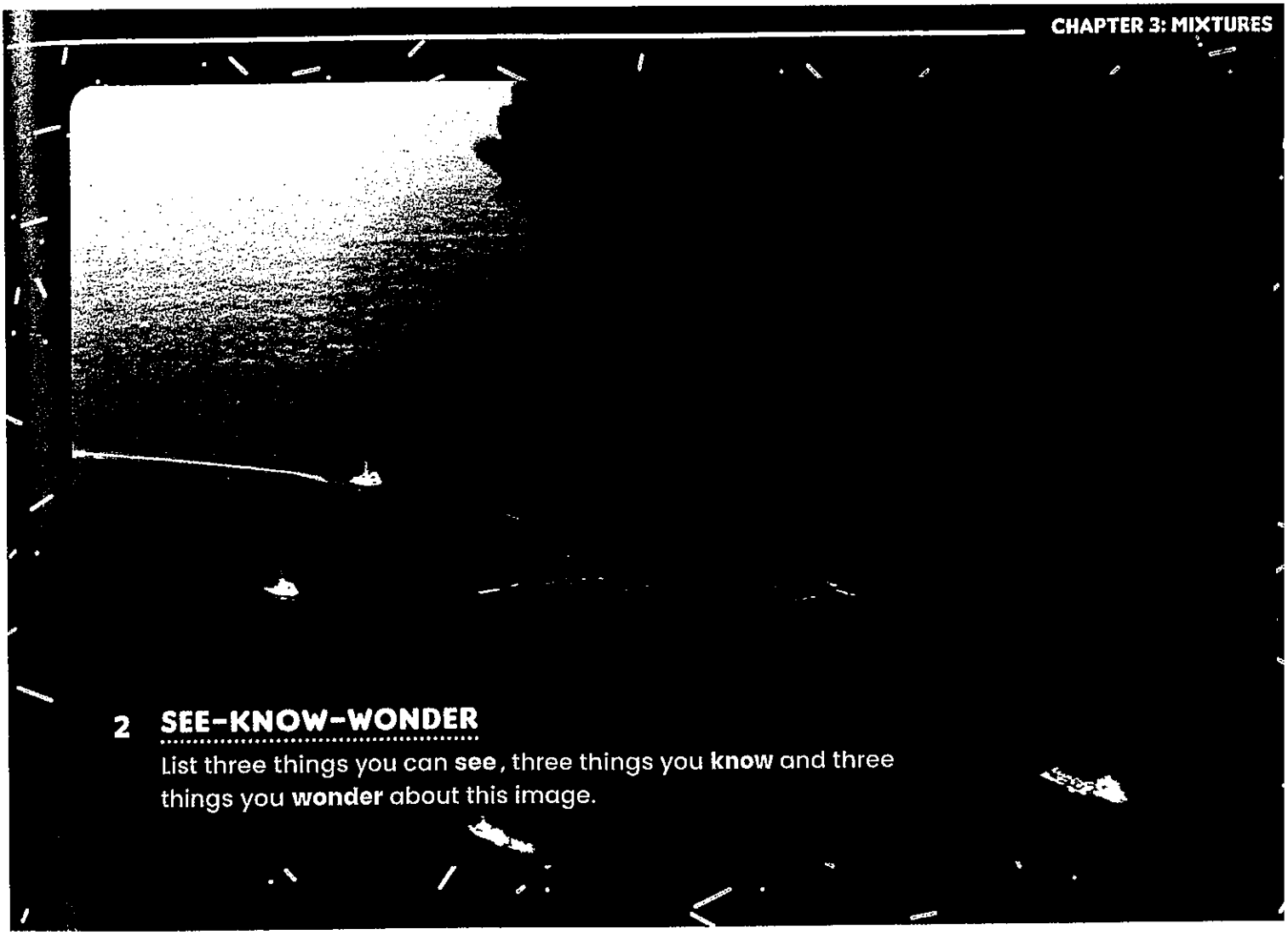
1 LEARNING LINKS

What do you already know about mixtures?

How many mixtures have you used today? List as many as you can.

Wet pour rubber (often used in playgrounds) is a mixture of rubber granules and polyurethane resin. How else can mixtures be used in innovative ways?





2 SEE-KNOW-WONDER

List three things you can **see**, three things you **know** and three things you **wonder** about this image.

3 CRITICAL + CREATIVE THINKING

Different uses: List some wildly different uses for filter paper. Think of as many as you can.

The alphabet: Think of a word about mixtures for every letter of the alphabet.

Ridiculous! Attempt to support this statement: 'From 2022, every home must process its own waste, including sewage'.

4 THE BIGGEST!

The biggest rubbish dump in the world probably isn't where you think it is – it's in the ocean. The Great Pacific Garbage Patch floats somewhere between Hawaii and California and is estimated to be at least three-quarters of the size of New South Wales. That's huge!

The ocean currents pull in more plastic every day, but there is some good news – a clean-up of the floating dump began in 2018 using floating 'ocean scrapers'. These scrapers are made out of recycled plastics from the garbage patch itself.

3.1 WATER AS A SOLVENT

At the end of this lesson I will be able to:

- **describe** the importance of water as a solvent in daily life, industries and the environment.

KEY TERMS

dissolve
a solid is mixed into a liquid to form a mixture called a solution

solute
a substance that is dissolved by a solvent

solvent
a substance that dissolves a solute

LITERACY LINK

Write a short story about living in a country that has very limited access to water.

NUMERACY LINK

A swimming pool full of water is 10 m long, 8 m wide and 1.5 m deep. What is its volume?

Formula: $V = lwh$

Water is vital for life on Earth – without water you couldn't survive. Our bodies need water, and so do the plants that we eat. We need water for daily activities such as cooking and washing.

Water is a **solvent** that can dissolve other substances. We use it to extract minerals from underground and to make medicines. Water is known as the *universal solvent* because it **dissolves** more substances than any other liquid.

1 Water is a solvent in daily life

A solvent is any substance, usually a liquid, that can dissolve other substances.

Water is a solvent, and it can dissolve many other substances – solids, liquids and gases. When these substances dissolve, they are called **solutes**. Water acts as a solvent in daily life in many ways:

- *human survival*: Water is an essential solvent for humans. Blood is mostly water, and it carries nutrients and oxygen throughout our bodies.
- *preparing meals*: Water dissolves spices, flavours and other ingredients as food cooks.
- *washing away dirt*: Water acts as a solvent for soaps and detergents when cleaning dishes, clothes and ourselves.

How does water act as a solvent?

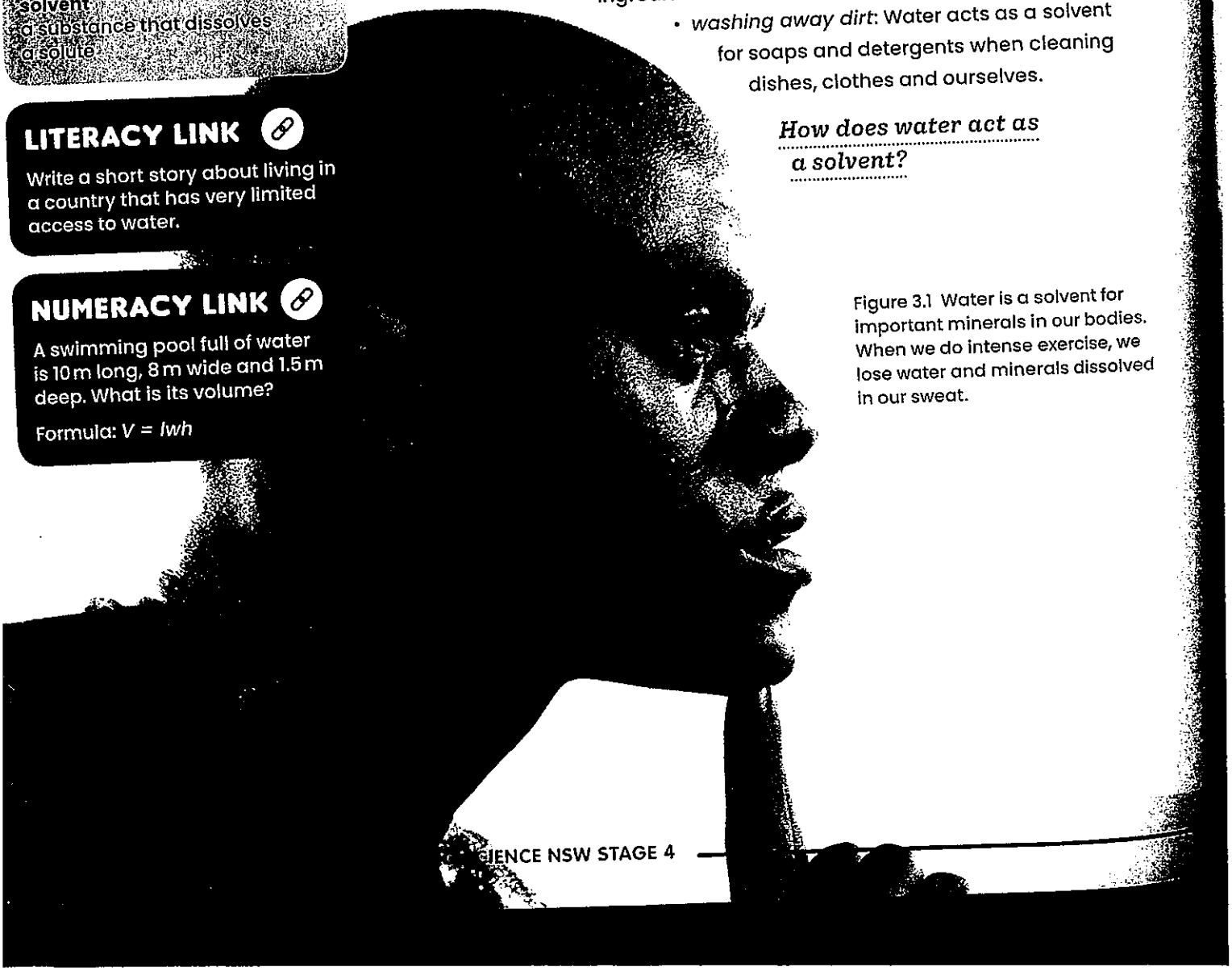


Figure 3.1 Water is a solvent for important minerals in our bodies. When we do intense exercise, we lose water and minerals dissolved in our sweat.

2 Water is a solvent in the environment

Many essential elements such as iron, zinc and calcium are needed by plants and animals. They exist as minerals in rocks and soil. Water can dissolve many of these minerals, so plants can absorb them from groundwater. Animals eat the plants, receive these essential nutrients, and are able to survive.

The water in rivers, lakes and oceans contains dissolved oxygen that is vital to fish and other animals. Similarly, water contains the dissolved carbon dioxide that marine plants need.

What substances can water dissolve?

3 Water is a solvent in industry

Industries such as mining use water as a solvent to extract different minerals and elements.

Uranium is an element found in rocks located deep underground. It is used as a fuel in the reactors of nuclear power plants and in powering nuclear submarines. In Australia, the major uranium mines use water as a solvent to remove the uranium from the rocks. Instead of digging up the rocks to remove the uranium, acids are dissolved into water that is then pumped into the rocks that contain the uranium. This solution dissolves the uranium, and the acidic water is then pumped back to the surface where it is processed to remove the uranium.

How is water used as a solvent in industry?

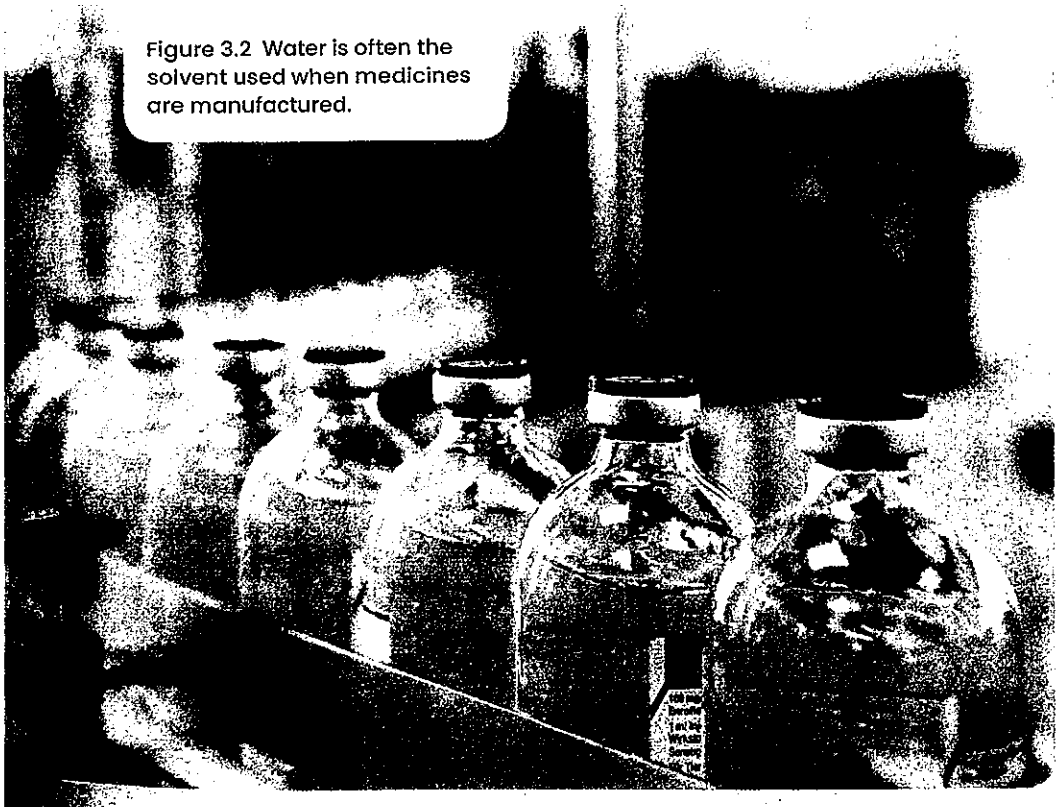


Figure 3.2 Water is often the solvent used when medicines are manufactured.

CHECKPOINT 3.1

1. Explain the difference between a solvent and a solute.
2. List three uses of water as a solvent in daily life.
3. What is found in soil and rocks that water can dissolve?
4. Identify how water can be used in industries as a solvent.
5. Explain how water is important for washing away dirt.
6. Explain why dissolved oxygen and carbon dioxide in water is important.
7. Describe how water can be used as a solvent in mining.
8. Explain how water can be used as a solvent in medicine.
9. Water is critically important to the environment. Suggest why.

CHALLENGE

10. Use the Internet to find out what properties of water make it a useful solvent. Use labelled diagrams to help you present your findings.

SKILLS CHECK

- I can describe what a solvent is.
- I can state how water is used as a solvent in daily life, industry and the environment.

3.2 SOLUTE, SOLVENT, SOLUTION

At the end of this lesson I will be able to:

- **describe** aqueous mixtures in terms of solute, solvent and solution.

aqueous
containing water

insoluble
something that does not dissolve

mixture
substances mixed together that can be physically separated

soluble
something that dissolves

solute
a substance that is dissolved by a solvent

solution
a mixture made up of a solvent and a dissolved solute

solvent
a substance that dissolves a solute

LITERACY LINK

Write a hypothesis for an investigation that explores what happens if a lot of sugar is dissolved in water compared to water with only a small quantity of sugar. Include the key terms *dilute, concentration, solvent, solute.*

NUMERACY LINK

When mixing cordial, Habib uses one part cordial to five parts water. Express this as a ratio.

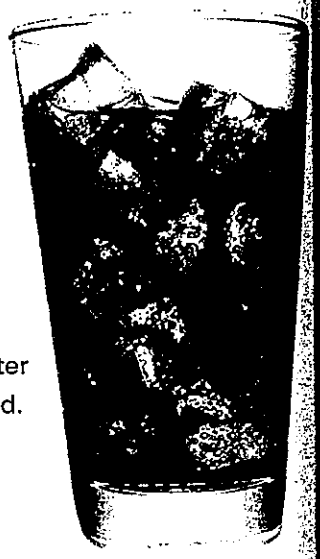
What's in a soft drink? What is dissolved and what are the ingredients that make these drinks so tasty?

It all starts with water, a solvent that can dissolve many substances. The ingredients of the soft drink – sugar, flavours and carbon dioxide for fizz – are solutes. They are dissolved in the **mixture**, which is a solution.

1 Solutes dissolve in other substances

A **solute** is any substance that can dissolve in another substance (the solvent). Solutes can begin as any of the three main states of matter:

- *solid*: For example, sugar, salt and instant coffee are all solutes that can dissolve in water.
- *liquid*: For example, cordial can dissolve in water to make a sweet drink.
- *gas*: For example, carbon dioxide can dissolve in soft drinks, which makes them fizzy.



Substances that dissolve are said to be soluble. Substances that do not dissolve are called insoluble. A substance that is insoluble in a solvent such as water might be soluble in a different solvent such as an acid.

What is a solute?

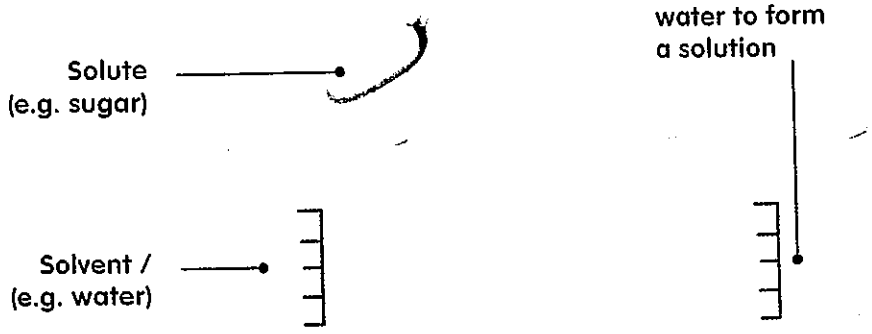
2 Solvents dissolve solutes

A **solvent** is any substance, usually a liquid, that can dissolve another substance (the solute).

Water is a liquid that can dissolve cordial (another liquid), sugar (a solid), and fizzy carbon dioxide (a gas) in soft drinks.

What does a solvent do?

Figure 3.3 A solution is a solute dissolved in a solvent.



3 Solutions are solutes in solvent

A **solution** is a mixture made up one or more solutes dissolved in a solvent. A cup of coffee, for example, is a solution made up of:

- solutes – powdered coffee and perhaps sugar
- a solvent – water.

Any solution that has water as a solvent is called an **aqueous** solution.

What is a solution made up of?

4 Solutions, suspensions and colloids

Not all solutions are the same. Different solutes make different solutions. Also, the amount of solute affects the solution:

- *concentrated solution*: a solution with a lot of solute. Putting 20 tablespoons of cordial in one glass of water gives you a concentrated (and unpleasantly sweet) solution.
- *dilute solution*: a solution with a very small amount of solute. Putting a quarter of a teaspoon of cordial in a large glass of water makes a dilute (and not sweet enough) solution.

Suspensions and colloids contain particles that behave differently to those in solutions:

- *suspension*: a mixture with large, insoluble particles that are spread out evenly at first and eventually settle to the bottom. A snow globe, with a mixture of plastic 'snow' particles and water, is a suspension.
- *colloid*: a mixture with tiny particles spread out evenly that never settle to the bottom. Milk is a colloid because it contains tiny droplets of fat in water.

How do particles in a suspension behave differently to those in a colloid?

Figure 3.4 The liquid in a snow globe is a suspension of plastic particles in water.

INVESTIGATION 3.2
The Tyndall effect

CHECKPOINT 3.2

1. Name three solutes.
2. For each of the three solutes above, identify a possible solvent.
3. Describe the difference between a solution and a solvent.
4. Copy and complete this sentence. A solution is a _____ dissolved in a _____.
5. What is the difference between a concentrated solution and a dilute solution?
6. In each of these aqueous solutions, identify the solute and the solvent.
   a. a cup of sweet, black tea
   b. a glass of orange juice made from powdered concentrate
   c. seawater.
7. A mystery substance is added to a glass of water. Initially the substance makes the water blue and cloudy. The substance then settles at the bottom of the glass. What type of mixture is described here?

CHALLENGE

8. Is fog a colloid? Do research to justify your answer.
9. Investigation 3.2 explores the Tyndall effect. Before the investigation, type 'Tyndall effect' into a search engine and do some background research.

SKILLS CHECK

- I can explain and give an example of a:
  - solute
  - solvent
  - solution.

3.3 FILTERING AND DECANTING

At the end of this lesson I will be able to:

- **relate** a range of techniques used to separate the components of some common mixtures to the physical principles involved in filtration and decantation.

KEY TERMS

decanting carefully pouring the liquid from a mixture, leaving the sediment behind

filtrate the liquid that passes through a filter

mixture substances mixed together that can be physically separated

residue the solid that does not pass through a filter

sediment the solid that settles to the bottom of a liquid

LITERACY LINK

Draw and label a diagram showing how to separate the parts of a mixture using filtration.

NUMERACY LINK

An identical mixture of chalk and water was separated by three students. Student A ended up with 5 grams of chalk, Student B ended up with 5.5 grams of chalk and Student C ended up with 4.2 grams of chalk. What is the average result?

Imagine you are stranded in the bush, and the only source of water is a muddy puddle. You scoop some water out with a container, and you notice how dirty it is. After a while, the mud sinks to the bottom of the **mixture**. You place a cloth over another container and, without disturbing the mud, carefully pour the liquid part of the mixture into the second container.

You've used decanting and filtering to separate the water and mud. You survive!

1 Mixtures can be physically separated

In science, a mixture is two or more substances mixed together that can be physically separated. Mixtures are all around us – concrete, air, mayonnaise, muddy water and sea water are all mixtures.

Some things are not mixtures. Oxygen, pure water and gold are not mixtures – they are pure substances.

Mixtures can contain:

- soluble substances, which will dissolve, such as salt
- insoluble substances, which won't dissolve, such as sand.

Some substances will partly dissolve, meaning that some but not all will dissolve into the solvent.

Scientists use information about solubility to help decide which technique to use to separate a mixture.

What is a the difference between a soluble and insoluble substance?

Figure 3.5 Salt dissolves in water but sand does not. They are both mixtures.

Salt water solution

Mixture of sand and water

❷ Filtration separates liquids from solids

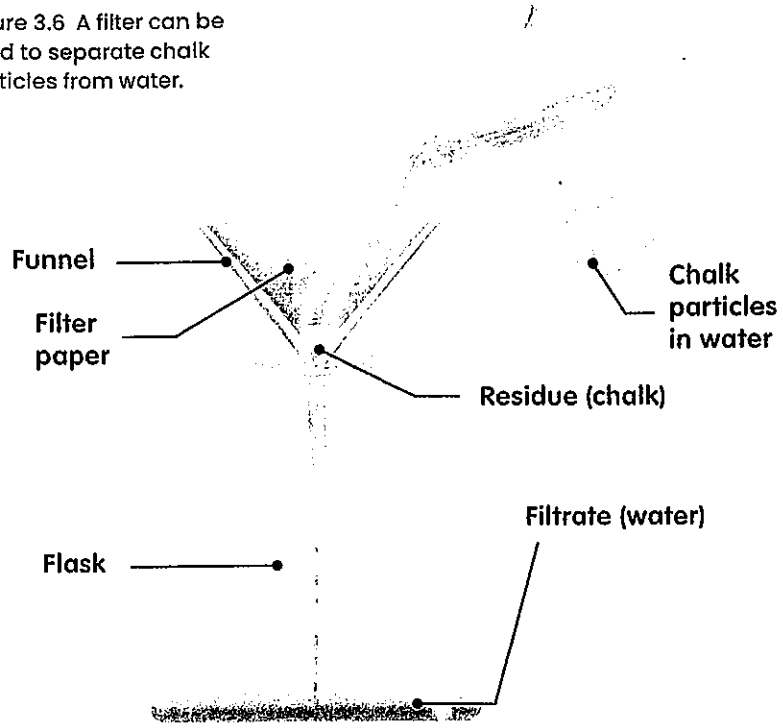
INVESTIGATION 3.3
Purifying muddy water

Filtration is used to separate insoluble substances from liquids. The filter acts like a sieve, using small holes to trap larger particles.

Figure 3.6 shows how filter paper can separate a chalk and water mixture. The solid chalk particles get trapped in the filter paper and the liquid water passes through the filter paper. The chalk left in the filter paper is called the **residue** and the liquid that passes through the filter paper is called the **filtrate**.

How does filtration separate solids and liquids?

Figure 3.6 A filter can be used to separate chalk particles from water.



❸ Decanting separates sediments from liquids

Decanting can also be used to separate insoluble solids from liquids. After an insoluble solid in a mixture settles to the bottom of a container, the liquid can be poured out carefully, leaving the solid behind.

Think back to the 'lost in the bush' scenario at the start of this section. The solid mud settled to the bottom of the container as a **sediment**. When the water was poured out from the top, the mud was left behind.

How does decanting separate solids and liquids?

CHECKPOINT 3.2

1. Which of these is a mixture?
   a gold
   b concrete
   c air
   d oxygen
   e pure water
   f seawater
2. For your answers to question 1, describe how you can tell it is a mixture.
3. Name three soluble substances.
4. Sand is an insoluble substance – suggest how you can tell.
5. Using words and a diagram, explain filtration.
6. Describe the process of decanting in 15 words or less.
7. Compare the physical properties that allow filtration and decanting to work.
8. In a laboratory, you are given a mixture of salt, dust and pebbles. Design a method of separating these three substances. (Hint: Salt dissolves in water, pebbles sink to the bottom of the container and dust floats on the surface.)

CHALLENGE

9. How are filtering and decanting used to solve problems in everyday life? Write or illustrate your answer.

SKILLS CHECK

- I can describe what filtration and decanting are.
- I can suggest ways to separate mixtures using filtration and decanting.

3.4 WATER FILTRATION AND WASTE MANAGEMENT

At the end of this lesson I will be able to:

- **investigate** the application of a physical separation technique used in everyday situations or industrial processes, for example, water filtering and sorting waste materials.

KEY TERMS

disinfection
destroying bacteria, often using special light or chlorine

sewage
semi-liquid human waste

sewerage
pipes that carry sewage

LITERACY LINK

Some people oppose the addition of fluoride into the water system. Write a short letter that could be published in a newspaper, giving your opinion.

NUMERACY LINK

A waste management plant combines $\frac{7}{12}$ litres of water with $\frac{3}{12}$ litres of chemicals. Add the fractions to find the total volume of liquid.

Many less economically developed countries do not have easy access to clean water, and the people there can get sick or die from diseases carried in water. These countries do not have good systems to manage their waste, creating serious health and environmental hazards in waterways and on land.

Australia has effective ways to purify water and manage wastes. This is better for our health and the environment.

1 Purification makes water safe to drink

Before water is safe to drink, it must be purified. This process kills bacteria and removes substances that are harmful.

In Australia, there are six main steps in water purification:

1 *screening*: Water passes through mesh screens to remove objects such as twigs and leaves
2 *flocculation*: A chemical called alum is added to the cloudy water to make the small floating particles clump together. These clumps are called floc.
3 *sedimentation*: The floc is heavy and settles to the bottom of the tank to form a sediment. This sediment is collected as sludge.
4 *filtration*: The water flows through tightly packed beds of different sized pebbles, sand and crushed coal to trap and remove the floc.
5 *chemical treatment*: Chemicals are added to the water. Fluoride is added to help prevent tooth decay. Chlorine is added to the water to kill harmful organisms such as bacteria. A chemical is added to reduce the acidity of the water.
6 *aeration*: Oxygen is added to the water to improve the smell and colour.

When the water is safe to drink, it's distributed through pipes to homes, schools, hospitals, businesses and countless other locations.

What steps are involved in water purification?

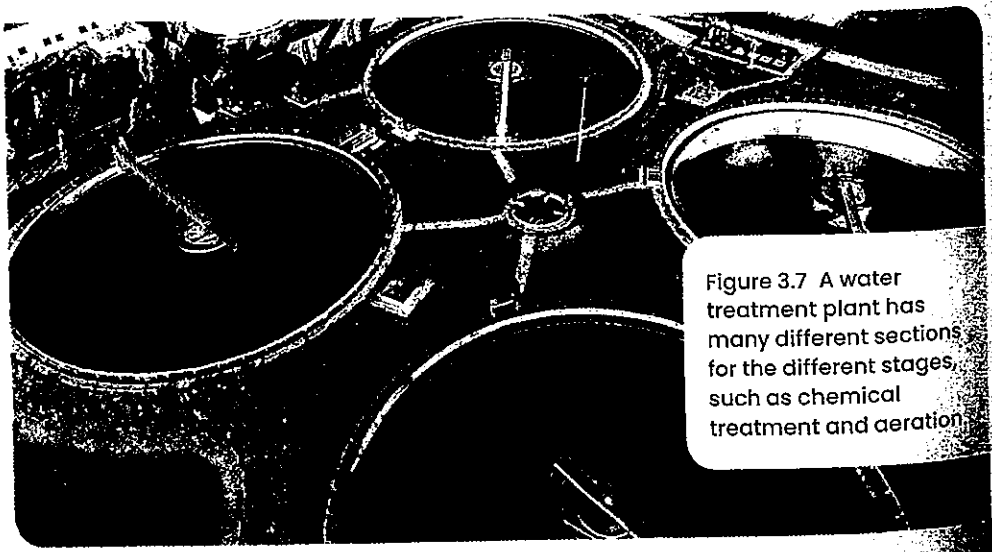


Figure 3.7 A water treatment plant has many different sections for the different stages, such as chemical treatment and aeration.

❷ Sewage is processed to reduce harm to the environment

Sewage is semi-liquid human waste. When you flush the toilet, the sewage goes into a **sewerage** system and is treated before it eventually goes into the ocean.

Some countries do not have proper sewerage systems. Untreated sewage is not good for human health and the natural environment, so in more economically developed countries like Australia it is processed before release.

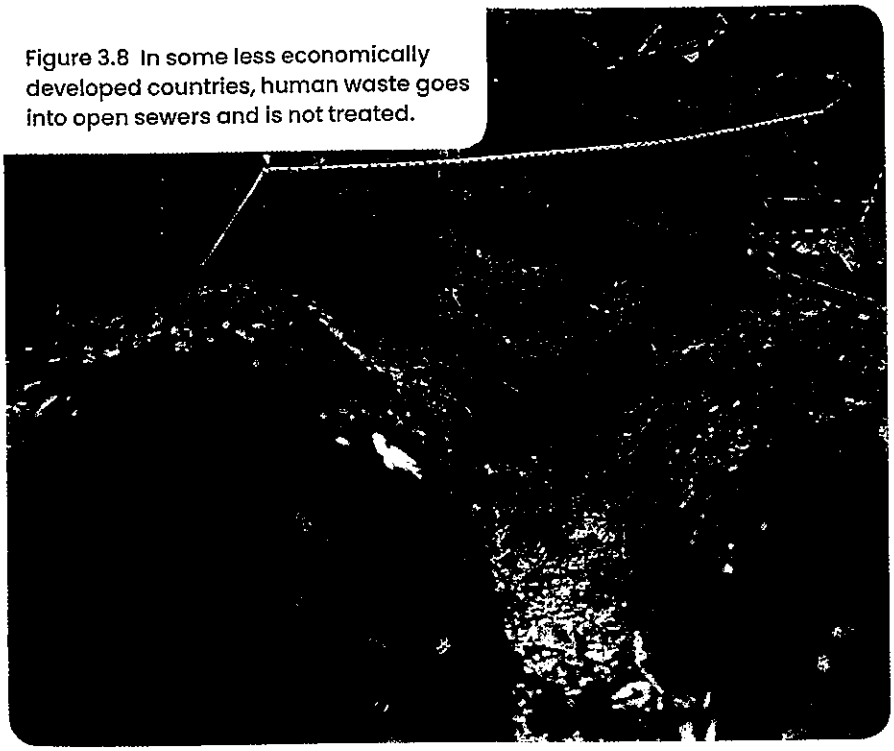


Figure 3.8 In some less economically developed countries, human waste goes into open sewers and is not treated.

In Australia, there are six main steps in sewage treatment:

1 *sewerage*: A network of pipes moves sewage from homes and businesses to sewage treatment plants.
2 *screening*: Screens at the plant act as a sieve and catch large objects, which can be physically removed.
3 *aeration*: Air is pumped into tanks that hold the sewage. This feeds bacteria, which break down the sewage.
4 *settling*: Other chemicals are added that cause the bacteria and solids to settle to the bottom of the tank as thick sludge. This sludge is removed and is used in soil and fertiliser products.
5 *filtration*: The sewage passes through a filter made from pebbles. This traps more solids, which are removed.
6 ***disinfection***: Special ultraviolet light or chlorine is used to kill harmful bacteria in the sewage before it is released into the ocean.

What steps are involved in sewage processing?

CHECKPOINT 3.4

1 Explain why sewage treatment is critical to a healthy environment.
2 Identify the purpose of flocculation in water purification.
3 Describe what happens during the sewage treatment phase called screening.
4 Identify two different ways of killing harmful bacteria.
5 Explain why the treatment and purification of water are such important processes.
6 What is the purpose of adding fluoride to water?
7 Explain why air is blown into tanks in a sewage treatment plant.
8 Create a table of similarities and differences between water purification and sewage treatment.

CHALLENGE

9 Investigate the processes used to separate items that go into yellow-topped recycling bins. How do these processes limit what can be put into recycling? What could happen if there is contamination?

SKILLS CHECK

- I can describe how water is purified.
- I can describe how sewage is treated.

3.5 EVAPORATION, DISTILLATION AND CRYSTALLISATION

At the end of this lesson I will be able to:

- **relate** a range of techniques used to separate the components of some common mixtures to the physical principles involved in each process, including evaporation, crystallisation and distillation.

KEY TERMS

condensation cooling of a gas to become a liquid

condenser a glass tube cooled by water that cools a gas to become a liquid

crystallisation separation of a solution by evaporating the solvent, leaving behind solute crystals

distillation using heating to separate liquids with different boiling points

evaporation heating a mixture to remove the liquid

LITERACY LINK

Identify three words from this section that you are unfamiliar with. Write definitions for each.

NUMERACY LINK

In a laboratory distillation process, 45 g salt is separated per 100 ml of water. If you begin the investigation with 500 ml of water, how much salt do you predict you will have at the end?

Australia is a country that experiences frequent droughts and water shortages. The country is surrounded by oceans; however, salt water cannot be used by living things. One way to use this resource is to separate the salt from the water.

Desalination is a process that uses separation techniques such as evaporation, distillation and crystallisation to purify salt water.

1 Solids can be evaporated and crystallised out of liquids

To separate a solid such as salt from water, without keeping the liquid, we can heat the mixture until the water boils and leaves the mixture as a gas. This method is called **evaporation**.

Crystallisation – the formation of crystals of the substance that was dissolved in the liquid – will start to happen when most of the liquid has evaporated. Smaller crystals form if the liquid evaporates quickly, and larger crystals form if it evaporates slowly.

What is the difference between evaporation and crystallisation?

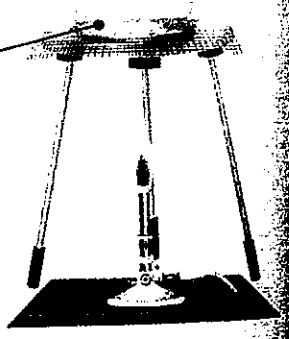


Figure 3.9 In the laboratory, a solution of salt water can be heated until the water evaporates and the solid salt begins to crystallise.

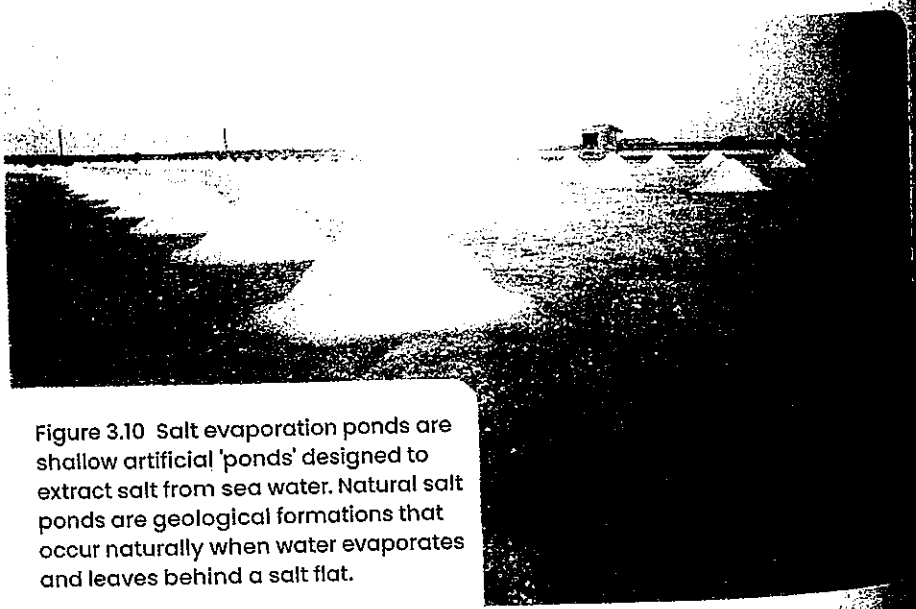


Figure 3.10 Salt evaporation ponds are shallow artificial 'ponds' designed to extract salt from sea water. Natural salt ponds are geological formations that occur naturally when water evaporates and leaves behind a salt flat.

INVESTIGATION 3.5A
Evaporating a solution

INVESTIGATION 3.5B
Growing crystals

INVESTIGATION 3.5C
Distillation (Teacher demonstration)

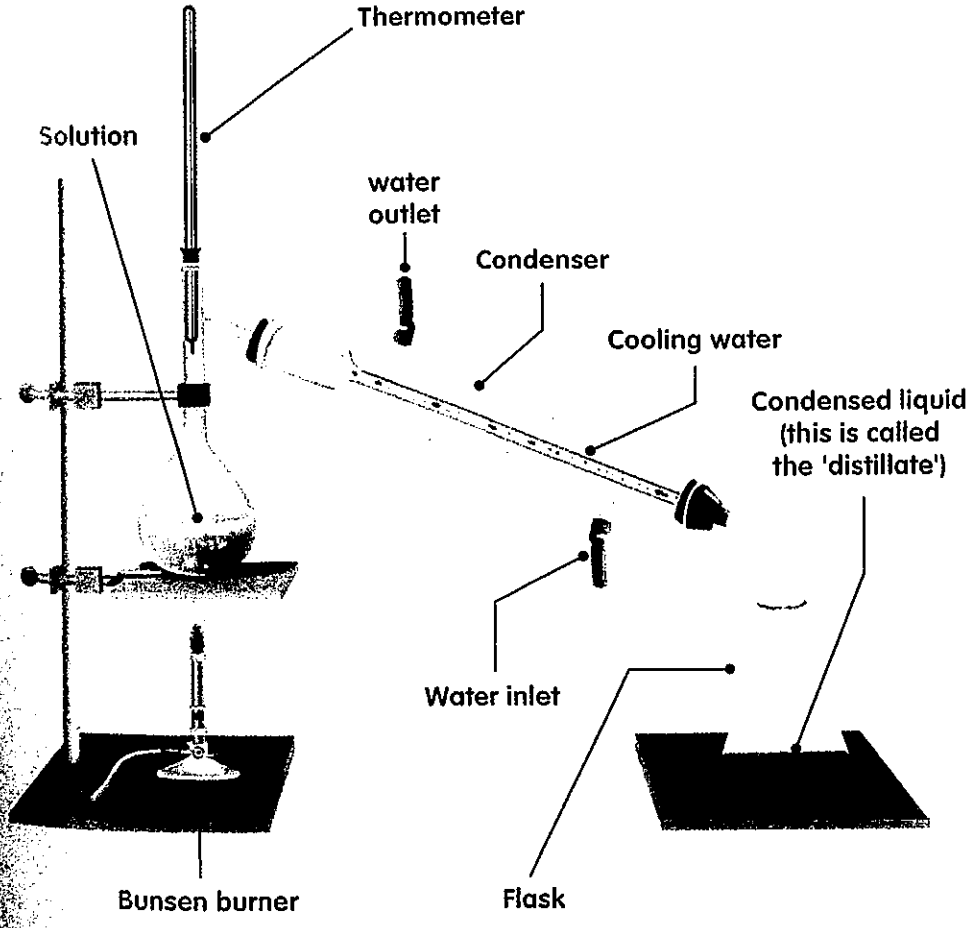
❷ Distillation can be used to purify water

Distillation can be used to separate pure water from salt. First, the salt water is heated in a glass flask. The water evaporates and the gas is captured. It is then cooled in a tube called a **condenser**, which has cool water flowing around it. This changes the gas to a liquid. This change is called **condensation**. The condensed liquid is collected in a different beaker, while the salt crystals remain in the flask.

Distillation can also be used to separate two liquids, such as water and alcohol. The physical property that allows these substances to be separated is boiling point (which is different for every substance).

What is distillation?

Figure 3.11 In a laboratory distillation set-up, a Bunsen burner heats a mixture and evaporates the liquid. This gas changes to a liquid in the condenser.



CHECKPOINT 3.5

1. Evaporation and crystallisation are related – suggest how.
2. Give an example of a mixture that can be separated by evaporation and crystallisation.
3. Describe a situation in which you could separate something using distillation.
4. Identify the physical property of a substance that is used to separate mixtures in distillation.
5. Suggest how you would go about creating large crystals using crystallisation.
6. Scientific drawing is an essential laboratory skill. Redraw the apparatus shown in Figure 3.9 or Figure 3.11. Use a sharp pencil and label your diagram accurately.

CHALLENGE

7. Use the internet to research how a desalination plant uses the process of reverse osmosis to purify water. Use labelled diagrams to present your findings.

SKILLS CHECK

- I can describe the difference between evaporation, crystallisation and distillation.
- I can give examples of situations in which each technique could be used to separate substances.

3.6 SEPARATING EVERYDAY MIXTURES

At the end of this lesson I will be able to:

- **investigate** the application of a physical separation technique used in everyday situations or industrial processes, for example, extracting pigments or oils from plants, and separating blood products.

KEY TERMS

centrifuge
a machine that spins fluid samples very quickly so that they separate into parts of different densities

condenser
a glass tube cooled by water that cools a gas to become a liquid

density
how heavy something is for its size; mass divided by volume

LITERACY LINK

Explain the word *centrifuge* in a very simple way that a younger person would be able to understand.

NUMERACY LINK

If a centrifuge extracts $\frac{2}{5}$ of the material from $\frac{2}{3}$ of a litre of liquid, calculate $\frac{2}{5} \times \frac{2}{3} =$ _____

Many everyday mixtures need to be separated before we use them.

Oils need to be extracted from flowers, fruits and leaves before perfumes can be made. Blood can be separated into its different components of red blood cells, platelets, plasma and white blood cells. These can be used to treat people with certain medical conditions and to save lives in emergency situations.

1 Oils can be extracted from plants

The leaves or flowers of plants such as eucalypt and lavender contain sweet-smelling oils. These oils can be extracted, using distillation, to make perfumes.

When steam from boiling water is mixed with leaves or petals in a flask, the oils are released as a gas. The mixture of oil and water vapour is then channeled into a condenser and cooled, changing it into a liquid. It is then separated using a separating column, leaving the pure essential oil and a floral or herbal water.

How is oil extracted from plants?

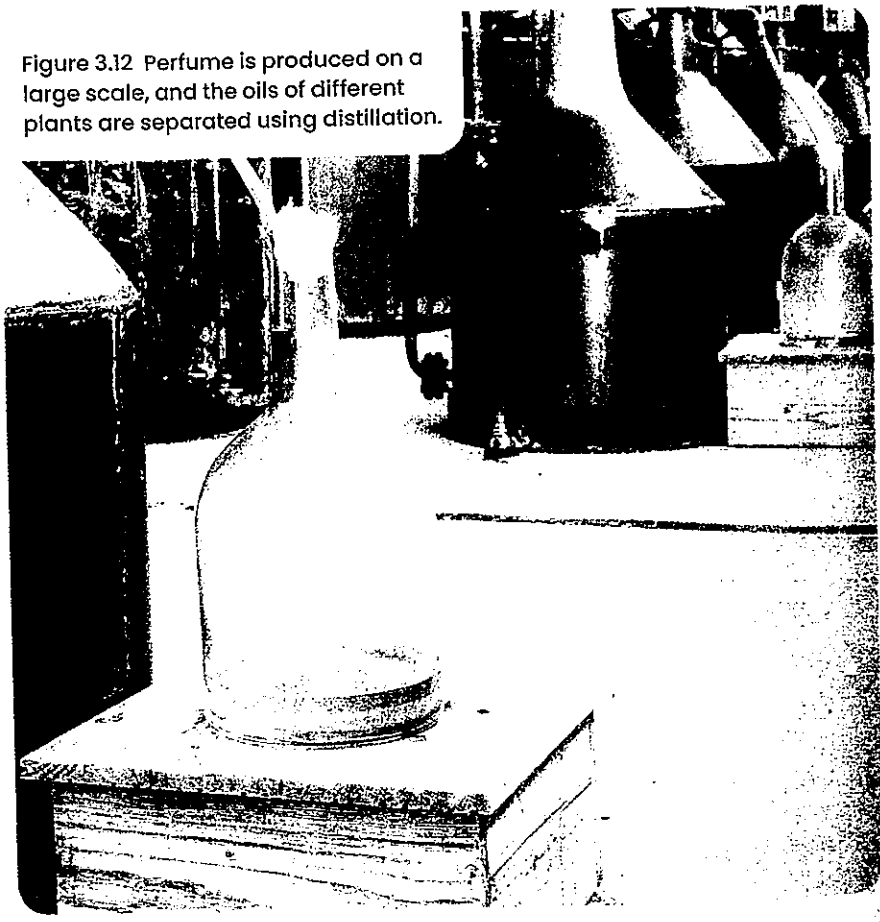


Figure 3.12 Perfume is produced on a large scale, and the oils of different plants are separated using distillation.

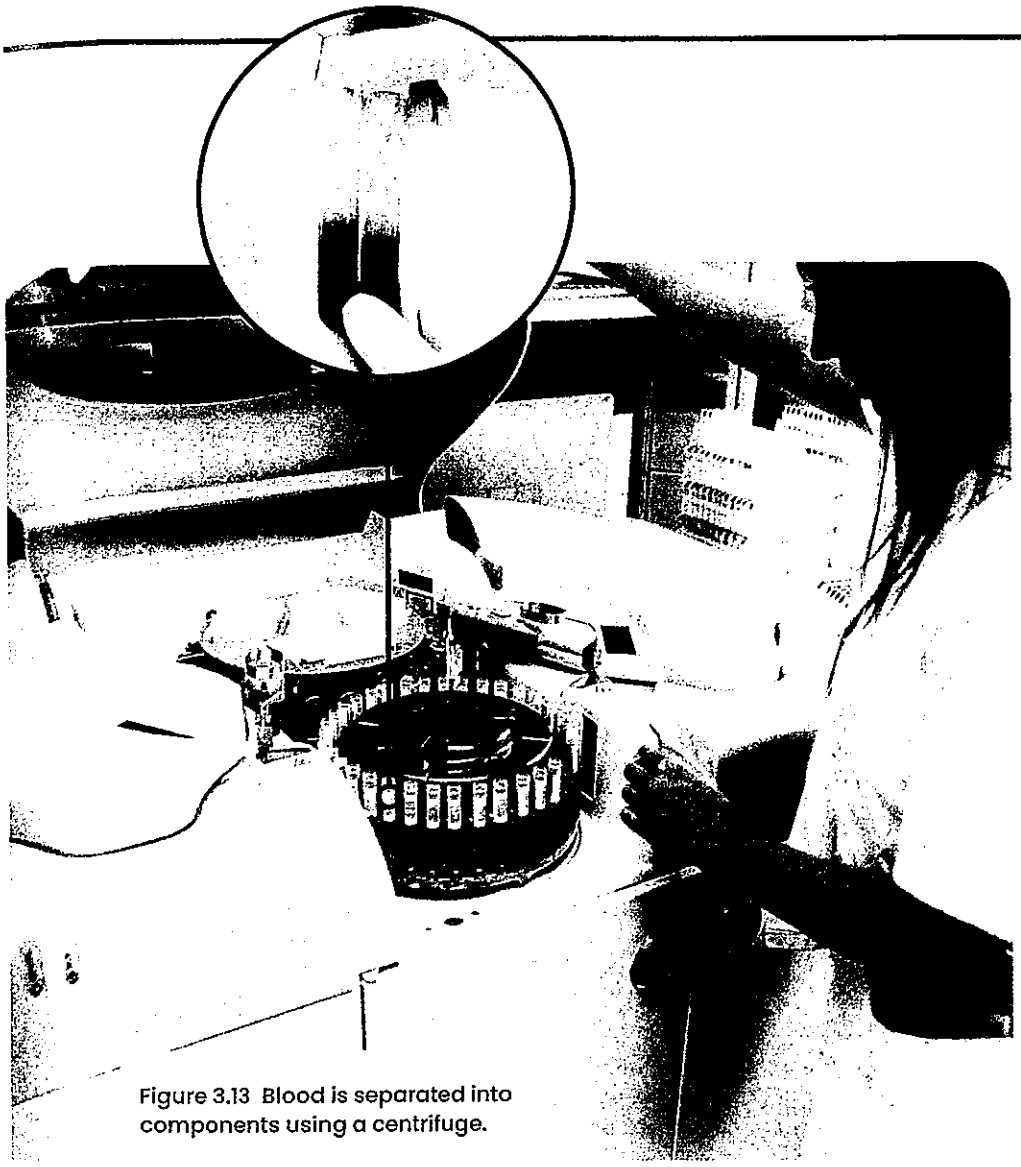


Figure 3.13 Blood is separated into components using a centrifuge.

2 Many useful components can be separated from blood

Blood is a mixture that maintains life. It contains substances such as red blood cells (which carry oxygen), white blood cells (which fight infections), platelets (which help blood to clot) and plasma (which carries nutrients).

The components of blood can be separated using a **centrifuge**. When this machine spins quickly, the blood components separate into different layers based on **density**. The heavier particles such as red blood cells settle to the bottom, followed by platelets and white blood cells. The lightest particles, such as plasma, remain on the top. These individual components can be given to patients who have lost blood or who have certain blood diseases.

What is a centrifuge used for?

CHECKPOINT 3.6

1 Copy and complete the following sentences.
Blood is a _____
Blood is made up of _____, _____, _____ and _____.
The process used by medical staff to separate blood is called _____.
Pigments and _____ from plants can be separated from the plant by using _____.

2 Identify the state changes that happen when the oils from flowers are extracted for use in perfume.

3 What physical property allows oils to be separated from water when they are in liquid form?

4 Identify the physical property that allows the different components of blood to be separated.

5 The Australian Red Cross encourages people to be plasma donors. The procedure involves blood being taken into a machine that extracts the plasma, at the same time the non-plasma components of blood are returned to the patient. Suggest how the machine that separates the blood would work.

CHALLENGE

6 Use the internet to research how pigments can be extracted from plants. Then write a procedure that you could use to extract a pigment from a common plant.

SKILLS CHECK

- I can describe how oil can be separated from plants.
- I can describe how blood is separated into its components.

3.7 SEPARATING OTHER LIQUIDS

At the end of this lesson I will be able to:

- **relate** a range of techniques used to separate the components of some common mixtures, including chromatography, to the physical principles involved in each process.

KEY TERMS

immiscible
not able to be mixed
paper chromatography
a technique used to separate coloured substances using a strip of paper and a solvent

LITERACY LINK

Write a step-by-step method for an experiment that separates the colours in textas using chromatography.

NUMERACY LINK

A separating funnel contains 150 mL of liquid. Convert 150 mL to litres.

Formula: 1 mL = 0.001 L

Different mixtures can be separated to find out more about their components or to use their components for different purposes. Forensic scientists sometimes use a process called chromatography to separate colours in inks and dyes to compare samples.

Sometimes mixtures do not mix well together and so a separating funnel can be used to separate the components.

1 Paper chromatography separates colours in mixtures

Many inks and dyes are made of a mixture of different colours. **Paper chromatography** is a separating technique that uses a solvent, such as water, to separate the different colours.

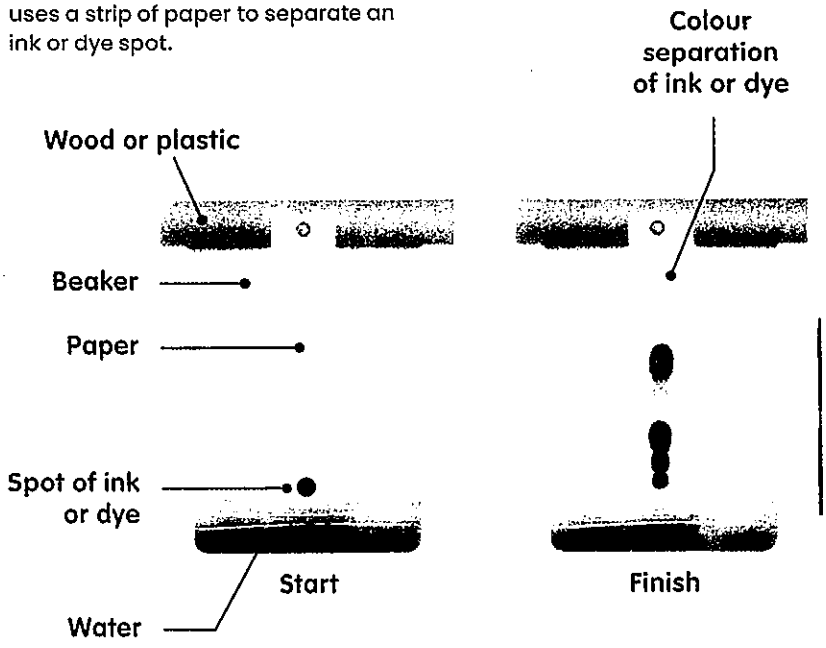
A spot of ink or dye is placed on a strip of paper that is touching a solvent, such as water or methylated spirits. As the solvent travels up the paper, it will dissolve the ink or dye. The more soluble the colour in the solvent, the further it is carried up the paper.

Inks or dyes that are not very soluble don't travel very far on the strip of paper. Dyes that are very soluble in water will travel further.

The result is that the ink or dye mixture separates into its pure components, each of which will have a different colour.

How can colours in inks or dyes be separated?

Figure 3.14 Paper chromatography uses a strip of paper to separate an ink or dye spot.



INVESTIGATION 3.7A Separating colours using paper chromatography

INVESTIGATION 3.7B Separating two immiscible liquids (Teacher demonstration)

2 A separating funnel can be used to separate liquids that don't mix

Many liquids will mix together easily, but some will not. Oil and water do not easily mix – instead, the oil floats on top of the water. It's possible to shake them and get them to mix, but they soon separate.

Liquids that will not mix together are **immiscible**. When two or more immiscible liquids are different densities, the liquids can be separated using a separating funnel.

What can a separating funnel be used for?

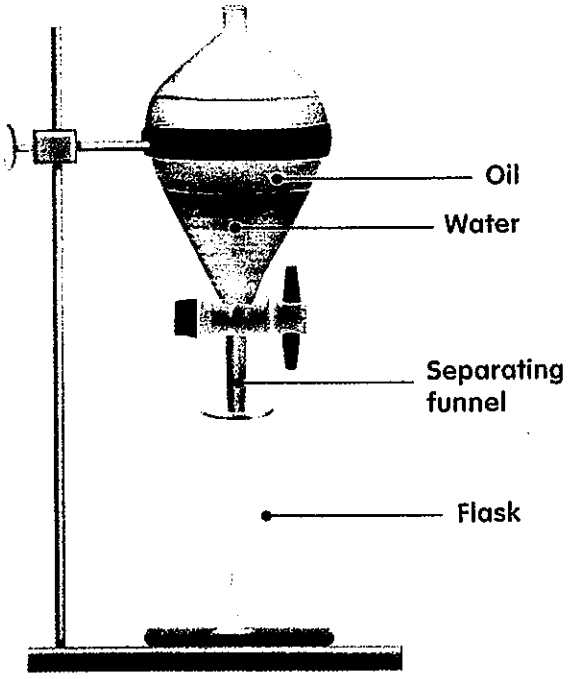


Figure 3.15 Two immiscible liquids can be put into a separating funnel and left to settle into layers. When the tap is opened, the liquid at the bottom runs into the flask.

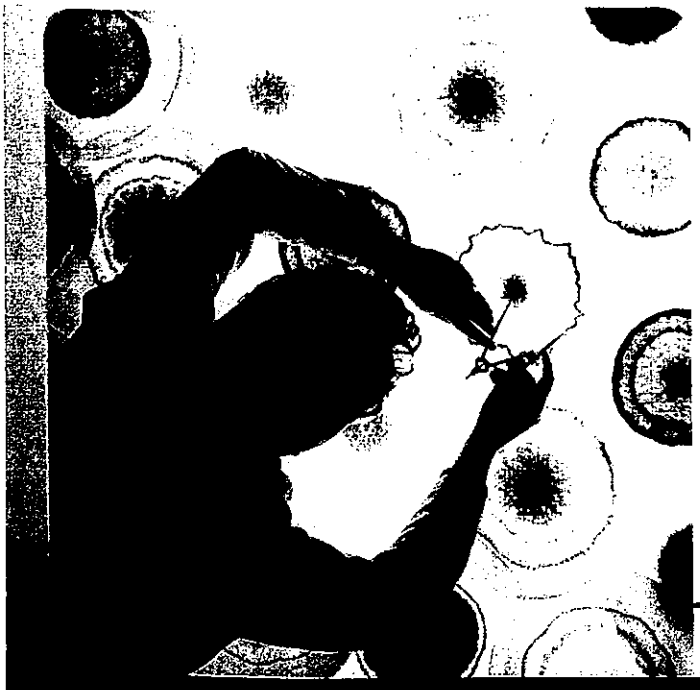


Figure 3.16 Forensic scientists can use chromatography to match pen and ink samples, or to compare dyes in fibre samples.

CHECKPOINT 3.7

1. Describe the process of paper chromatography.
2. Identify two solvents that can be used in paper chromatography.
3. You want to compare the components in some different inks.
   a. What would you expect to observe if a dye was not a mixture?
   b. What would you expect to observe if a dye was a mixture?
4. Explain why colours separate on a filter paper.
5. Identify a situation where a separating funnel could be useful.
6. Would a separating funnel be useful for separating a mixture that had a solute dissolved in a solvent? Explain why/why not.

CHALLENGE

7. Gas chromatography is an extension of paper chromatography used by forensic chemists. Use the internet to find out how the process works and why it is used.

SKILLS CHECK

- I can explain how paper chromatography works.
- I can give some examples of things that can be separated using chromatography.
- I can describe how a separating funnel can be used.

3.8 CLEANING UP OIL SPILLS

At the end of this lesson I will be able to:

- **investigate** the application of a physical separation technique used in everyday situations or industrial processes, for example, cleaning up oil spills.

KEY TERMS

crude oil
oil that is extracted from underground reservoirs
separated into useable petroleum products
immiscible
not able to be mixed
oil slick
a layer of oil on the surface of water

LITERACY LINK

Write a 'how to' information sheet to help communities clean up after an oil spill. Include images and information that are easy to understand.

NUMERACY LINK

An oil spill covers a rectangular region 20 m long and 12 m wide. What is the area of this region?

Formula: $A = lw$

Oil is one of the most important materials used today. When refined, it fuels the engines of vehicles, powers factories to produce electricity and is an ingredient in the manufacture of plastics. However, its extraction, transport and use have an impact on the environment.

The accidental release of crude oil into the environment is called an oil spill. Oil spills in the ocean can have a significant impact on ecosystems. Understanding the properties of oil and how it mixes with water and other chemicals has allowed scientists to work out methods to clean up oil spills.

1 Oil spills can be caused by different incidents

Oil spills into the marine environment can be caused by different events.

Crude oil is extracted by drilling it from reservoirs underground. Often this is done from oil rigs in the oceans. If an accident happens during the drilling or pumping process, crude oil can be released into the ocean.

Ships use oil as fuel. If a ship breaks down, runs aground, collides with another ship or their tanks are damaged, the oil can leak into the water.

Oil is transported by massive ships called oil tankers. If these ships are damaged, the oil that they are carrying can spill into the environment.

How do oil spills happen?

2 Oil spills can damage the environment

When oil is spilled into the ocean it forms a thin layer on the surface known as an **oil slick**. Over time, the oil slick will spread out to cover a large area. If it comes into contact with the shore line, the oil will stick to and mix in with the sediments.

The oil on the surface of the ocean stops oxygen and carbon dioxide gas from dissolving into the water from the atmosphere. If the levels decrease enough, this can kill marine plants and animals.

How do oil spills affect the environment?

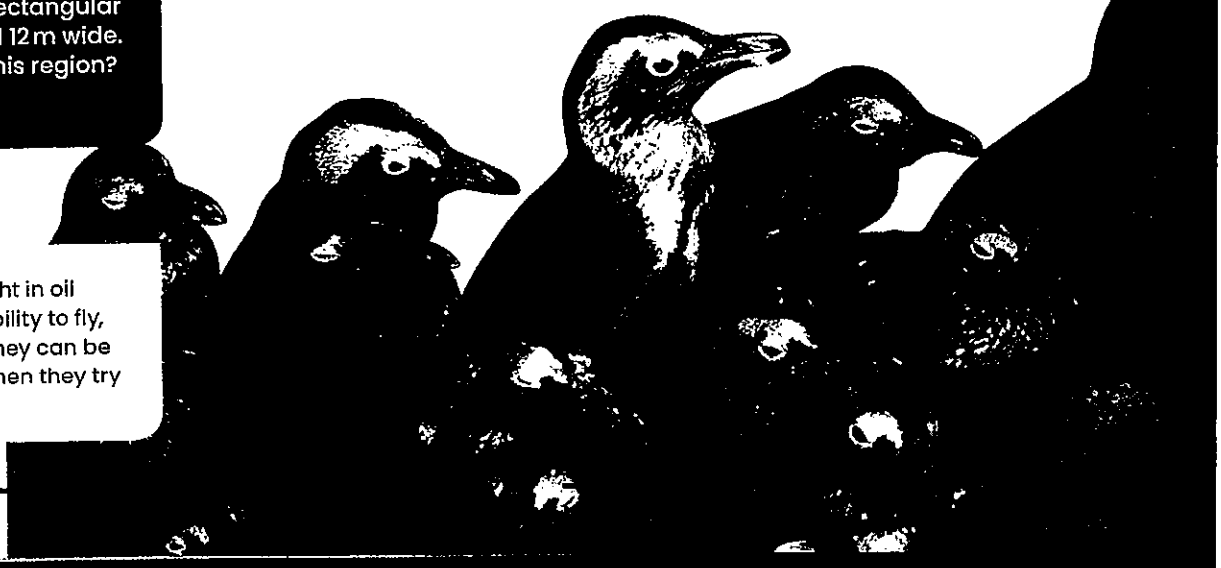


Figure 3.17 Birds caught in oil spills can lose their ability to fly, swim and float, and they can be poisoned by the oil when they try to clean themselves.

3 Oil spills can be contained and filtered

Oil slicks float on top of water because oil is less dense, and **immiscible** with water. There are several different ways that oil slicks can be cleaned up by taking advantage of these properties.

Floating booms are used to contain oil slicks. Devices called skimmers are then used to scoop or suck oil from the surface of the water within the enclosed areas. This oil can then be processed in a factory to remove any sea water that was also collected.

Sorbent booms are a special type of boom that work in a similar way to a disposable nappy, but they only absorb oil. The booms can then be removed and disposed of.

If oil hits the shore line it can be difficult to clean up. One way to clean oil from the shore line is to wash the oil back into the water so that it can be easily skimmed off the top. Another way is to remove the contaminated sediment. This is either disposed of in landfill or processed in factories to separate the oil from the sediment.

How are oil spills contained and cleaned up?

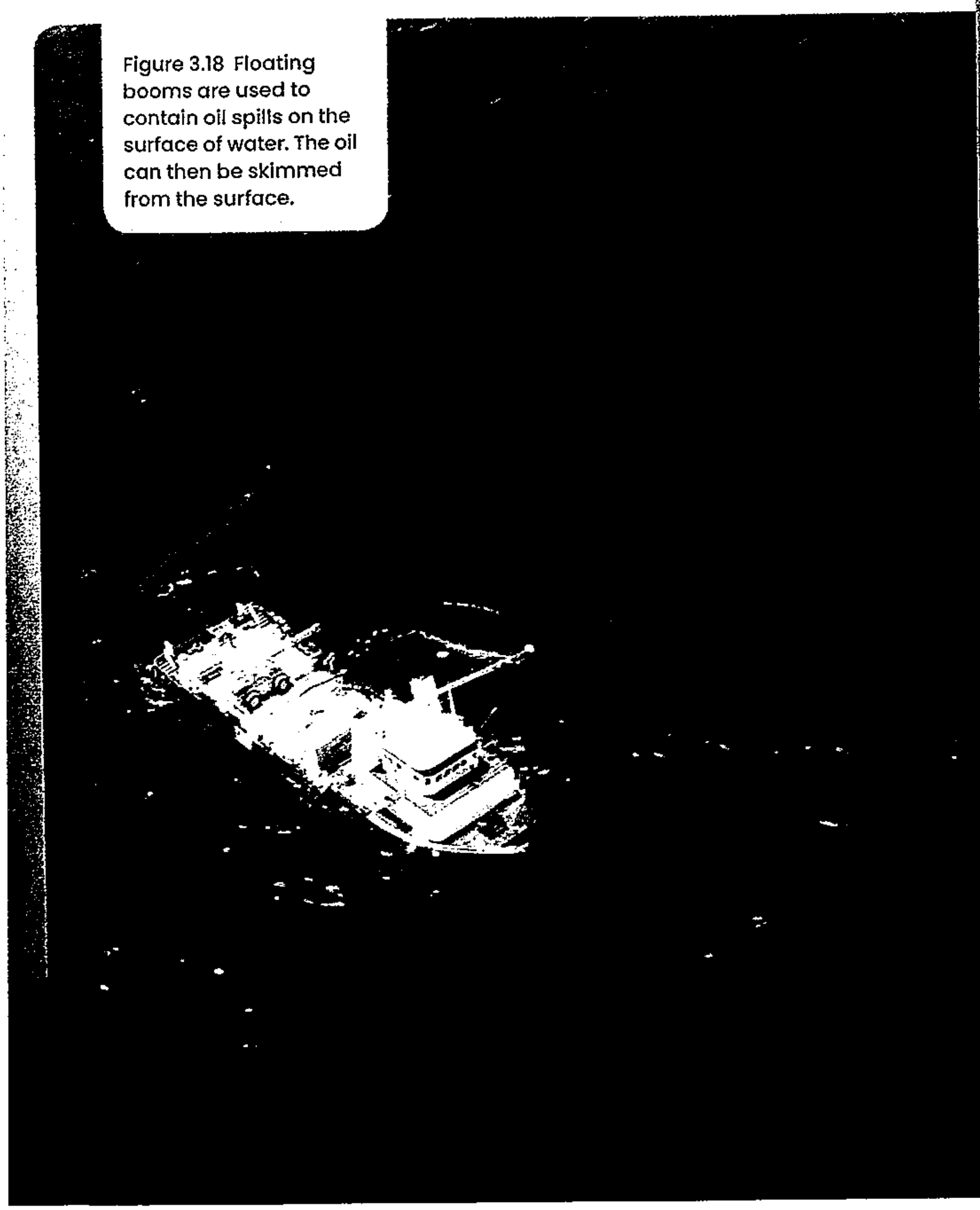


Figure 3.18 Floating booms are used to contain oil spills on the surface of water. The oil can then be skimmed from the surface.

CHECKPOINT 3.8 ✓

1 Describe one way that an oil spill can happen in the ocean.

2 Describe what happens to oil once it is spilled into the ocean.

3 Why does an oil spill reduce oxygen and carbon dioxide levels in water?

4 Identify two properties of oil that make it easy to clean up when a spill happens in the ocean.

5 Suggest why booms are important in cleaning up oil spills.

6 Explain why clean up crews wash oil on the shore back into the ocean, in reference to being able to collect oil.

CHALLENGE

7 The Montara oil spill in 2009 has been Australia's largest oil spill to date. Use the internet to research the causes of the spill, the area covered, the damage it caused and techniques used to clean it up.

SKILLS CHECK

- I can explain how separation techniques can be used to clean up oil spills.

3.9 SEPARATIONS IN INDUSTRY

At the end of this lesson I will be able to:

- **research** how people in different occupations use understanding and skills from across the disciplines of science in carrying out separation techniques.

KEY TERMS

fractional distillation
a method that separates liquids by using their different boiling points

froth flotation
a method that uses special chemicals to separate minerals from their ores

mineral ore
a mineral that contains useful metals

LITERACY LINK

Create a mind map that demonstrates your understanding of these terms: *froth flotation, magnetic flotation, ore, oil, fractional distillation.*

NUMERACY LINK

A magnetic separator recovers 75% of the iron from ore. If 1000 kg of ore goes through the machine, how much iron does it recover?

We obtain many useful resources from Earth, such as metals and oil. Once raw materials have been extracted, they must be processed to separate the useful material from the waste.

1 Froth flotation uses water to separate metals

Copper is used for electrical wiring and plumbing pipes. It is rarely found in its pure form, instead it is found as a **mineral ore** called malachite. Before copper can be purified, it must be separated from the other rocks and material in the ore. This is done using **froth flotation**.

The mixture of unwanted material and copper is dug out of the ground in solid lumps. These are crushed into a fine powder, and mixed with water and some detergent-like chemicals. Air is blown into the bottom of the container, and the malachite is carried to the surface by the air bubbles as it sticks to the chemicals. The waste sinks to the bottom of the tank, unable to stick to the chemicals.

The malachite froth containing the copper is skimmed off the surface. It's then further treated to extract pure copper.

How does froth flotation separate metals from ore?

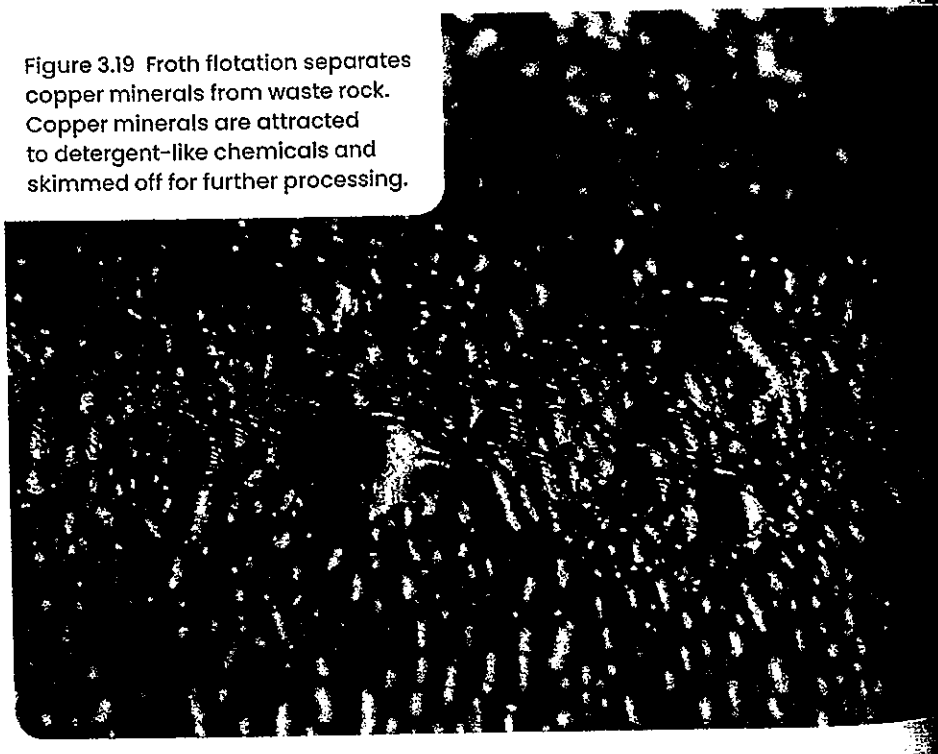


Figure 3.19 Froth flotation separates copper minerals from waste rock. Copper minerals are attracted to detergent-like chemicals and skimmed off for further processing.

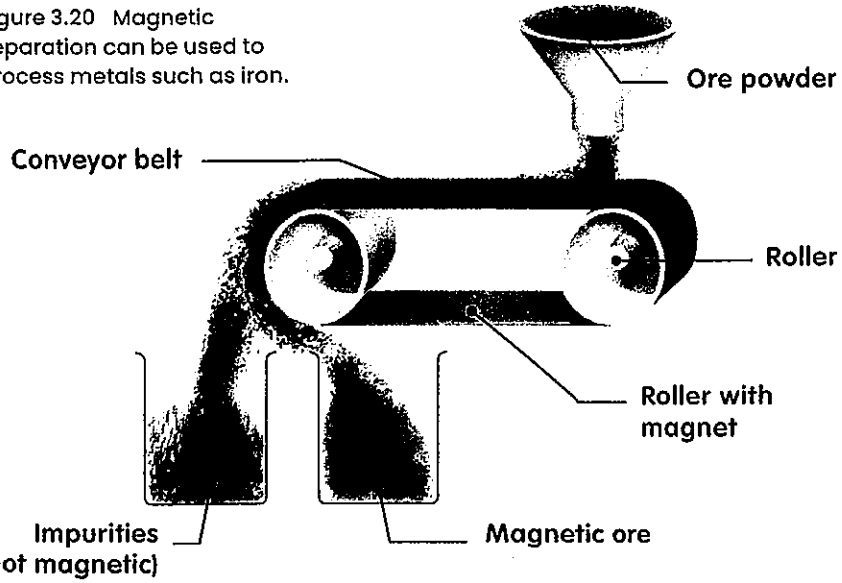
❷ Magnets are used to process iron ore

Iron is another vital metal – it's one of the main components used to make steel. It is magnetic and this property can be used to separate minerals that contain iron from waste rock.

Rock containing iron minerals is crushed into a fine powder then dropped onto a conveyor belt. At the end of the conveyor belt, a magnetic roller attracts the pieces containing iron. As the waste rock reaches the roller, the non-magnetic pieces drop off the belt immediately. The pieces containing the iron are carried further around the belt and collected for processing.

How are magnets used to separate iron minerals from rock?

Figure 3.20 Magnetic separation can be used to process metals such as iron.



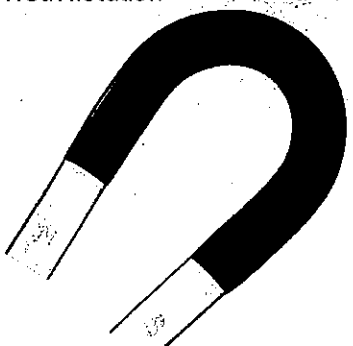
❸ Crude oil is processed using fractional distillation

Crude oil is a mixture of chemicals such as petrol, oil, kerosene and diesel. Each of these chemicals is useful, so a process called **fractional distillation** is used to separate them from the crude oil.

The crude oil is placed in a piece of equipment called a fractionating column and then heated. As each liquid evaporates, it rises up the column. As it rises, it cools, and when it cools to below its boiling point it becomes a liquid and leaves the column through a tube. Each liquid rises to a different height in the column, depending on its boiling point.

How is crude oil separated into different liquids?

INVESTIGATION 3.9
Froth flotation



CHECKPOINT 3.9

1. Identify the difference between copper minerals and waste rock that allows them to be separated by froth flotation.
2. Identify the difference between iron minerals and waste rock that allows them to be separated by magnets.
3. Identify the difference between the components of crude oil that allows them to be separated by fractional distillation.
4. Suggest why it is important to crush rock into a fine powder before froth flotation or magnetic separation.

CHALLENGE

5. The agriculture industry also relies on various separation techniques, especially in the processing of food crops. Use the internet to research one example of separation being used in agriculture. Present your findings as a series of labelled diagrams.

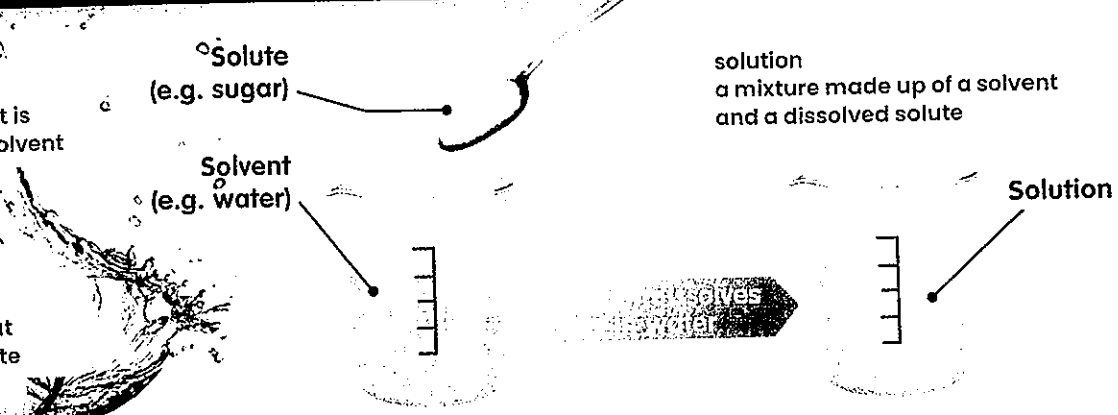
SKILLS CHECK

- I can describe separation techniques are used in the mining industry.
- I can suggest other industries where knowledge of separation techniques is important.

CHAPTER SUMMARY

solute
a substance that is dissolved by a solvent

solvent
a substance that dissolves a solute

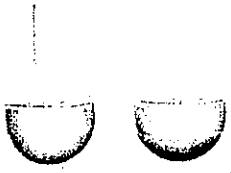


solution
a mixture made up of a solvent and a dissolved solute

Water is a solvent that can dissolve other substances. This makes it vital in everything from digesting food in your stomach to mining sulphur from underground rocks.

PROCESS	USED TO SEPARATE
Filtering	Solid from liquid
Decanting	Solid sediment from liquid
Distillation	Liquids with different boiling points
Evaporation and crystallisation	Solid from a liquid solution, without keeping the liquid
Paper chromatography	Colours

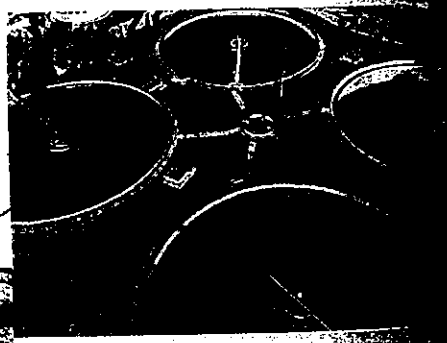
Mixture
two or more substances mixed together that can be physically separated



Physical separation is useful in the 'real world'.

Cleaning up oil spills ▶

◀ Separating blood products



Sorting waste material ▶

◀ Chromatography

Colloid ▶
a mixture with tiny particles spread out evenly that never settle to the bottom. Milk is a colloid because it contains tiny fat droplets in water.

◀ Suspension
a mixture with large, insoluble particles that are initially spread out evenly and eventually settle to the bottom

★ FINAL CHALLENGE ★

LEVEL 1
★☆☆
☆☆☆
50xp
LEVEL UP!

1. Define the following terms: solute, solvent and solution.
2. Briefly summarise how water acts as a solvent in everyday life, in the environment and in industry.
3. Explain why decanting can assist filtration to ultimately get cleaner water.

LEVEL 2
★★☆
☆☆☆
100xp
LEVEL UP!

4. The following table lists separating techniques and different types of mixtures. Draw an arrow between the separating technique and the mixture that would allow its separation.

Filtration	Iron filings mixed with sand.
Decanting	Salty water from which you want to extract pure water.
Evaporation	A mixture of fruit pulps floating in water.
Distillation	Oil and water.
Centrifugation	A solution containing dissolved salt, from which salt needs to be kept.
Magnetic separation	Muddy water containing some sand.
Separating flask	A solution containing sand and water.

5. Select one of the separation techniques above and write a step-by-step method for its use.

LEVEL 3
★★★
☆☆☆
150xp
LEVEL UP!

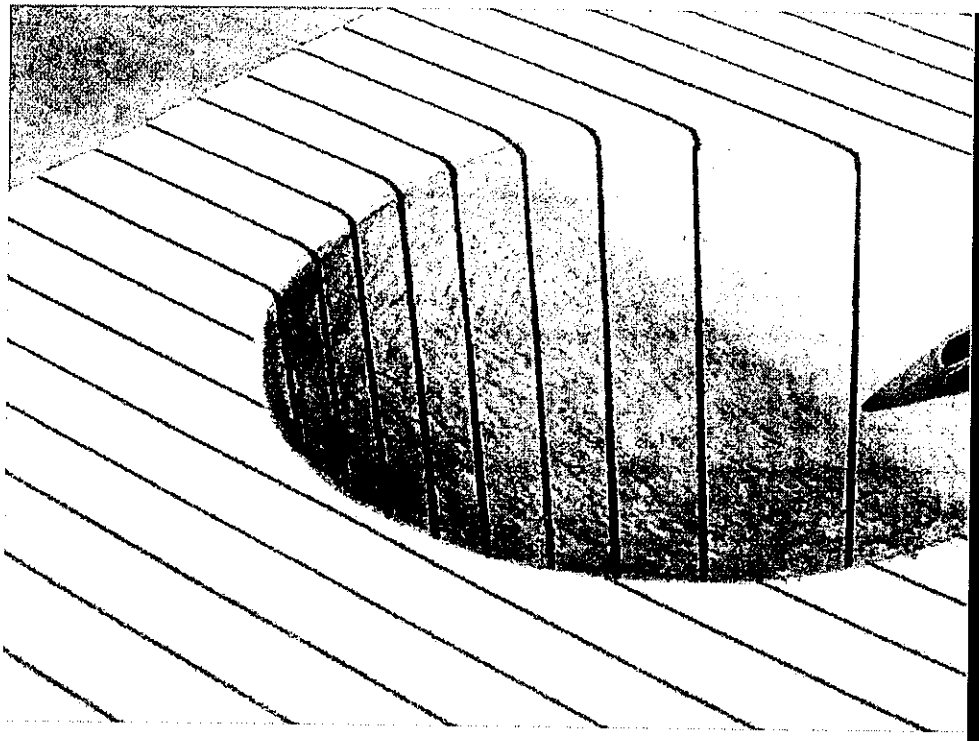
6. Identify two ways in which water purification and waste treatment are similar, and two ways in which they are different.
7. Compare and contrast distillation and evaporation separating techniques.
8. A snow globe is a suspension but a drink of cordial is a solution. Explain why.

LEVEL 4
★★★
★☆☆
200xp
LEVEL UP!

9. Write a numbered method detailing the steps to extract oil from plants.
10. The components of blood are separated using a centrifuge. Suggest what physical properties of blood make this possible.

LEVEL 5
★★★
★★★
300xp
LEVEL UP!

11. Identify an occupation that would utilise the following processes:
    a froth flotation
    b magnetic separation
    c fractional distillation.



WELCOME!!!

Please write your details here...

FULL NAME:

CLASS:

ENJOY ☺

YEAR 7

TERM 1 '20 ELEMENTS OF ART & PRINCIPLES OF DESIGN

LINE/COLOUR/VALUE/SHAPE/FORM/SIZE/TEXTURE/SPACE

These are the foundations (basics) of art & design that are considered when creating a piece of work.

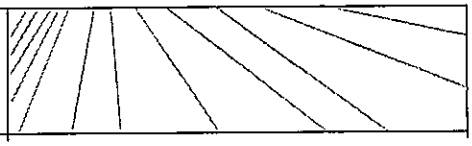
TEACHER

NAME:

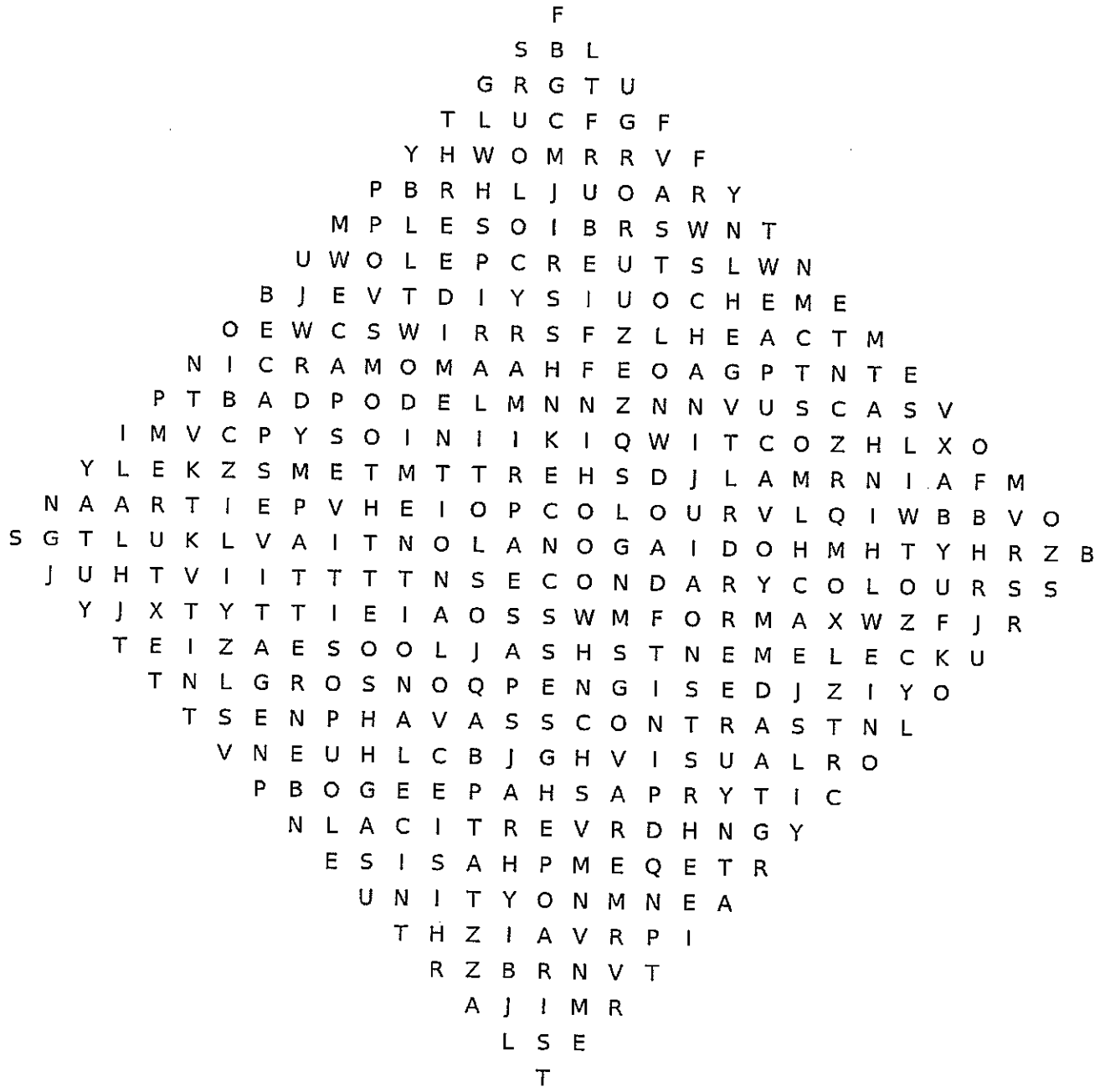
EMAIL:

ELEMENTS OF ART

LINE	A line is an identifiable path created by a point moving in space. It is one-dimensional and can vary in width, direction, and length.		
SHAPE	Shape and form define objects in space. Shapes have two dimensions, height and width,and are usually defined by lines.		
VALUE	Value describes the brightness or darkness of color. a gradient is a series of values from darkest to lightest.		
FORM	Shape and form define objects in space. Forms exist in three dimensions, with height, width, and depth.		
SPACE	Space in a work of art refers to a feeling of depth or three dimensions. It can also refer to the artist's use of the area within the picture.		
TEXTURE	The surface quality of an object that we sense through touch: hard, soft, rough, smooth, hairy, leathery, sharp, etc.		
COLOR	Reflected.light, Organized on a color wheel with 3 primary colors, 3 secondary colors and 6 intermediate colors.		

LINE	A line is when two points are joined together	

ART, BALANCE, BUMPY, COLOUR, CONTRAST, CROSSHATCH, DESIGN, DIAGONAL, ELEMENTS, EMPHASIS, FLUFFY, FORM, HORIZONTAL, HUE, LINE, MOVEMENT, NEGATIVE SPACE NEUTRAL, PATTERN, POSITIVE SPACE, PRIMARY COLOURS, RHYTHM, ROUGH, SECONDARY COLOURS, SHADE, SHAPE, SMOOTH, SPACE, SPECTRUM, SPIRAL, TERTIARY COLOURS, TEXTURE, THREE DIMENTIONAL, TINT, TWO DIMENTIONAL, UNITY VALUE, VERTICAL, VISUAL

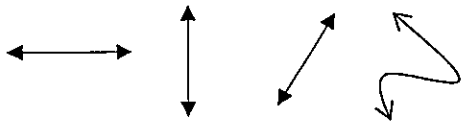


LINE

"A Line is a Dot that went for a walk" Paul Klee

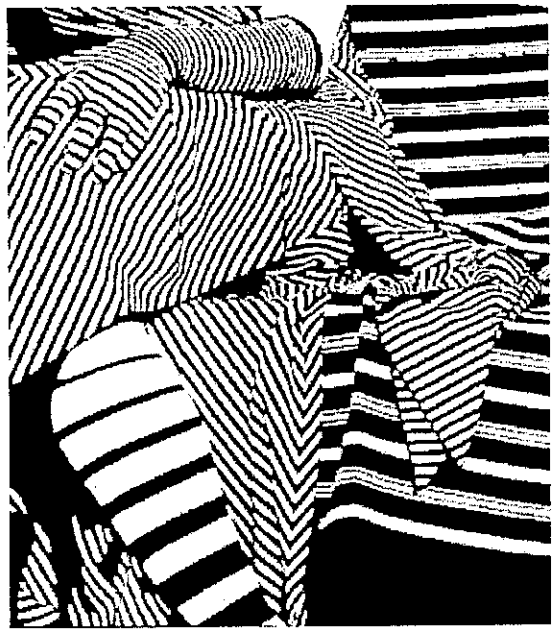
A line....

- Is the **path** of a moving point: **horizontal, vertical, diagonal, contour, or a combination of these.**



- Is the **mark left by a tool**: brush, pencil, pen, etc.
- Defines the **position and direction** of a design, image or form.
- They **may be** curved, straight, thick, thin, smooth, long, short and so forth.
- Lines **are used to** create shape, pattern, texture, space, movement and optical illusion in design.
- The use of lines allows artist to demonstrate **delicacy or force** (see below).
- Curves may take us slowly uphill, or turn sharply twisting our mind as they turn.
- A line can express various **moods and feelings.**

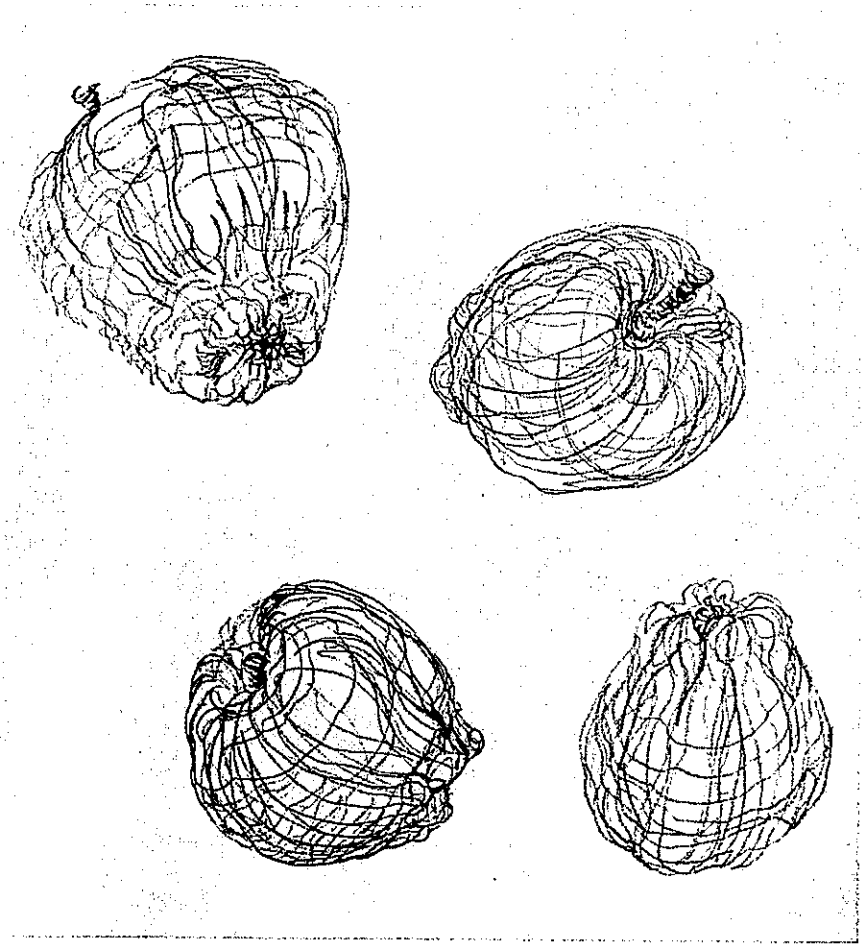
Look around your class. Look at the edge of objects ... you are looking at lines!



Stripe Song, by J. Seeley. 1981.

Outline: Outlines show the edges of the shapes and forms being drawn.
Contour Line: Contour lines not only show the edges of the shapes being drawn; they also go onto the surface of the object to help describe the 3-dimensional qualities of the form.

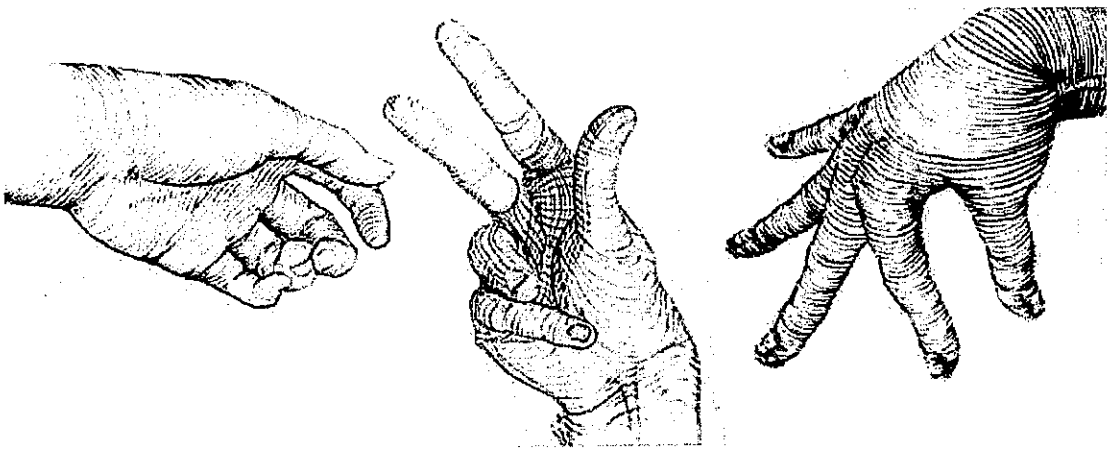
Gesture Lines: They indicate action and physical movement. They are done quickly in the form of a rough sketch as the model moves. Therefore they lack detail.



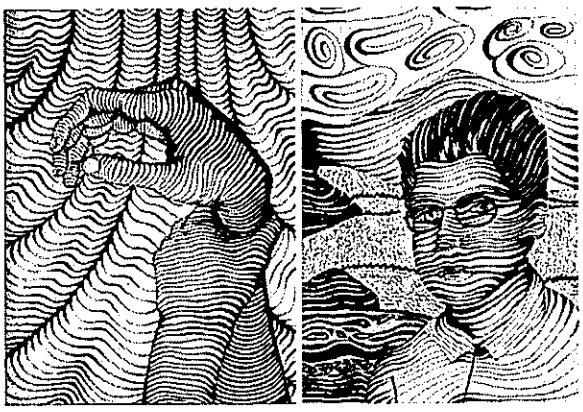
Line drawings of an apple.

See how the lines show the **shape** and **three dimensionality** of the apple,

Where the **light** is coming from depending on the amount of lines in certain sections; the more lines, the darker it looks and visa versa… showing **shadows** and **contours.**



Cross Contour lines of a hand.



Three dimensional drawings using line

Activities

1. In your VAPD, draw an object (any object found in class) using line to show three dimensionality, contours and shadows.

The above examples should help you with this activity.

2. What is *Line* in Visual Arts? Hint... The answer has already been given to you... multiple times ☹ Write the answer in your VAPD.

COLOUR

The Colour Wheel is very helpful in art for many reasons.

- It shows the difference between **Primary** (pure), **Secondary** (two mixed together) & **Tertiary** colours (three or more mixed together).

- It discusses the difference between **warm** (i.e. Red) and **cool (**i.e. Blue) colours.

- It shows the colours that are similar (**analogous**) and others that are complete opposites (**complimentary**) i.e. Green vs Red or Yellow vs Purple etc.

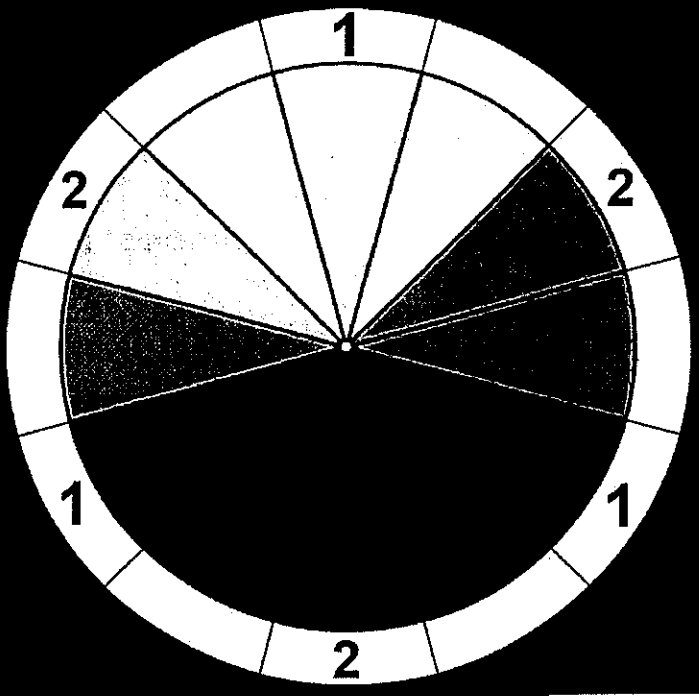
- It helps you to decide what colours to mix together to get your preferred colour.

- It also describes what happens when you add, black, grey or white to these colours.

Three colour sheets are attached on the next few pages.

1. The first is a full sheet of what was discussed above
2. The second is a sample colour mixing explanation. This wheel is available in class as well.
3. The third sheet has some colour definitions that you should memorise.

The Colour Wheel



Primary Colours (1)

RED

YELLOW

BLUE

Primary colours can not be mixed from the other colours, but they can be mixed to make all the other colours in the colour wheel.

Secondary Colours (2)

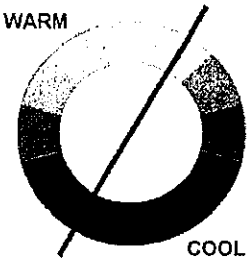
+ = ORANGE

+ = GREEN

+ = PURPLE

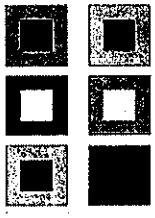
Secondary colours can be made by mixing two primary colours. They lie half way between primary colours on the colour wheel.

Warm / Cool Colours



When painting, colours are often thought of as being *warm* or *cool*. The diagram left shows which region on the colour wheel is considered warm and which region is considered cool.

Complementary Colours



Complementary colours lie opposite each other on the colour wheel. For example:

- Green is the complementary of RED
- Purple is the complementary of YELLOW
- Orange is the complementary of BLUE

A colour often appears brighter when placed adjacent to its complementary. Notice how the inner squares appear more vivid in the column on the left.

Notice also that if a colour is WARM, its complementary colour will be COOL. Conversely, if a colour is COOL, then its complementary colour will be WARM.

Tertiary Colours

Colours made by mixing a primary colour with its complementary colour are called *tertiary colours*. Tertiary colours are neutral colours such as browns and greys. In fact, almost any shade of brown can be created by mixing a primary colour with its complementary colour. Using varying amounts of each colour will produce different shades of brown.

Tertiary colours can also be made by combining all three primary colours in varying amounts. The reason for this is that a primary colour's complementary can be made by mixing the other two primary colours.

+ = RED-BROWN

+ = YELLOW-BROWN

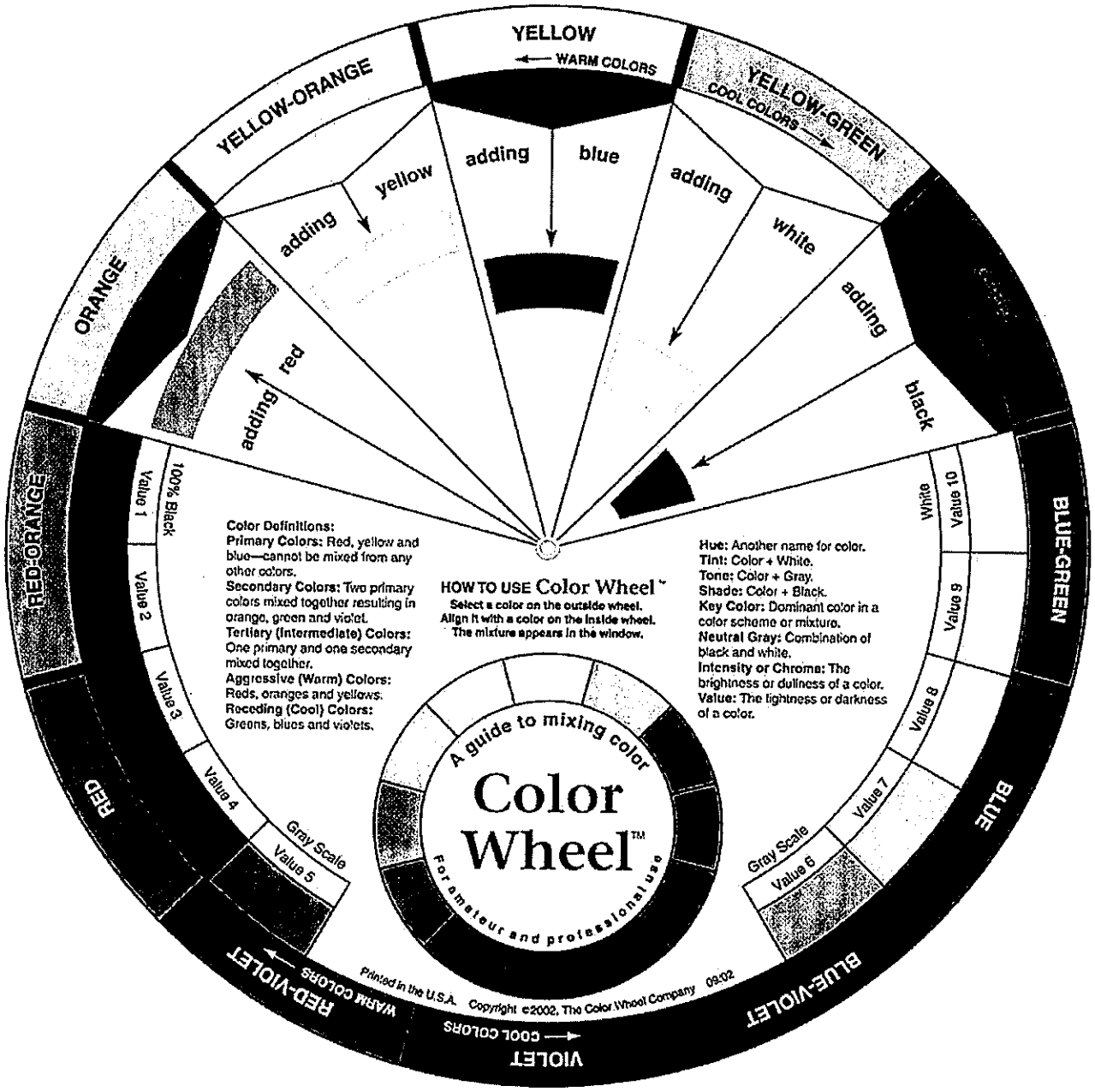
+ = GREY-BROWN

Mixing the colours above in different proportions will result in different shades of tertiary colours.

Black, White and Grey

These neutral colours can be used to darken or lighten other colours. Adding white will make a colour lighter (known as *tinting*). Adding black will make a colour darker (known as *shading*).

MAJOR BRUSHES


YELLOW
WARM COLORS
YELLOW-ORANGE
YELLOW-GREEN
COOL COLORS
ORANGE
adding
yellow
adding
blue
adding
white
adding
black
adding
red
RED-ORANGE
BLUE-GREEN
RED
BLUE
RED-VIOLET
BLUE-VIOLET
VIOLET
WARM COLORS
COOL COLORS
100% Black
Value 1
Value 2
Value 3
Value 4
Gray Scale
Value 5
White
Value 10
Value 9
Value 8
Value 7
Gray Scale
Value 6
Color Definitions:
Primary Colors: Red, yellow and blue—cannot be mixed from any other colors.
Secondary Colors: Two primary colors mixed together resulting in orange, green and violet.
Tertiary (Intermediate) Colors: One primary and one secondary mixed together.
Aggressive (Warm) Colors: Reds, oranges and yellows.
Receding (Cool) Colors: Greens, blues and violets.
HOW TO USE Color Wheel™
Select a color on the outside wheel.
Align it with a color on the inside wheel.
The mixture appears in the window.
Hue: Another name for color.
Tint: Color + White.
Tone: Color + Gray.
Shade: Color + Black.
Key Color: Dominant color in a color scheme or mixture.
Neutral Gray: Combination of black and white.
Intensity or Chroma: The brightness or dullness of a color.
Value: The lightness or darkness of a color.
A guide to mixing color
Color Wheel™
For amateur and professional use
Printed in the U.S.A.
Copyright ©2002, The Color Wheel Company 09:02

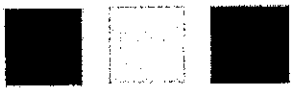
Color Terms

Hue

a gradation or variety of a color.

Primary Color

a color, such as red, yellow, or blue, that cannot bemixed or created.



Secondary Color

a color, such as orange, green, or violet, produced by mixing two primary colors.

Value

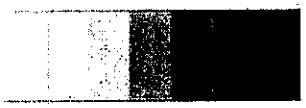
the degree of lightness or darkness in a color.

Complementary Color

one of a pair of primary or secondary colors opposed to the other member of the pair on a schematic chart orscale (color wheel).

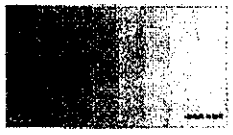
Tone

the prevailing effect of harmony of color and values.



Saturation

the degree of chroma or purity of a color.



Deuteranope

red/green color deficient.

Tritanope

blue/ yellow color deficient.

The Visual Element of Colour has the strongest effect on our emotions. It is the element we use to create the mood or atmosphere of an artwork.

There are many different approaches to the use of colour in art:

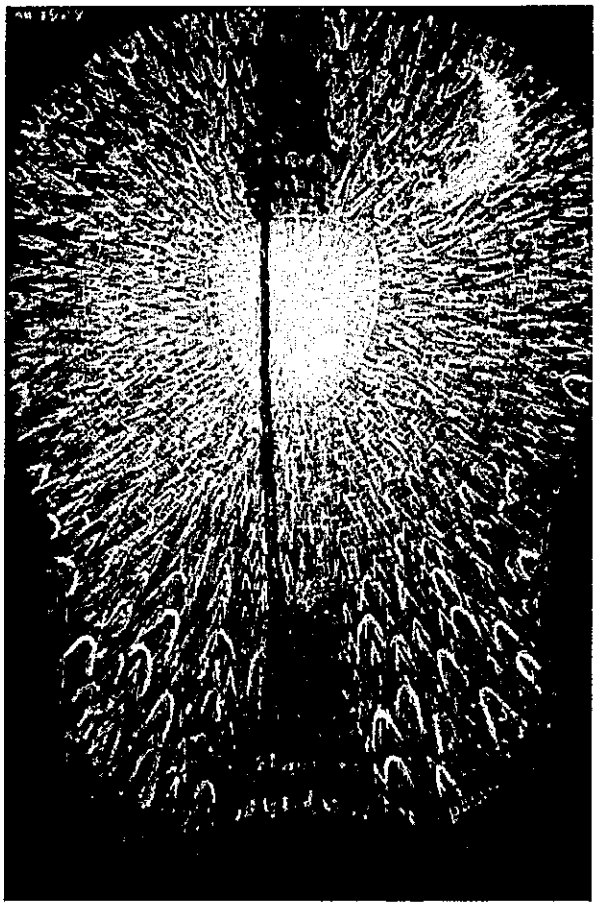
- **Colour as light**
- **Colour as tone**
- **Colour as pattern**
- **Colour as form**
- **Colour as symbol**
- **Colour as movement**
- **Colour as harmony**
- **Colour as contrast**
- **Colour as mood**

Artwork examples for each approach to colour are on the next few pages...

<u>Activity 1:</u>

For each artwork, describe how light is used.
Write your answers as notes/mindmap on the sheet.
Try and use some of the words that you have learned about from the previous sheets i.e. Tone, Hue, Value, Complimentary, Analogous etc...

Colour as Light



GIACOMO BALLA (1871-1958)
Street Light, 1909 (oil on canvas)

Colour is what we see when light and an object come together at different wavelengths, this is taught in the science of physics.

Colour is the sensation or feeling that is stimulated in our brain by different wavelengths of light. One wavelength will stimulate our perception of red, another orange, another yellow and so on through all the colours of the spectrum.

Giacomo Bella's beautiful painting of a street lamp is a poetic impression that represents the **physical properties of light**. At its centre, the bulb burns with a white heat in the darkness of the night. Its **radiant** glow dissolves in **concentric** waves, each of which diminish in intensity and change colour to suggest the different wavelengths of the spectrum.

RENÉ MAGRITTE (1898-1967)
Empire of Light, 1954 (oil on canvas)

Colour as Tone (light & dark)

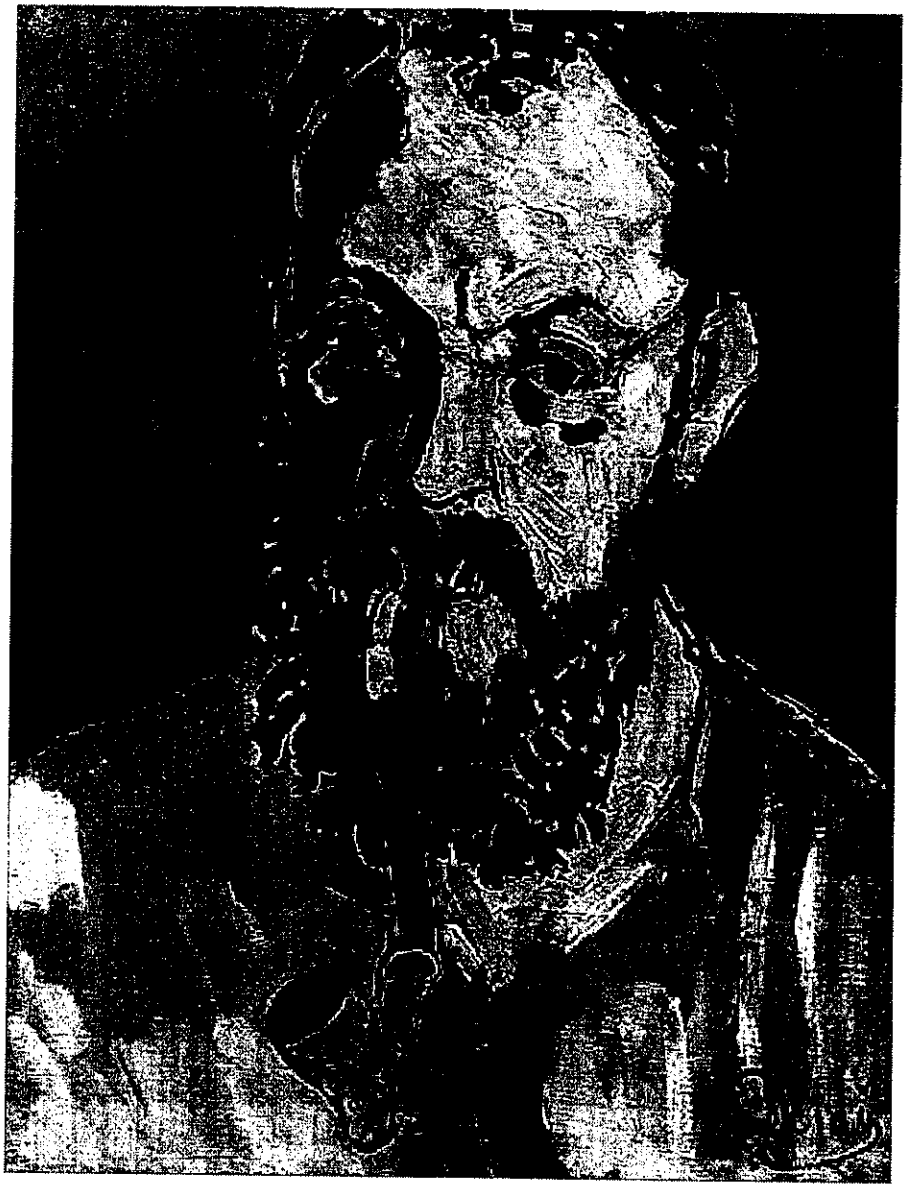
EMILE NOLDE (1867-1956)
Lake Lucerne, 1930 (watercolour on vellum)

Colour As Pattern

JUAN GRIS (1887-1927)
Violin and Checkerboard, 1913 (oil on canvas)

In 'Violin and Checkerboard' by Juan Gris, the artist uses different colours to particular shapes, which create a pattern of forms arranged around the white cloth at the centre of the painting. This pattern of colours leads the viewer's eye in a clockwise motion around the picture. Colour distributed (used) as irregular pattern, is often used as unifying (bringing together) elements in the composition of artworks.

Colour as Form



ANDRÉ DERAIN (1880-1954)
Portrait of Matisse, 1905 (oil on canvas)

To create the illusion of form in a painting, artists traditionally added lighter and darker pigments to the main colour of an object in order to render the naturalistic effects of light and shade.

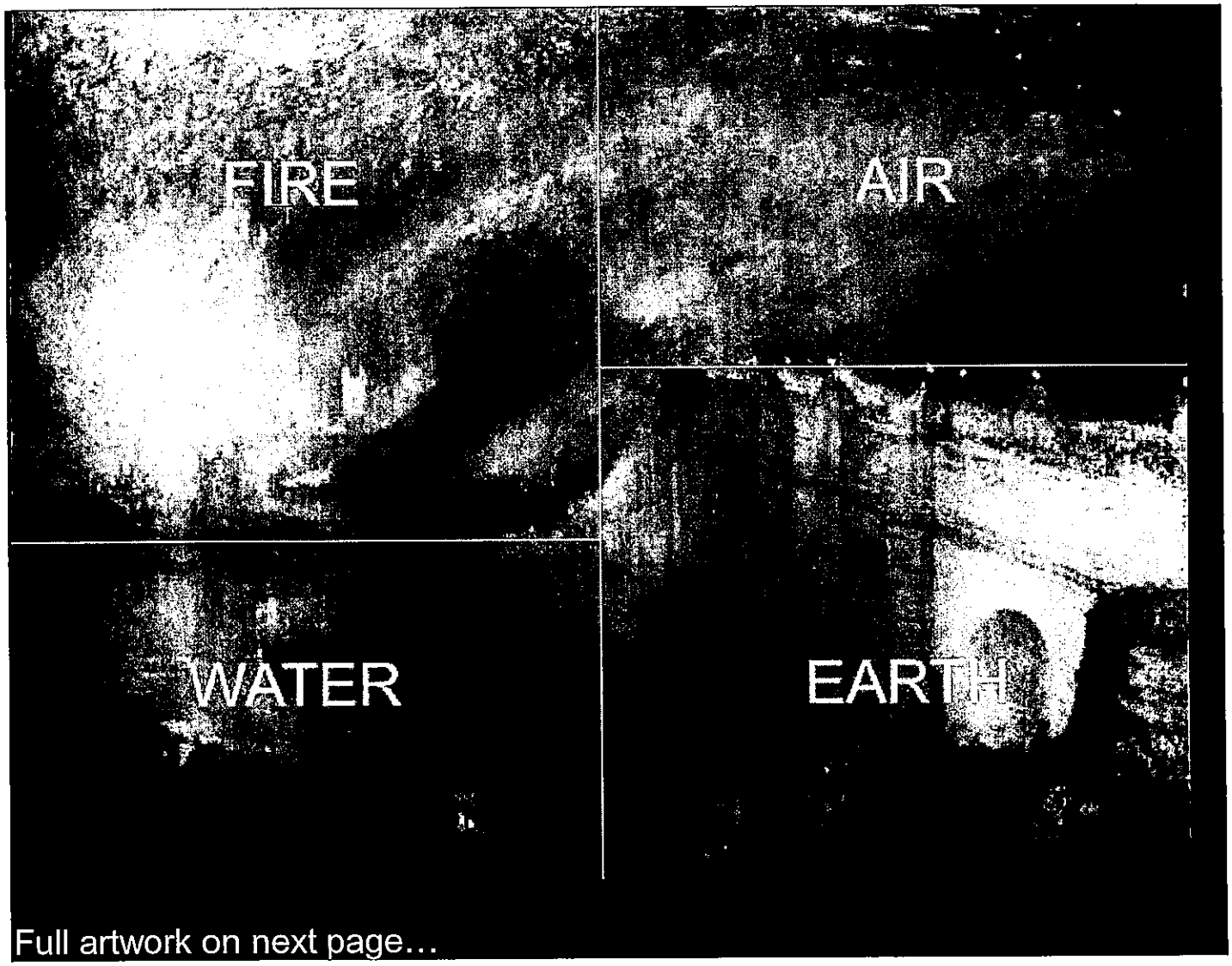
Colour as Harmony

EDGAR DEGAS (1834-1917)
Blue Dancers, 1899 (pastels)

Harmony is the compatibility, balance or progression of similar elements. 'Blue Dancers' by Edgar Degas is a carefully composed pastel painting that illustrates the harmony of colour.

The warm ochres of the background should clash with the cool blue dresses in the foreground as they are opposite colours. However, Degas reconciles their opposition with a clever harmony of their colours. He **scumbles** traces of blue over the warm ochre background which is counterbalanced by the ochre underpainting that beats beneath the blue dresses. This has the effect of harmonising the foreground with the background but still retaining enough contrast to stimulate our interest.

Colour as Contrast



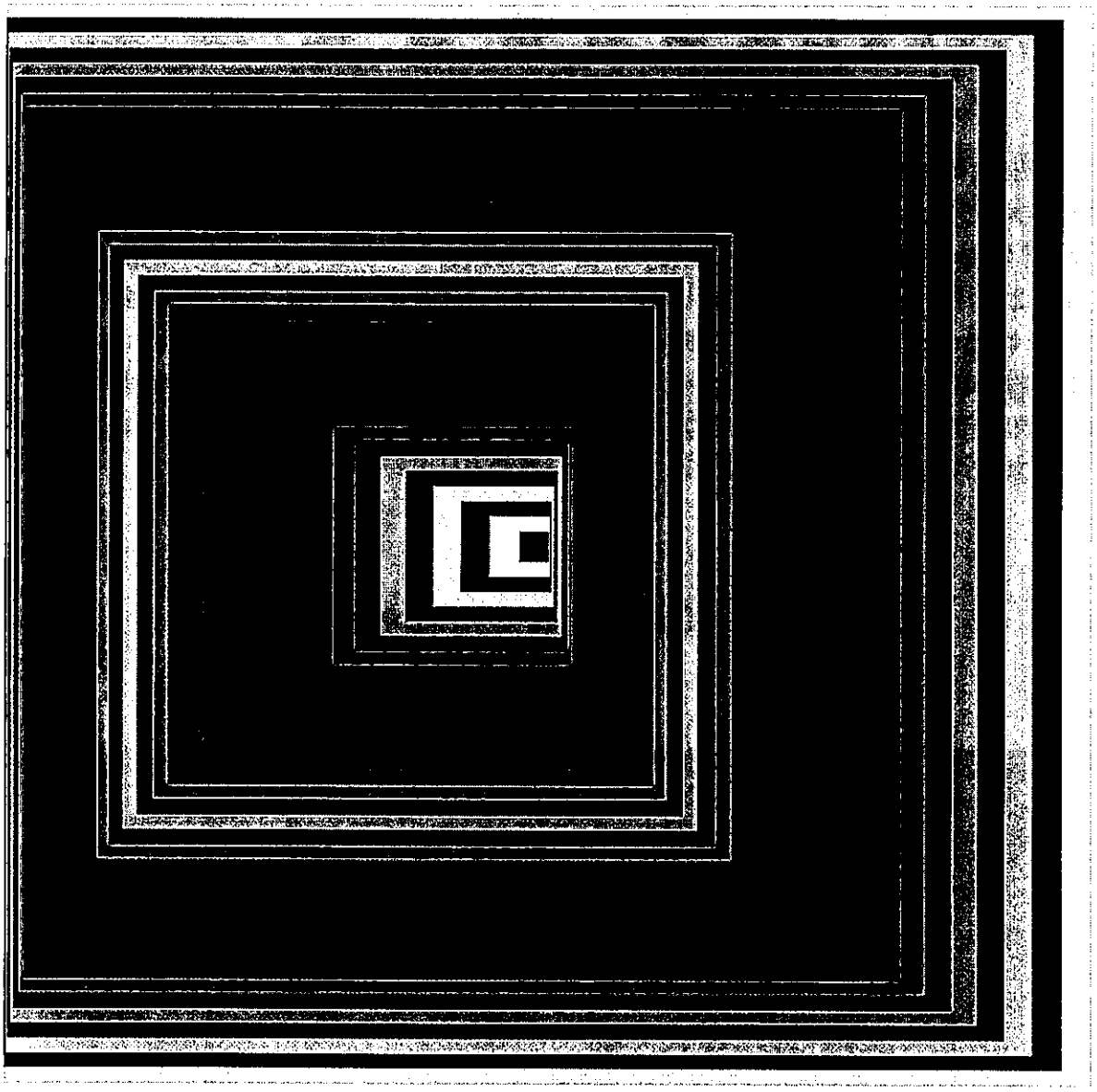
Full artwork on next page…

JOSEPH MALLORD WILLIAM TURNER (1775-1851)
The Burning of the Houses of Lords and Commons, 1835 (oil on canvas)

Few painters in the history of art capture the intensity of light and energy more than Turner. In his first of two versions of 'The Burning of the Houses of Lords and Commons' (1835), the visual elements of the painting are fuelled by a collision of the classical elements of earth, air, fire and water using colour.

The composition of the work is divided into four sections, each of which harbors one of the four classical elements. On the left the blazing oranges and yellows of the burning buildings are set in opposition to the cold blues and lilacs of the sky. The hot colours of the flames and their reflections (fire and water) are intensified by the cold colours of the sky and bridge (earth and air).

Colour as Movement



VICTOR VASARELY (1906-1997)
Vonal KSZ, 1968 (silkscreen print)

When you look at an abstract artwork your brain searches for signs of order to try to make sense of the image. Victor Vasarely makes use of this to create an impression of movement by combining graduated squares and sequential colours. These lead the eye into and through the image with increasing and decreasing acceleration (speed) to create the illusion of a tunnel whose dizzying perspective unfolds as they travel towards the vanishing point at its centre.

Separation of Colour Progressions in Vonal KSZ, 1968 (silkscreen print)

The receding squares in this image form the shape of the movement while the progression of colours determine its speed. In our illustration above we have separated the alternate sequences of colours so that you can see their relationship more clearly. You can now distinguish their tonal scale as one sequence moves from dark through light to dark, while the other moves from light through dark to light. The changing contrasts of these sequences form a counter-change of tones and colours which give rise to the retinal roller coaster ride that is 'Vonal KSZ'.

Colour as Symbol

VINCENT VAN GOGH (1853-1890)
The Potato Eaters, 1885 (oil on canvas)

This is Van Gogh's masterpiece from the first period of his work before he moved to Paris in 1886. 'The Potato Eaters' are a poor Dutch peasant family sitting down to share their frugal evening meal. They are agricultural labourers and the earthy greens and browns that Van Gogh uses to paint them symbolize their closeness to and dependence on the land for their survival. There is a unity of colour and texture between the hands and faces of the peasants and the potatoes and coffee they are sharing. The dark sombre tones of the work sympathetically reflect their humble existence and the artist's respect for the quiet dignity of their labour.

Colour as Mood - Joy

VINCENT VAN GOGH (1853-1890)
Sunflowers, 1888 (oil on canvas)

For Van Gogh, yellow was the colour of joy and friendship. He painted a series of at least seven sunflower pictures to decorate the rooms of his 'Yellow House'. These paintings were conceived as a welcome to his friend and fellow painter Paul Gauguin with whom he dreamed of setting up a *'Studio of the South'* [2] in Arles in the South of France.

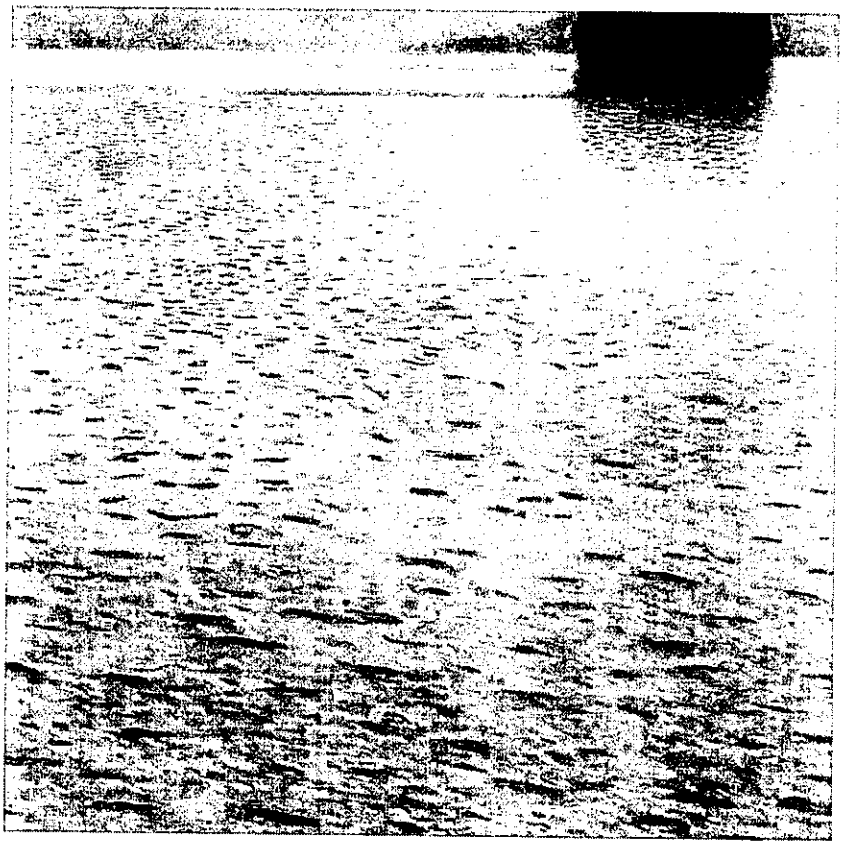
In contrast with the sombre mood of 'The Potato Eaters', 'Sunflowers' is one of the most joyful paintings in the history of art.

Colour as Mood - Sadness

PABLO PICASSO (1881-1973)
The Old Guitarist, 1903-04 (oil on panel)

We often use the language of colour to describe our emotions. We talk of being 'red' with rage or 'green' with envy. If we are feeling good we are in the 'pink' or if we are sad we've got the 'blues'. When Pablo Picasso painted 'The Old Guitarist' he was certainly suffering from the 'blues'. In fact, the main body of his work between 1901-04 is now referred to as his 'Blue Period'.

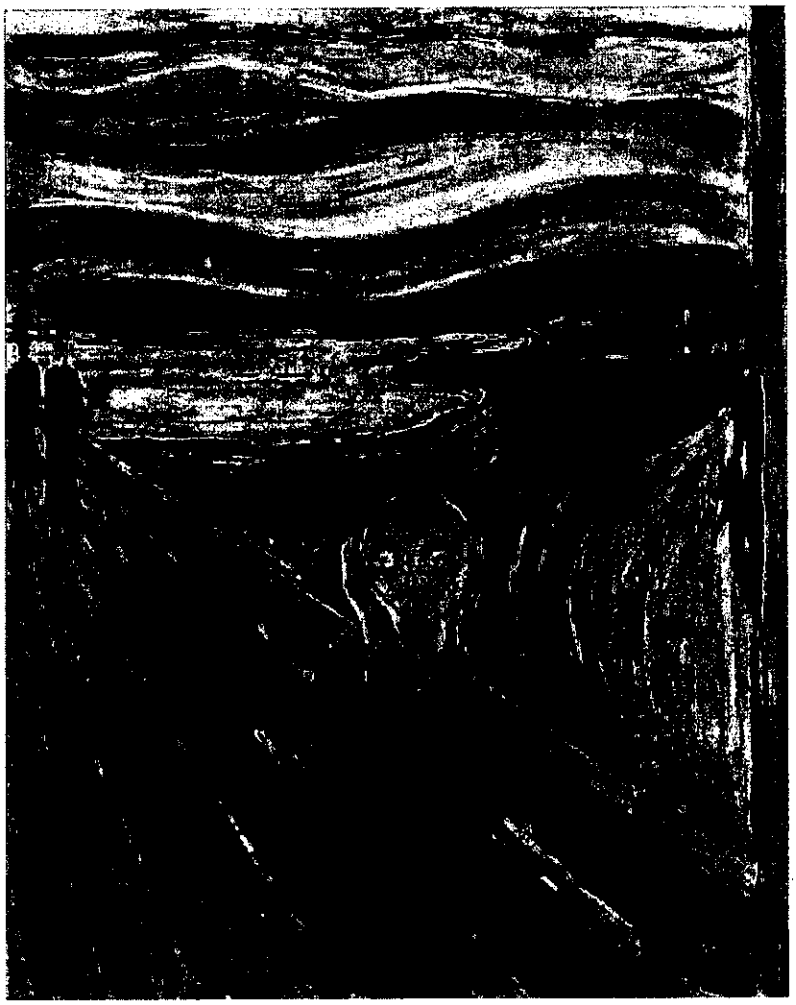
Colour as Mood - Peace



GUSTAV KLIMT (1862-1918)
Isle on Lake Attersee, 1902 (oil on canvas)

There are few more peaceful pursuits than to sit at a lakeside and watch the glimmer of light and colour on the surface of the water. Gustav Klimt conveys that peaceful feeling of total relaxation and contentment in the way he focuses his attention on the Impressionistic spectrum of turquoise and blue reflections that gently merge into the soft waves of yellow sunlight.

Colour as Mood - Anxiety



EDVARD MUNCH (1863-1944)
The Scream, 1893 (oil, tempera and pastel on cardboard)

Activity: Highlight the words that describe emotion. What colours have been used to describe this emotion?

'The Scream' by Edvard Munch has entered the public consciousness as an emblem of anxiety. All its components combine to form an image of impending doom; it is a panic attack in visual elements. The two main colours of the painting are orange and blue, a lurid contrast from opposite ends of the spectrum guaranteed to form a tense relationship. An anxious state of agoraphobia is generated by the extended perspective of the bridge and the haunting waves of sound that echo around the fjord. A stomach-churning glimpse over the edge of the handrail initiates an attack of vertigo. A deep sense of isolation and helplessness is experienced by the figure who is holding his head to absorb the phobic assault from this environment, while his

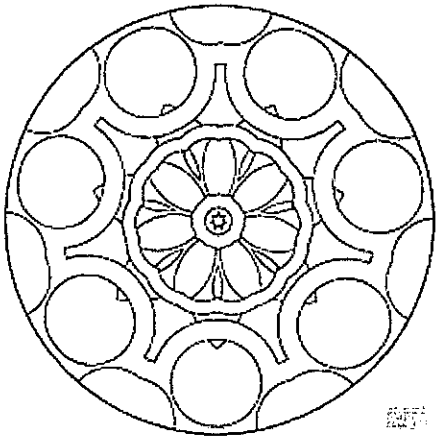
path of escape is blocked by the spectral figures at one end of the bridge and the mysterious border which channels the burning colour of the sky at the other.

The figure is Munch himself. In his diary of 1892 he wrote, *"I was walking along the road with two friends. The sun set. I felt a tinge of melancholy. Suddenly the sky became a bloody red. I stopped, leaned against the railing, dead tired. And I looked at the flaming clouds that hung like blood and a sword over the blue-black fjord and city. My friends walked on. I stood there, trembling with fright. And I felt a loud, unending scream piercing nature."*

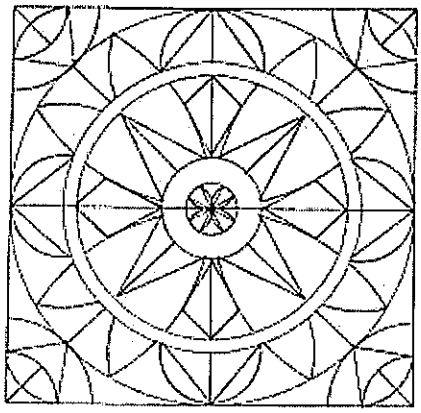
Colour as Mood - Noise

GINO SEVERINI (1883-1966)
The Dance of the Pan-Pan at the Monico, 1909-1911/1959-1960 (240cm x 400cm, oil on canvas)

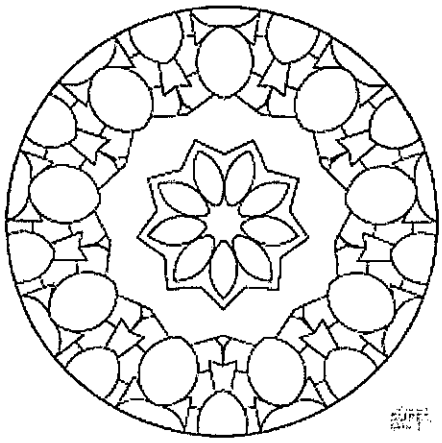
Activity 2: Colour in the following images using the type of colour instructed under each square. Use the colour sheets/wheels to help you!



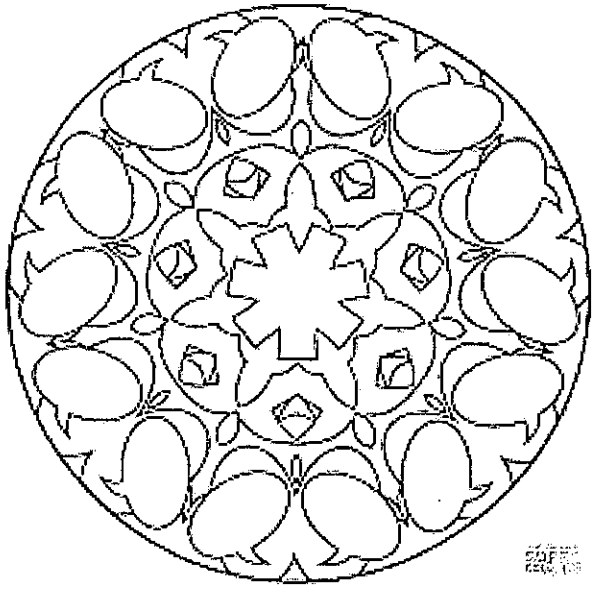
Primary Colours



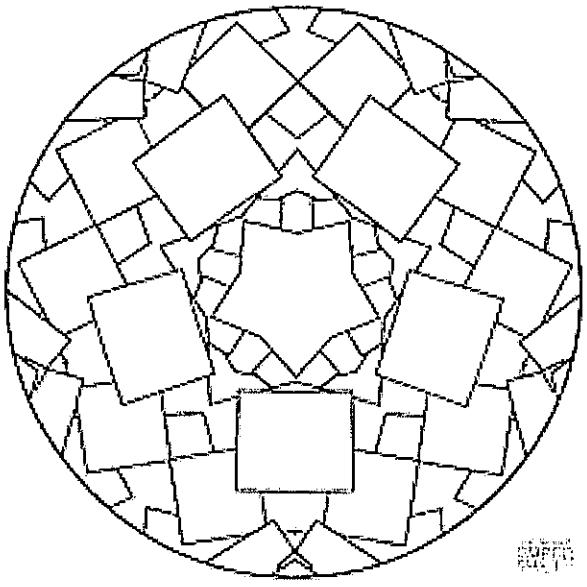
Secondary Colours



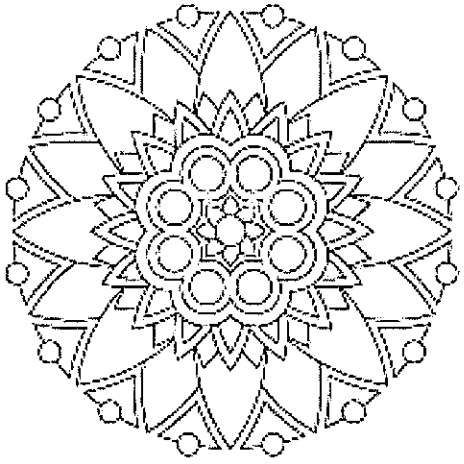
Tertiary Colours



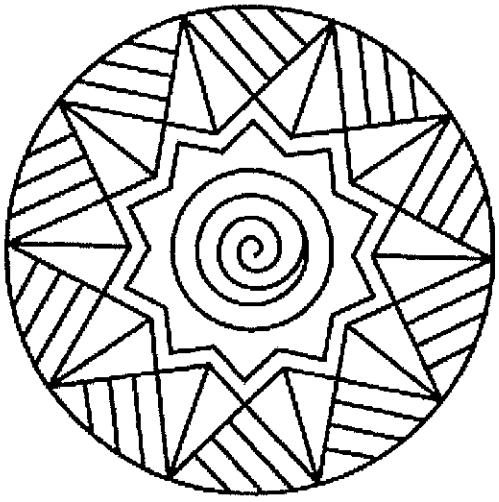
Warm



Cool



Complimentary



Analogous

Activity 3:

1. **Draw your own object**
2. **Colour it in the colours that describe the mood you want the audience to feel when looking at your artwork. I will try and guess what it is** 😊

VALUE

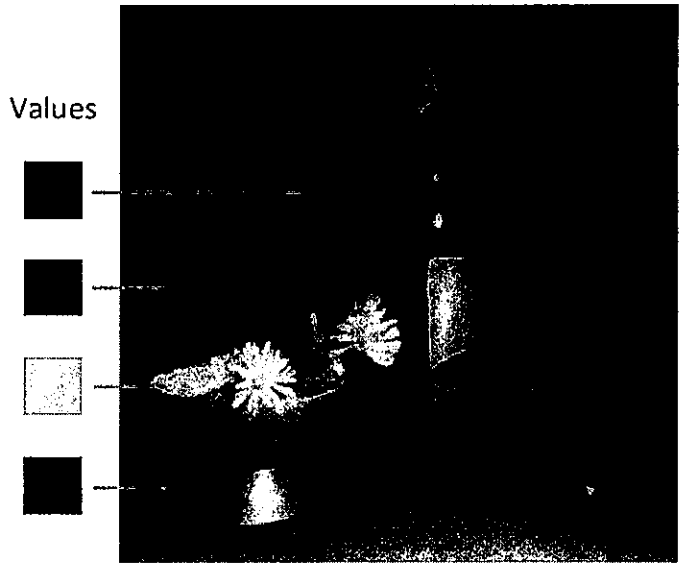
The value scale is a system of organising lightness and darkness. It consists of nine values ranging from white to black, with several shades of grey in between. These shades of grey make up the most of a drawing, and help to create the **illusion of depth and three-dimensionality.** It does include the 'value' of a colour, however, other terms like 'saturation' & 'tone' are also used.

Value drawing can be used to create an image that feels so real and spacious that it seems like you could reach right into it!

It helps us create believable space, mood, atmosphere and various "special effects" in our pictures. It is an incredibly versatile tool when understood and used correctly!

So, what *is* value?

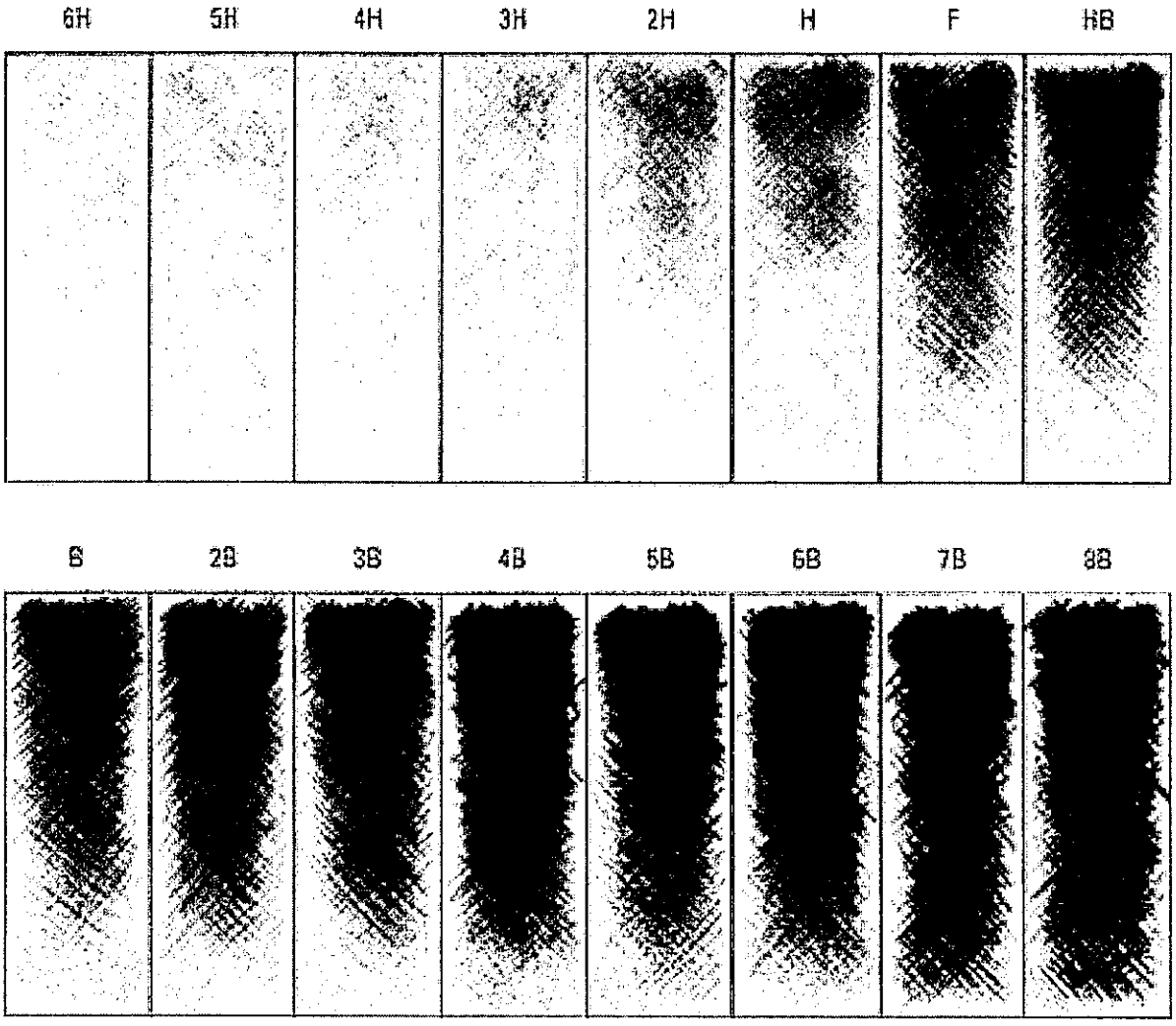
"Value" simply means how light or dark something is.



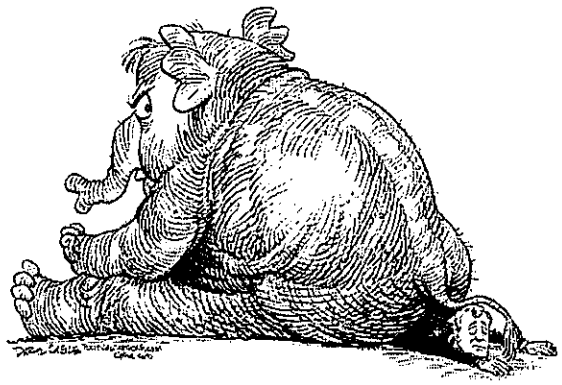
A drawing is said to be a **value drawing** when it is in black and white, when it has no colour. Black, white, and the many shades of grey in between the two are called values (and sometimes tones or shades).

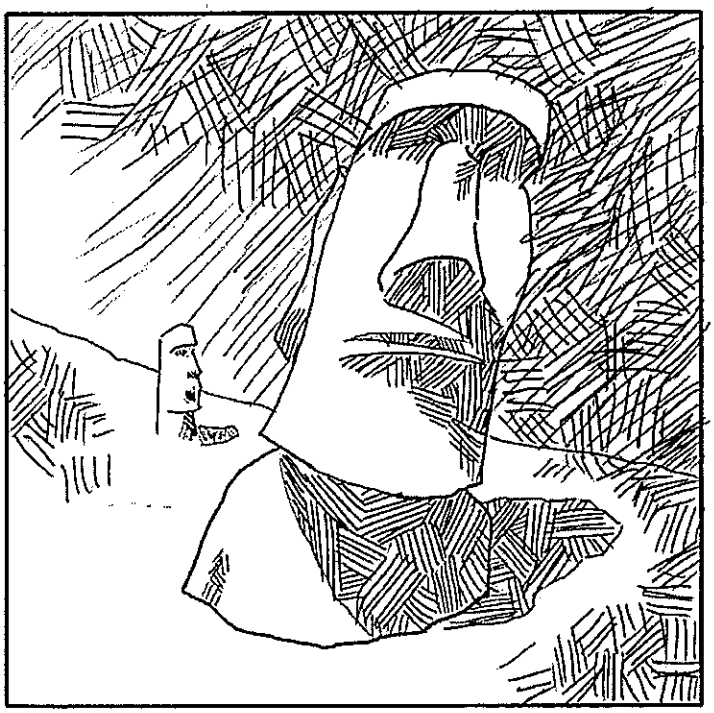
There are various techniques that can be used to add value or tone, to an artwork, which include things like shading or hatching... let's get into the *depth* of the topic ☺

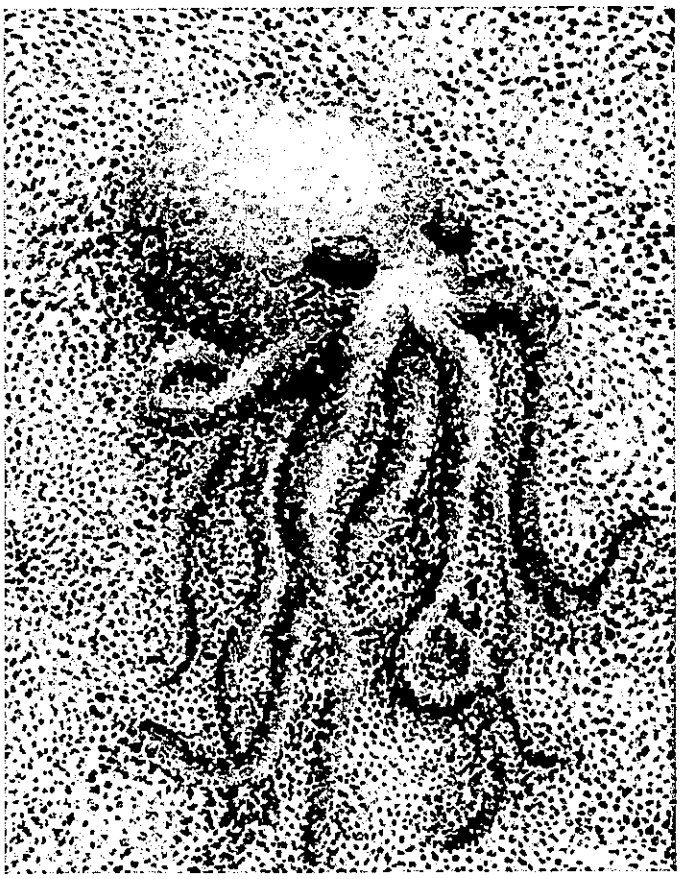
Different grades of pencil



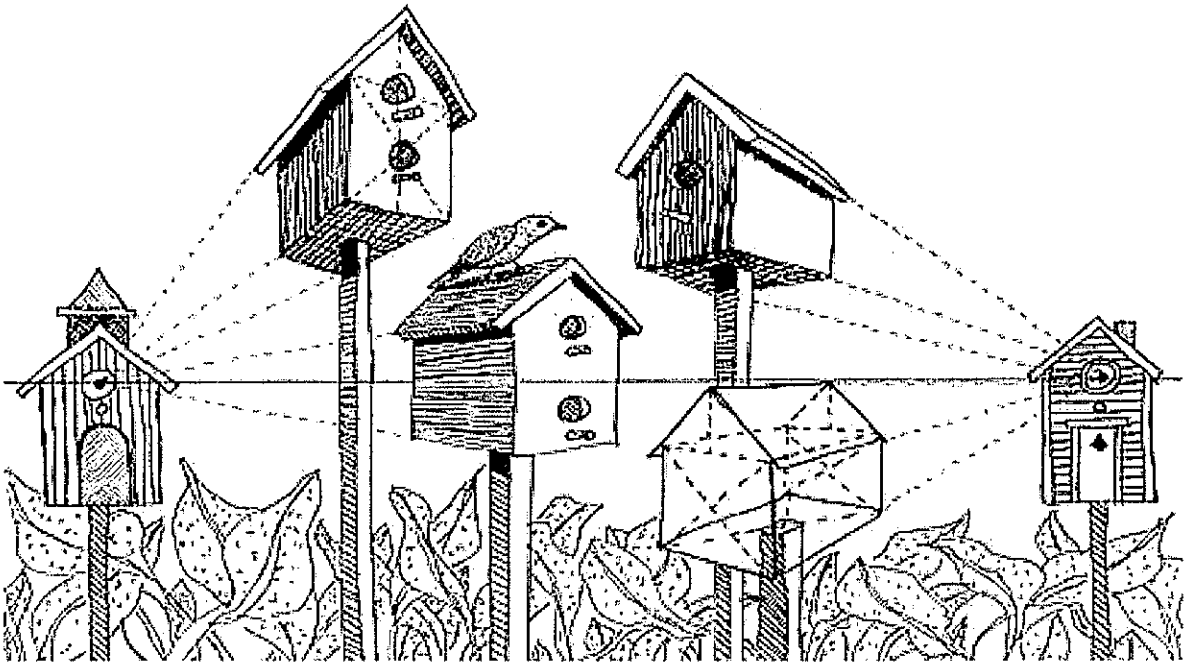
You use the different grades to create depth in your shading... the darker the pencil, the more depth you add to the sketch.





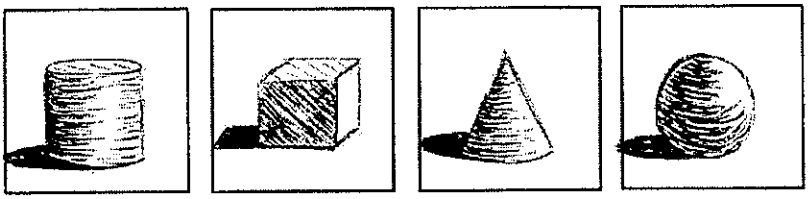


You can use various techniques to create depth into your artwork

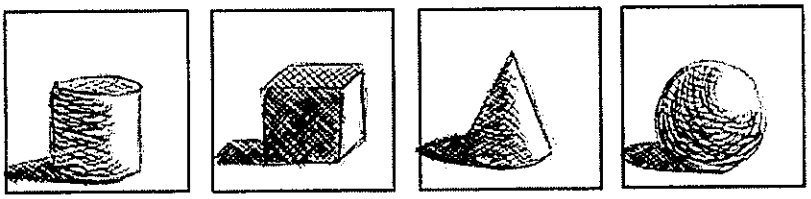


Such as...

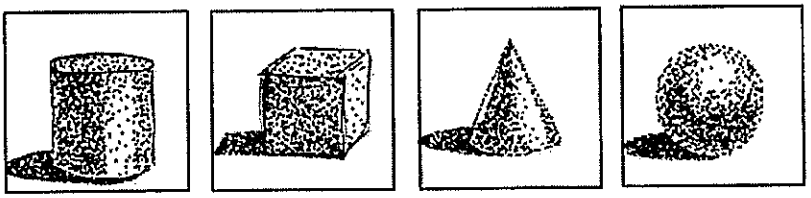
Hatching



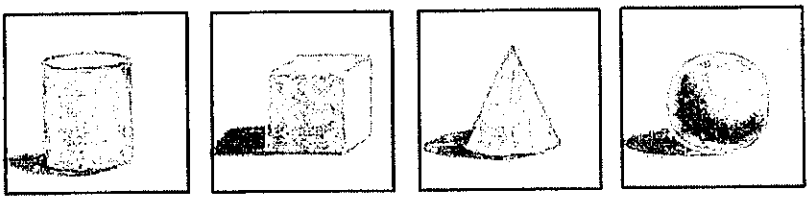
Crosshatching

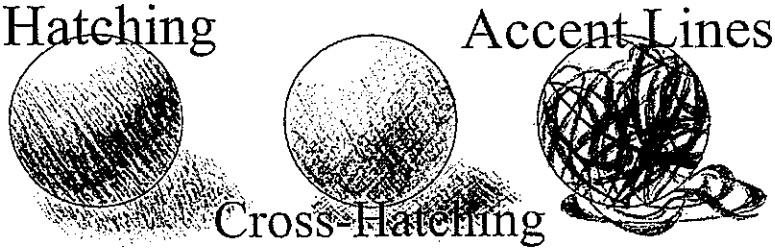


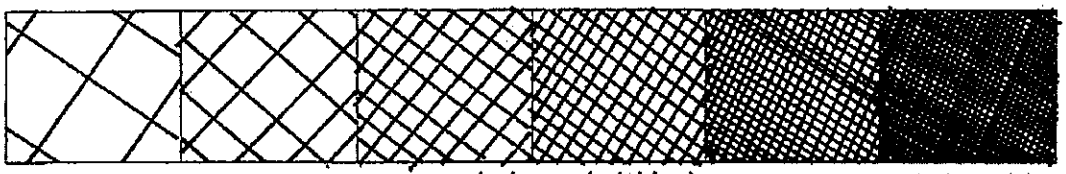
Stippling



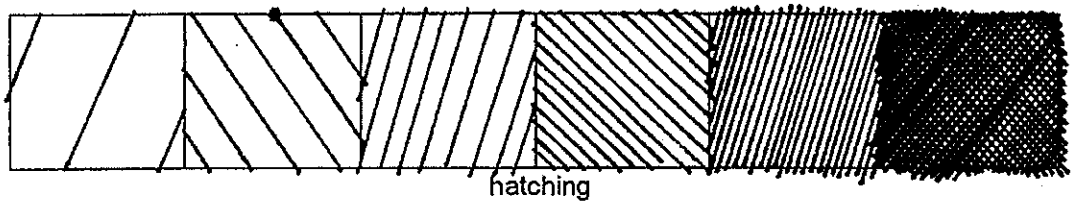
Blending



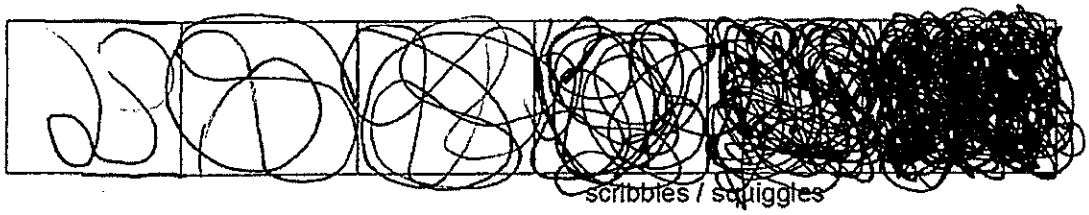




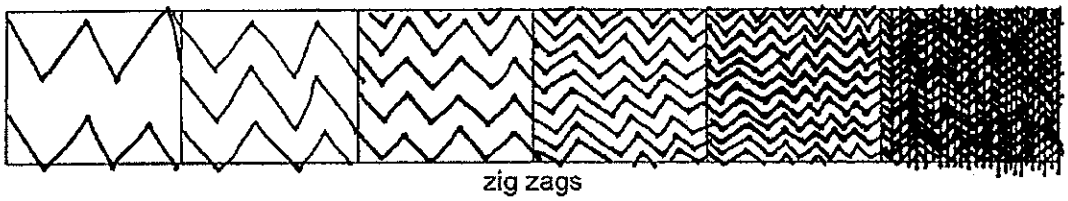
lightest (1) example (cross hatching) darkest (6)



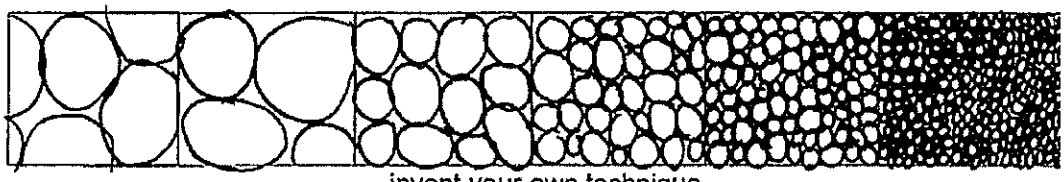
hatching



scribbles / squiggles



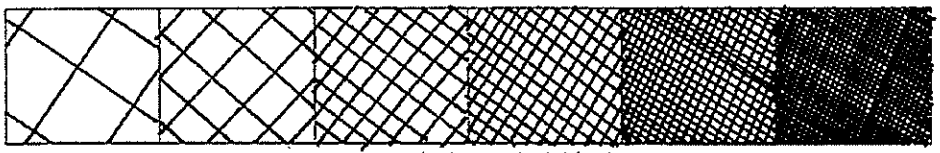
zig zags



invent your own technique

combination of 2 or more techniques (from above examples)

value scales using line



lightest (1) example (cross hatching) darkest (6)

cross hatching

hatching

scribbles / squiggles

zig zags

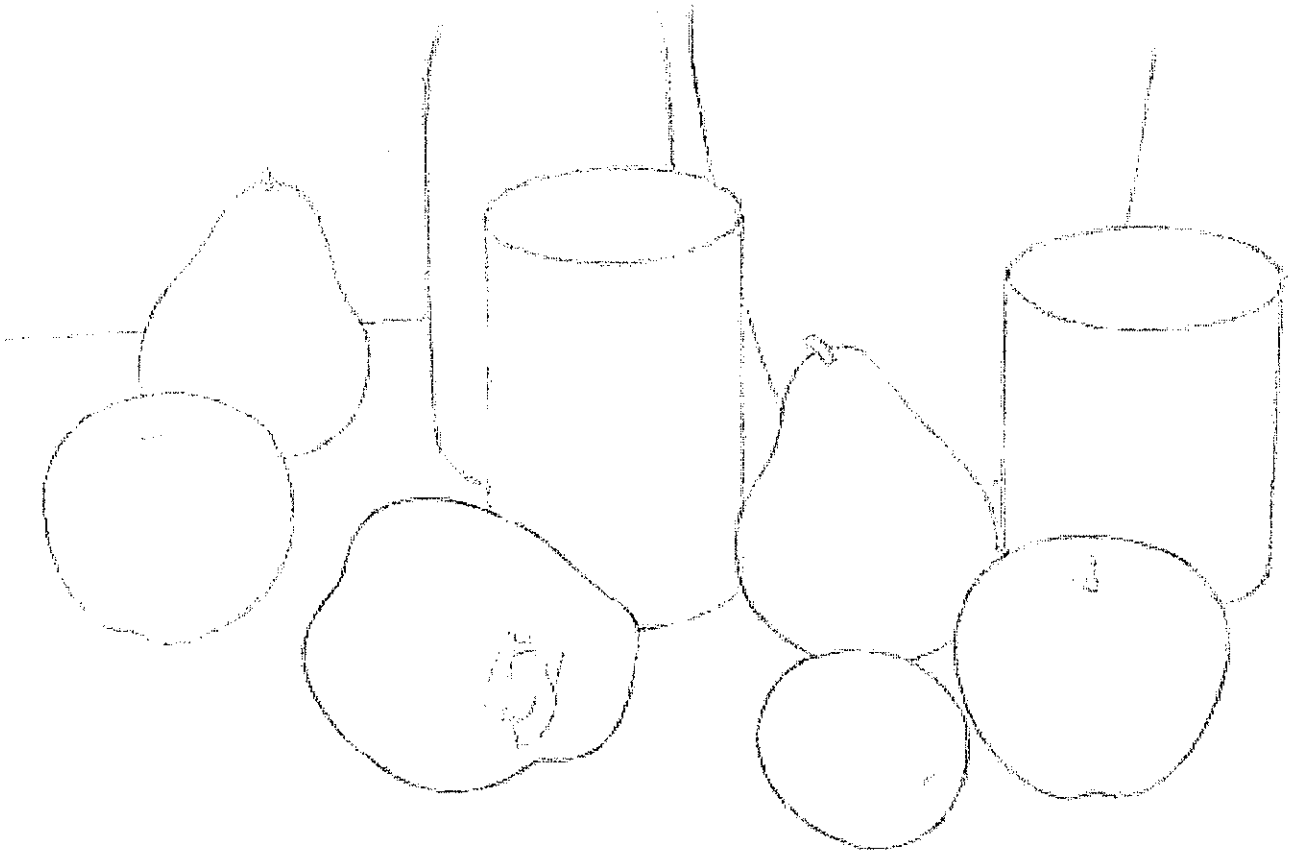
invent your own technique

combination of 2 or more techniques (from above examples)

Activities:

1. Copy the techniques from the previous page onto this page, it will give you practice in creating depth with these techniques.

2. Add value/depth using at least one technique from above to the object given to you on the next page



Remember... the aim of adding value to an artwork is to create the illusion of depth and three-dimensionality.

SHAPE/FORM

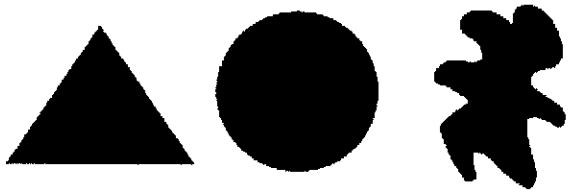
FRANCIS CAMPBELL BOILEAU CADELL (1883-1937)
The Blue Fan, 1922 (oil on canvas)

In the **visual arts**, **shape** is a flat, enclosed area of an artwork created through lines, textures, colours or an area enclosed by other **shapes** such as triangles, circles, and squares. Likewise, a form can refer to a three-dimensional composition or object within a three-dimensional composition.

Most of the art we see is two-dimensional: a drawing, a painting, a print or a photograph which is usually viewed as a flat surface. Most two-dimensional art tries to create the illusion of three dimensions by combining the visual elements to a greater or lesser degree.

Within Applied arts or Visual Design, we see three-dimensional art being introduced as sculpture, wearable art, ceramics, glass objects etc.

Activity: Name the shapes & Forms below:



Shapes

Forms

CUBISM

"Cubism is like standing at a certain point on a mountain and looking around. If you go higher, things will look different; if you go lower, again they will look different. It is a point of view."

Cubism is the most famous style of art that used shape to portray objects within their artworks. Pablo Picasso & Georges Braque were the most well known artists of the Cubist art period.

Activities:

1. List all of the shapes and forms you see in the two artworks below on the sheet.
2. Using your pencils (both graphite & coloured) to recreate one of the artworks on a full A4 page in your VAPD. Use as many of the elements of art & principals of design you have learned about in class.

Weeping Woman (Femme En Pleurs), 1937.

Pablo Picasso,

Oil Paint on Canvas

Tate Gallery, London

Violin and Palette, 1909.

Georges Braque

Oil on Canvas

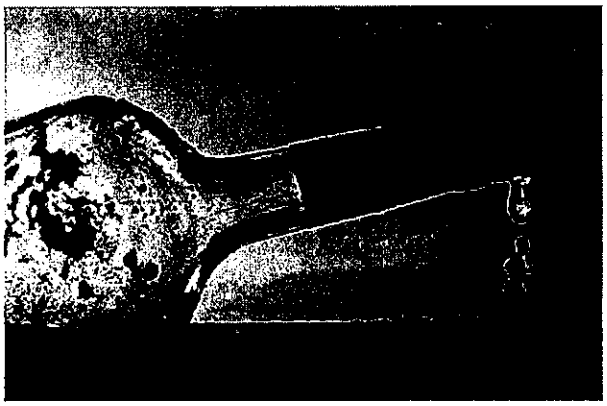
Guggenheim, New York

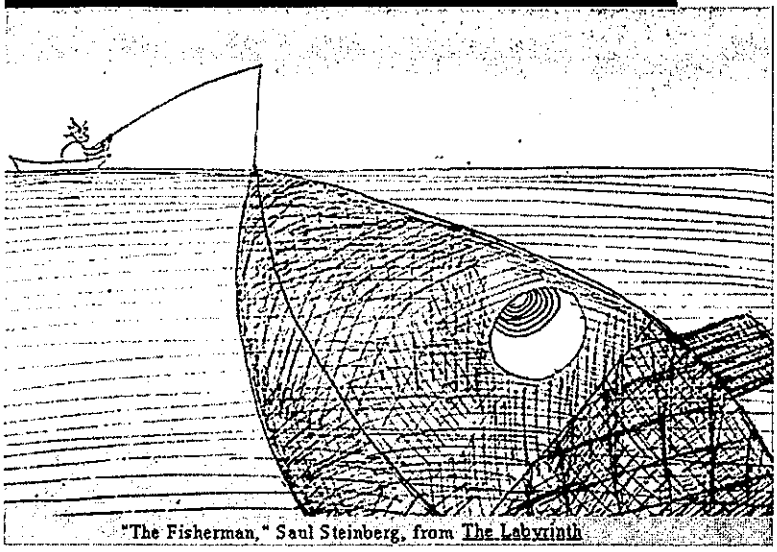
SIZE

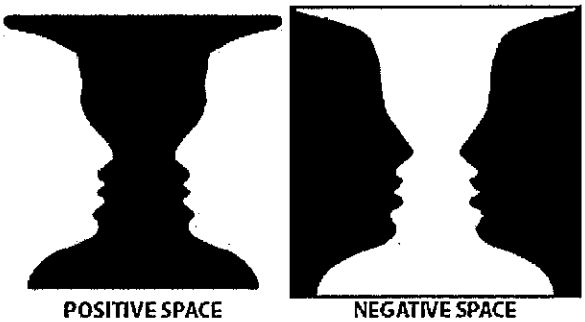
Size, within the elements of art and principles of design describes a few things, which include:

- The measure of shapes, lines and the space in between them. This also includes positive and negative space.
- Spatial placement & depth- this is a fancy way of discussing how to draw things that are meant to be either close or far away; it creates a 3D effect.
- It also discusses the scale (size) of the artwork, which includes small and large scale. All of these can change the way an artwork looks quite dramatically.

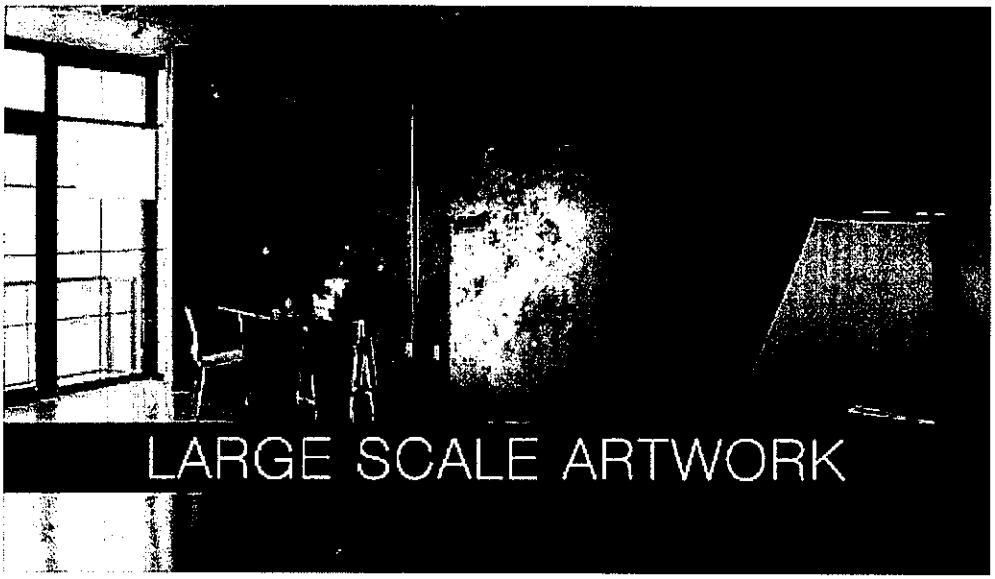
The artworks you see here have used positive and negative space, size, scale & spatial placement to create visual effects.



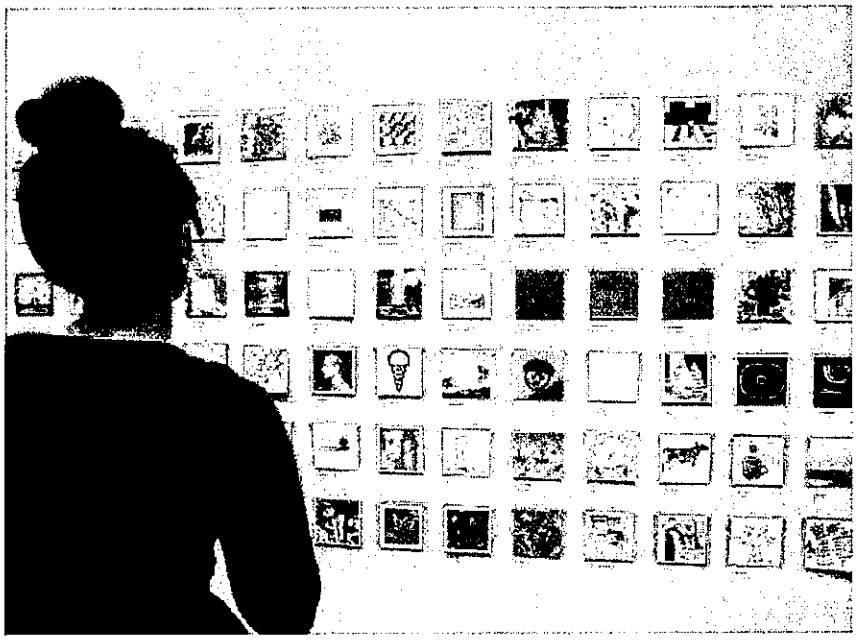


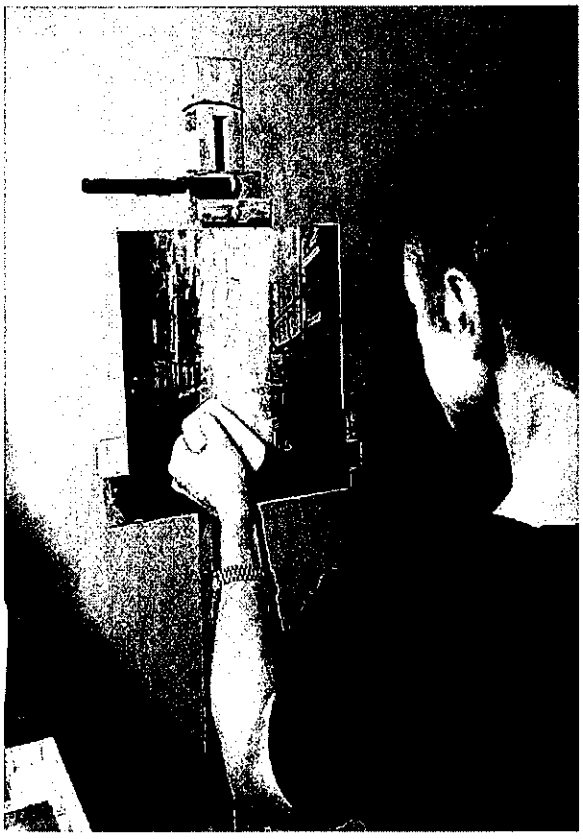


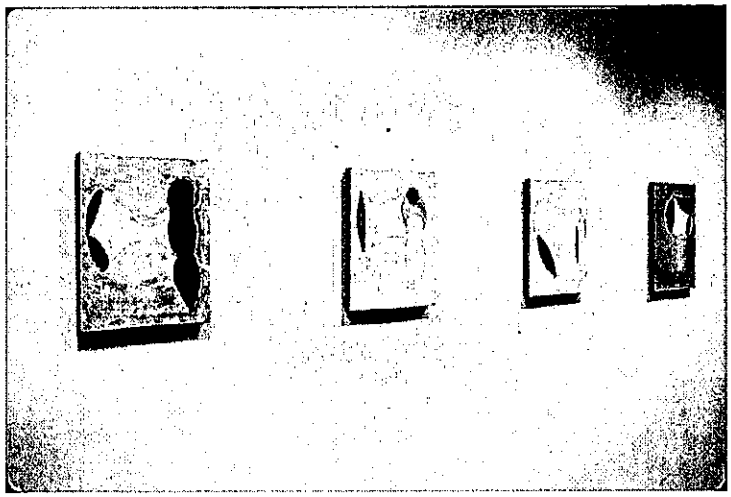
Large scale



Small scale







ACTIVITY:

Within the squares provided, choose an object in the classroom and draw it in two different sizes to see how it changes the artwork. Include other elements of art within your final drawing.

TEXTURE

It is used to describe the way a three-dimensional work actually feels when touched. In two-dimensional work, such as painting, it may refer to the visual "feel" of a piece.

It appeals to our sense of touch, which can evoke feelings of pleasure, discomfort, or familiarity. Artists use this knowledge to elicit (make you feel) emotional responses from people who view their work. The reasons for doing so vary greatly, but texture is a fundamental (basic) element in many pieces of art.

Take rocks, for example. A real rock might feel rough or smooth and it definitely feels hard when touched or picked up. A painter depicting (of) a rock would create the illusions of these qualities through the use of other elements of art such as color, line, and shape.

Textures are described in many different ways. Rough and smooth are two of the most common, but they can be further defined. You might also hear words like coarse, bumpy, rugged, fluffy, lumpy, or pebbly when referring to a rough surface. For smooth surfaces, words like polished, velvety, slick, flat, and even can be used.

TEXTURE IN THREE-DIMENSIONAL ART

Three-dimensional artwork relies on texture and you cannot find a piece of sculpture or pottery that does not include it. Fundamentally, the materials used give a piece of art texture. That may be marble, bronze, clay, metal, or wood, but this sets the foundation for the work feels if it were touched.

As the artist develops a piece of work, they can add more texture through technique. One might sand, polish, or buff a surface smooth or they might give it a patina, bleach it, gouge it, or otherwise rough it up.

Many times you will see texture used in patterns such a series of intersecting diagonals lines that give a surface a basketweave look. Rectangles staggered in rows offer the texture of a brick pattern and concentric, irregular ellipses may imitate the texture of wood grain.

Three-dimensional artists often use a contrast of texture as well. One element of an artwork may be smooth as glass while another element is rough and mangled. This contradiction adds to the impact of the work and can help convey their message just as strongly as a piece made of one uniform texture.

TEXTURE IN TWO-DIMENSIONAL ART

Artists working in a two-dimensional medium also work with texture and the texture may either be real or implied. Photographers, for instance, almost always work with the reality of texture when creating art. Yet, they can enhance or downplay that through the manipulation of light and angle.

In painting, drawing, and printmaking, an artist often implies texture through the use of brushstrokes lines as seen in crosshatching. When working with the impasto painting technique or with collage, the texture can be very real and dynamic.

Watercolor painter, Margaret Roseman, said, *"I aim for an abstract element of a realistic subject and use texture to add interest and suggest depth."* This sums up the way many two-dimensional artists feel about texture.

Texture is something that artists can play with through the manipulation of their medium and materials. For instance, you can draw a rose on a rough textured paper and it won't have the softness of one drawn on a smooth surface. Likewise, some artists use less gesso to prime canvas because they want that texture to show through the paint they apply to it.

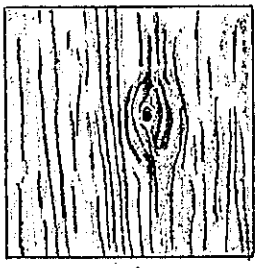
TEXTURE IS EVERYWHERE

As in art, you can see texture everywhere. To begin to correlate reality with the artwork you see or create, take the time to really notice the textures around you. The smooth leather of your chair, the coarse grains of the carpet, and the fluffy softness of the clouds in the sky all invoke feelings.

As artists and those who appreciate it, regular exercise in recognizing texture can do wonders for your experience.

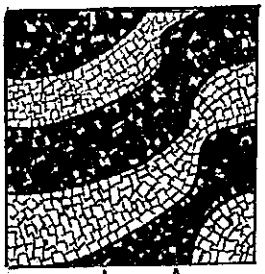
ACTIVITY

In each square draw a different texture (see next page for examples)



wood 1

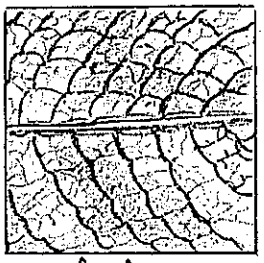
cracked earth



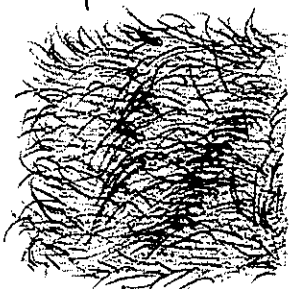
paved road

broken glass

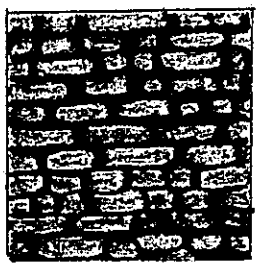
cracked paint



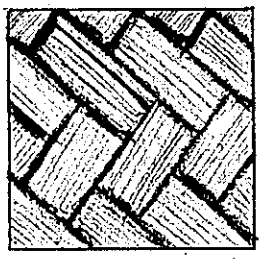
leaf



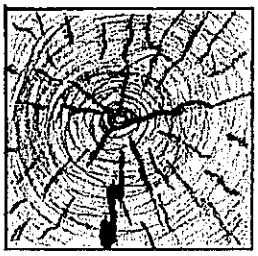
windy grass



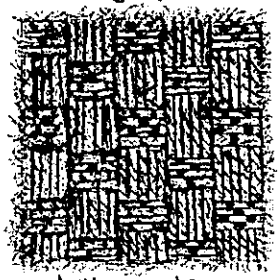
pavement



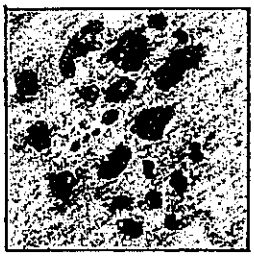
basket texture



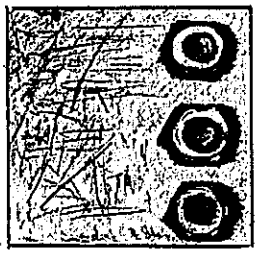
Wood 2



little mat

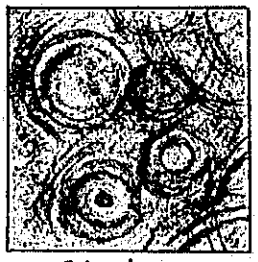


water drops



old metal surface

sand

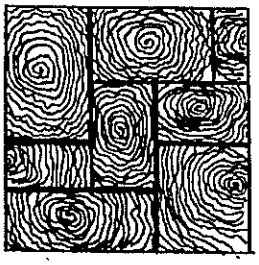


rain drops

crumpled paper

tiles structure

zebra linespattern



curly

artistic

Year 7 – Technology Mandatory

Students have started looking at digital technologies and how they affect our lives.

Students are asked to read and complete the activities in the workbook.

ORAN PARK HIGH SCHOOL

Name: _____ Class: _____

Technology Mandatory

Digital Technologies

Focus Area: DATA

01000100 01101001 01100111 01101001
01110100 01100001 01101100 00100000
01010100 01100101 01100011 01101000
01101110 01101111 01101100 01101111
01100111 01101001 01100101 01110011
00100000 01101001 01110011 00100000
01000110 01010101 01001110 00100001

GLOSSARY

Complete the meaning of the following words in relation to computing:

1. hardware
2. software
3. processing
4. central processing unit (CPU)
5. storage device
6. operating system
7. analog data
8. digital data
9. binary
10. bit
11. file format
12. bit-mapped graphics
13. vector graphics
14. Internet
15. world wide web
16. protocol
17. filter (Excel)
18. sort (Excel)
19. cell address or cell reference (Excel)
20. analyse

COMPUTER ROOM RULES

1. Do not logon to computers until told to do so. You are NOT to change the desktop image.
2. Use the Internet for schoolwork only.
3. Students are not to save program, audio and video files on the school network without teacher permission.
4. Students are not to play computer games unless it is part of the lesson.
5. Report all hardware and software problems to your teacher as soon as you notice them. Your teacher will note the problem so that it is fixed as soon as possible.
6. Students are not to try to repair the computers themselves. No student is to unplug or plug in any cable on the computer.

FILE MANAGEMENT

When you use software, you often create pieces of data, which you want to keep. A piece of data like this is called a **file**.

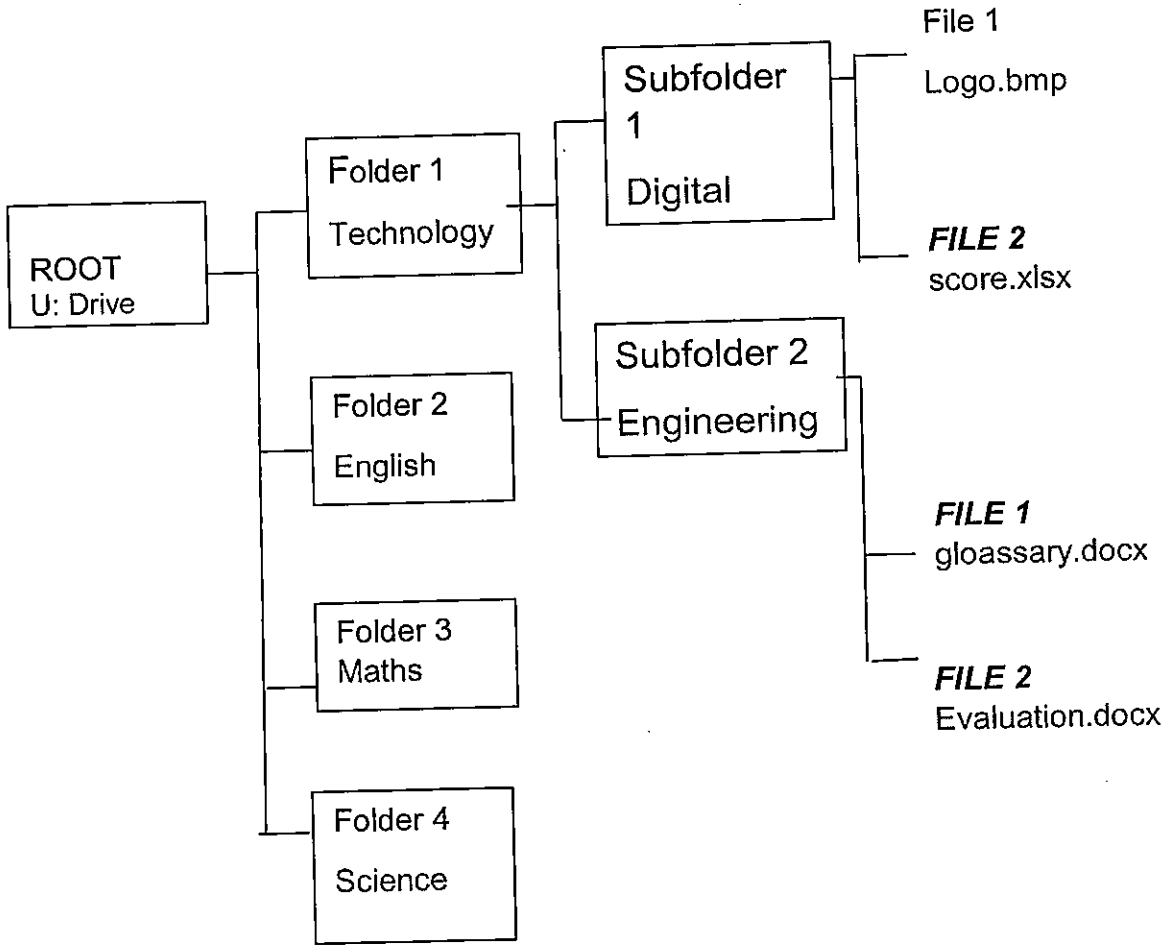
Folders/ Directories – a group of files

Root Folders/ Root Directories – the main folders from where all other folders branch out.

A **file manager** is a program that shows you a list of your files and helps you organise them into folders/ directories. E.g. Windows Explorer.

FILE ORGANISATION

THE TREE STRUCTURE



Activity:

Organise your OneDrive so that you have a folder for all your subjects. Your Technology folder have 2 subfolders called Digital Tech and Engineering.

NAMING DIRECTORIES/FOLDERS /FILES

- Filename should be short, no more than 30 characters long.
- It should be concise (short and to the point) and meaningful – should remind you of what is in the file.
- **Avoid using characters and symbols such as** . * / : < > ? \ | ê etc. because they make your file unreadable to some software.

There are many types of files. The **filename extension** at the end of a filename tells you the file type.

For example:

filename . ext.

design . docx -is a Word document

design . xlsx -is an Excel spreadsheet

design . jpg -is an image document

1. Name the folders/ directories that you can access on the school network.

_____

_____

2. What is the name of your personal folder on the U: drive?

_____

3. Name the directory which is accessible by all year 7 students. Write your answer as it is seen on your screen.

_____

DIGITAL SYSTEMS

A **digital system** is a collection of hardware and software components. A computer is a digital system. Information systems are digital systems that have been combined with data, processes and people to collect, organise and communicate information.

Hardware components of a computer system is the term used for all the things you can _____, turn on, switch _____, or adjust.

Software

- A computer software or _____ is a set of _____ telling the computer what to do.
- Operating System - is a set of programs that control and organise everything the computer does. The school computer uses _____.
- Applications Software – programs that let you do specific jobs such as writing, drawing, and calculations. Three examples of applications software we use at school are _____

Activity:

1. What makes great software?

Criterion1_____

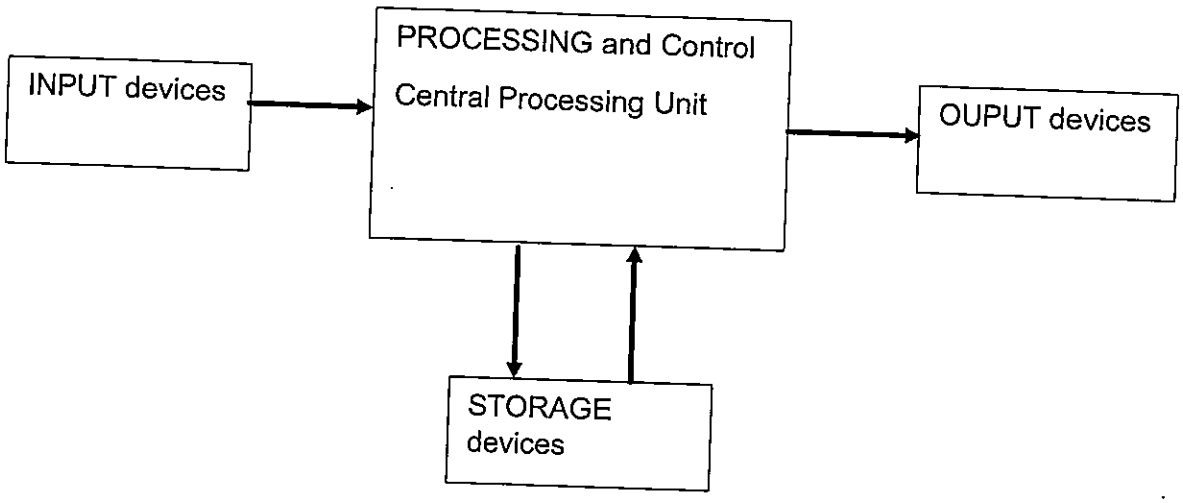
Criterion2_____

Criterion3_____

2. Compare and evaluate some software using the criteria from above.
   - Chrome versus Internet Explorer
   - Microsoft Word versus Google Docs

IPO CHART

Hardware components of a computer system can be classified according to the type of work they do.



An **input device** collects data from the outside world and changes it into a form suitable for the computer.

Processing and control – the CPU (Central Processing Unit) processes/changes the data collected into information.

An **output device** gets information processed by the CPU and displays to the users.

A **storage device** stores data and information for the computer system.

Input, output and storages are sometimes connected to the computer via cables using a port.

1. Identify and name 3 examples of each of the following:
   a. Input devices –
   b. Output devices –
   c. Storage devices –

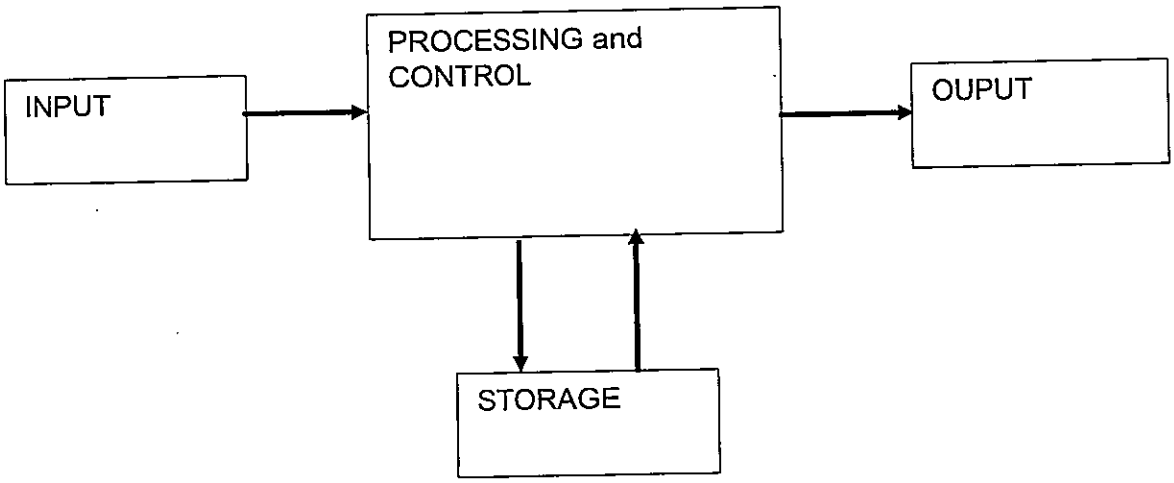
2. Complete the table on storage devices.

Storage device	**Picture**	**typical capacity**	**When would you use it? Why?**
USB flash memory			
SD card			
HDD			
SDD			

3. Describe the function of each of the following ports.

Port	Picture	What is it used for?
USB		
HDMI		
VGA		
Ethernet/LAN		
Card slot		

4. Complete the IPO chart to describe what happens you type up a message on your phone.



BINARY NUMBERS

Analog and digital data

Analog data

- Data that is continuously changing is called analog data.
- Devices like mercury thermometer or voltmeter used to measure voltage are analog representation of data.

Digital data

- Data is shown by a series of values. There's no in-between state with a digital data.
- A light switch is either on or off; a set of traffic lights is green, red or amber.
- Computer uses binary code or numbers which contains 2 digits - 0 and 1 to represent "off" and "on" of its circuit.

Why do computers use binary numbers?

_____

_____

_____

Binary to Decimal and Vice Versa

How to video: https://www.youtube.com/watch?v=tfKe8PPI2zs

Computers also use binary to store and send data. This is because they are electronic and turn electricity on (one) or off (zero) to represent the data. Sometimes the terms high and low are used to represent on and off. There are other ways to store the ones and zeros that a computer reads, but we won't go into that here. To learn more, search the internet for "data storage".

Each digit is called a bit. This will be a 1 or 0.

Computers store bits in blocks of 8. Each block of eight bits is called a byte.

Normally people count in base ten. In binary we count in base two.

2^7s	2^6s	2^5s	2^4s	2^3s	2^2s	2s	Units	In Base 10
128s	64s	32s	16s	8s	4s	2s	1	Calculations
0	0	0	0	0	0	0	1	1
0	0	0	0	0	0	1	0	
0	0	0	0	0	0	1	1	
0	0	1	0	1	0	1	0	4
								255

Each byte represents a number between 0 and 255. There are 256 numbers in total but computers consider zero to be the first counting number so the highest number is 255.

Binary and Hexadecimal

Use the converter to convert binary to hexadecimal
https://www.rapidtables.com/convert/number/binary-to-hex.html

Binary number	Hexadecimal number
01110000	
10101111	
00111010	

Why do computer scientists use hexadecimals?

Hexadecimal colour picker

https://htmlcolorcodes.com/color-picker/

Pick 3 colours and use snipping tool to make a screen shot of the colour and hexadecimal number.

ASCII CODE
One way alphabets, symbols etc. can be represented in binary is by using the ASCII code system.

Activity:

Convert text to binary

1. Write a one word message to your friend in binary.

   Use the following website and convert your word into binary

   http://www.unit-conversion.info/texttools/convert-text-to-binary/

2. When you receive your message, decode it using the following website

   https://onlinebinarytools.com/convert-binary-to-text

3. You might recognise some of these numbers from "computer talk".
   Decipher the message on the cover of your workbook'

UNICODE

Another way to represent characters, symbols etc. is by using Unicode system. It can represent more characters and it is universal, can be used by any platform.

Activity:

Use the following websites or find your own to work out the Unicode for the characters and emoji's in the table. You add your own characters from your own language.

https://unicode-table.com/en/#control-character

https://www.chineseconverter.com/en/convert/unicode

https://unicode.org/emoji/charts/full-emoji-list.html

Characters or emoji	**Unicode**	**Characters or emoji**	**Unicode**	**Characters or emoji**	**Unicode**
T		H			
E		Letter in another language			
C		Letter in another language			

BINARY NUMBERS AND PROGRAMMING LANGUAGES

Complete the following passage about binary numbers in computing using the word bank provided. Some of the missing words have been started for you.

Word bank

Binary	Every	Syntax
C/C++	Translator	Theoretically
Computer	Language	Zero
Digital	One	
Efficient	Programming languages	

Computers have different _____, you may have heard of some of them such as _____, HTML, Python or Scratch.

Regardless of what language you program in they all convert to _____ when running through the _____. This is because computer processors only work at base level as "on" or "off".

They are a _____ machine and only have _____ or ____ (off or on) as a state to calculate. _____ Computer, regardless of its age or specification works on binary at its core. You need to understand that binary is like a counting system that can tell a computer what to do.

All a programming _____ does is make the binary system easier to understand and use by acting as a _____ between plain human speak and computer speak. It is_____ possible to program a computer using binary only, but this would be an enormous task and it is much more _____ using a programming language instead. These languages have dictionaries of commands,_____ and terminology preloaded for you to use.

REPRESENTING IMAGES IN DIGITAL FORM

Fill in the blanks using the following terms:

Logos	Pixels	Smaller	Paintings	Less	Draw
Paint	Graphics	Bigger	Drawings	Photographs	Diagrams
Storage	Object	Edited	Objects	Curves	Charts

- Information presented in the form of pictures, _____, paintings, diagrams, photographs, charts etc. are termed _____.
- There are two major types of graphics: **bit-mapped graphics** and **vector graphics**.

Bit-mapped graphics

- In bit-mapped graphics, the image is made of dots called _____. Each pixel has to be stored, so the file size is _____ and requires more _____. Bit-mapped graphics can be _____by erasing or altering individual _____.
- A _____ program such as MS Paint creates bit-mapped graphics by telling the computer how to display each pixel. Paint programs are good for producing and editing realistic images that contain a lot of gradual colour changes, such as _____ and _____.

Vector graphics

- In vector graphics, the image is created using a number of _____ such as straight lines, _____ and shapes. The file size is _____ and requires _____ storage. Editing can be done by changing the characteristics of each _____
- A _____ program such as Illustrator creates vector graphics by using objects. Draw programs are good for producing _____, _____, and _____.

Which program should I use?

Graphics	**Program**
A free-hand drawing of the autumn scenery	
The plan of a house	
A diagram of the equipments in my Science lab	
A touch-up of my Birthday party photograph	

CODING AN IMAGE ACTIVITY

Black and white image

1. Create an 8 x 8 square table in a document. Then duplicate the table on page 2 to make 2 tables.
2. Use the fill bucket  to create a black and white picture. Fill some squares with black and leave others white on the first table on page1.
3. Now you are binary code writers. You need to develop a code for each line of the picture. Each line of code should have 8 numbers (consisting of 0s and 1s, 0=black and 1=white).
4. Swap your code to the person next to you.
5. You are now acting as decoders, trying to put the picture back together using each line of code from another student. Do this in the second table on page2. As a decoder, you are not to refer to the original drawing.
6. Once finished, make comparisons with the original image. Discuss and try to debug any problems.

Coloured image

Watch the video and complete the puzzle.

https://studio.code.org/s/pixelation/stage/3/puzzle/1

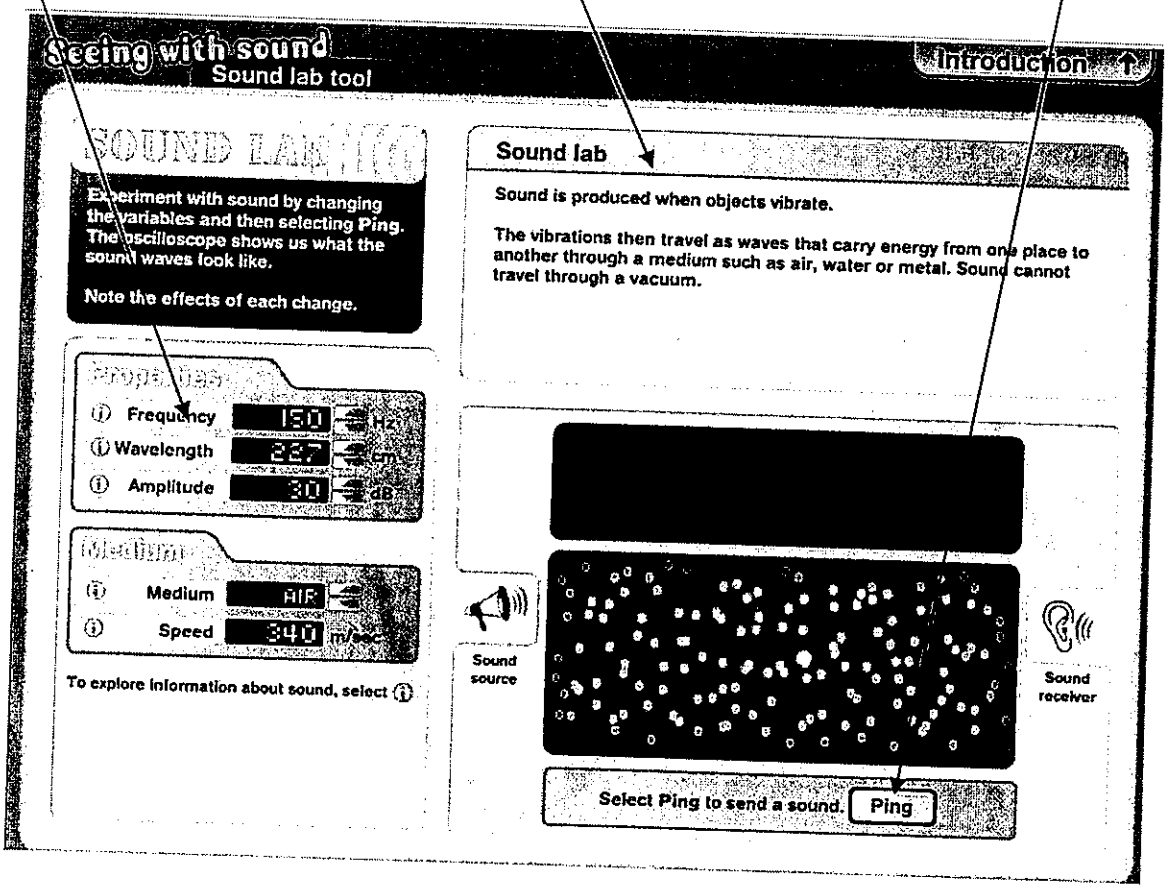
REPRESENTING SOUND IN DIGITAL FORM

Seeing sound

http://www.scootle.edu.au/ec/viewing/L1301/index.html

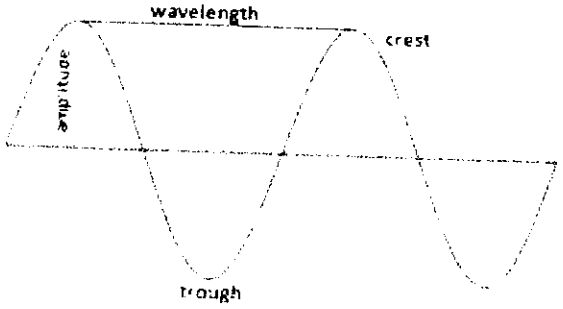
Click on each of the properties (frequency, wavelength, amplitude) and read the explanation.

Experiment with different frequency, wavelength and amplitude, each time press **ping,** and watch the wave changes



Analog sound

Sound travels in the form of waves.



Amplitude = loudness

Wavelength is the length between 2 crests, and is equal to length of one wave.

Frequency is the number of waves that pass through a point in one second (Hz).

Frequency = pitch

The bigger the amplitude, the _____the sound.

Increasing wavelength, _____ the frequency

The higher the frequency, the _____ the pitch

Audio

Audio is digital sound. Sound in a waveform can be converted to binary numbers by an analog to digital converter.

Analogue to digital converter (ADC) converts analogue signal into a digital signal that is represented in binary.

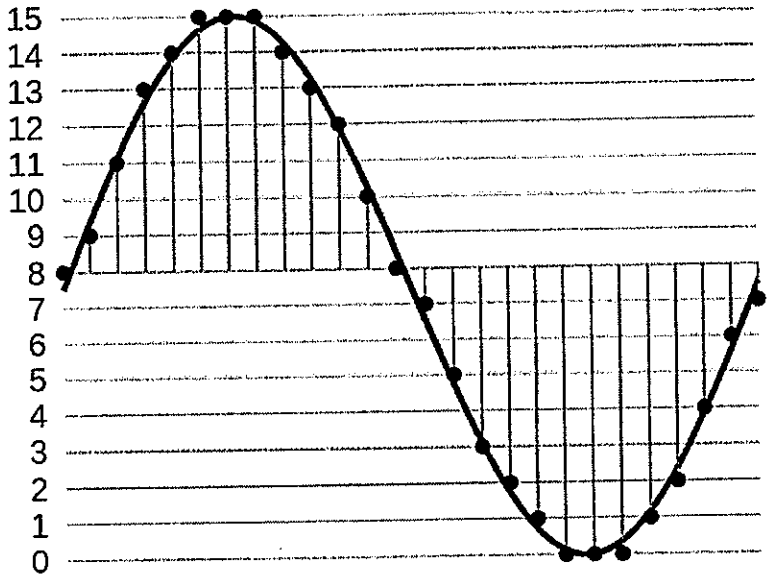
The way we do this is dependent on two things:

- sample rate
- sample size (bit depth)

DIGITISING SOUND

Reference site: Sampling sound

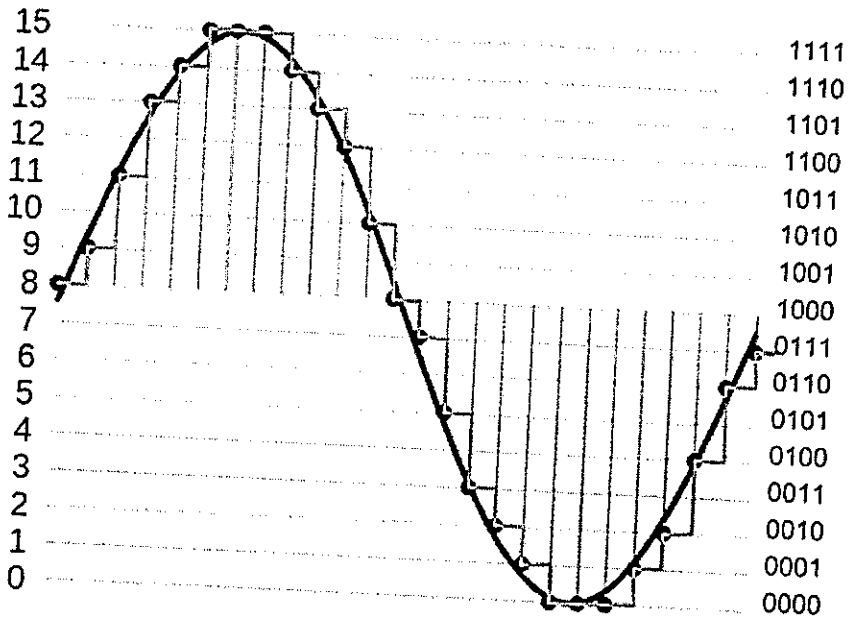
This is an example of an analog sound waves



The process of digitising sound

Sampling sound wave by slicing the wave into samples. Each slice is represented in binary numbers.

The number of samples per second is the sampling rate. The bit-depth or sample size is the number of bits in the binary numbers. In this case it is 4-bit.

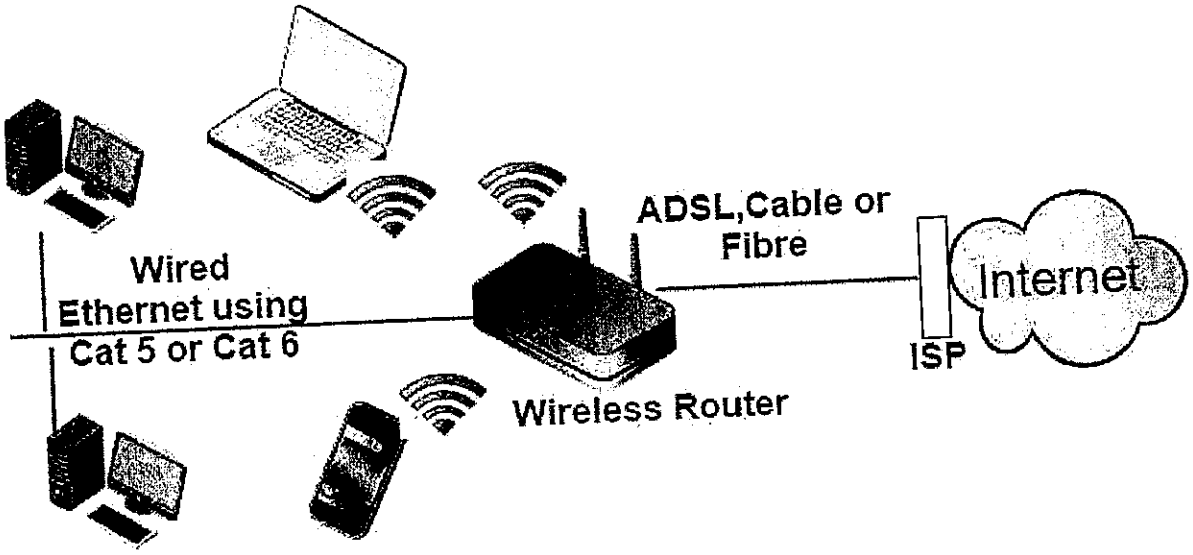


Questions:

How will If the sampling rate is increased (more samples are made)?

NETWORKING

The Internet, sometimes called simply "the Net," is a worldwide system of computer networks - a network of networks in which users at any one computer can, if they have permission, get information from any other computer (and sometimes talk directly to users at other computers).



Network Diagram-Typical Simple Home Network

How data travels over the Internet?

All devices (computers, laptops, tablets, servers etc.) on the Internet are assigned unique addresses, known as Internet Protocol (IP) addresses which look like this 203.58.212.99

URL stands for Universal Resource Locator. URL's are web addresses that help you to locate pages on the Internet. Example: www.google.com.au, this is the Domain Name of Google's server.

When you type in the URL, Domain Name Server (DNS) will convert www.google.com.au to its IP address, 216.58.212.99. This makes life easier as it is easier for us to remember URL to IP address.

TCP/IP

Protocols is a set of rules. Communication protocols allow us to communicate using the Internet. TCP/IP is a common protocol used by devices on the Internet to communicate.

Activity:

1. What is the difference between the Internet and the World Wide Web?

   _____

2. What is the function of the wireless router?

   _____

3. What does ISP stand for? What is the purpose of ISP?

   _____

4. Complete the table below

Medium	Picture	Speed	Reliability
Twisted pair			
Optic fibre			
Coaxial cable			
Wireless			

5. Use this Telstra link to test the speed of your Internet connection.

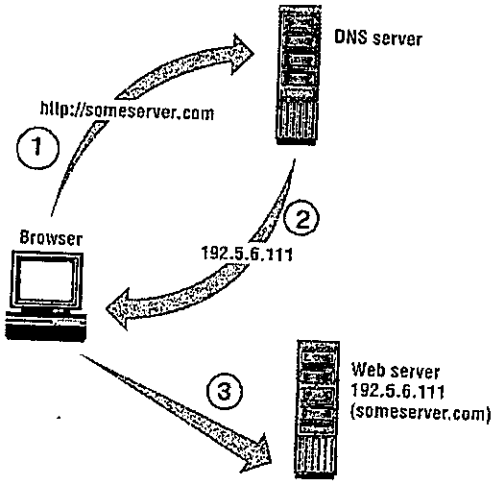
   https://speedtest.telstra.com/

   download speed _____ upload speed _____

6. Refer to the diagram below and fill in the blanks using the word bank provided.

Word bank

wireless	intercepted
address bar	IP address
Data packets	destination
encrypts	unauthorised
192.5.6.111	DNS server
Personal information	Wi-Fi Protected Access
connection	transmitted



When the URL for somewhere.com is typed into the _____ of the web browser, TCP/IP contacts a _____ to get the IP address of somewhere.com. The DNS server replies by sending the IP address of somewhere.com which is _____. TCP/IP then makes _____ to somewhere.com web server using the _____. TCP/IP helps to keep the communication session going until it is terminated. TCP/IP put data such as IP address, messages into the form of _____ so that they can be _____ to their _____.

Data in a _____ network is often protected by using WPA. WPA stands for _____. WPA is a security standard for users of computing devices equipped with wireless network connections. WPA _____ the data sent so that _____ person cannot understand the data even if it is _____. It is especially important when the data involved is a person's password and _____.

Year 7 music:

http://www.mrsvaccaro.com

password: anthony

Year 7 music>introduction to music

Click through the slideshow at the top of the page until you find the cloze passage "Music is". Copy into book and fill in the missing words.

Keep clicking through the slideshow until you get to the "Tubby the Tuba" page (questions are written in black). Follow youtube link and complete the questions, then click forward to the "narrative task" which will be 1 x A4 page at least.

If there are any issues, I'm fine with being emailed directly... belinda.vaccaro@det.nsw.edu.au

Year 7

Absence Work

PDHPE

Week 8 and 9

You will need to do the following:

- Define what you think a 'peer group' is.
- Then complete the attached 'Peer Groups' sheet. This is where you will be reflecting on how your relationships with family and friends have changed over the past 5 years.
- Answer the following questions in your health book:
    - How do adolescent relationships change as they grow and become more independent?
    - Why do adolescents feel the need to become more independent?

- Complete the attached brainstorms around what different scenarios may cause conflict within family members and friends.
- Conflict Resolution – Create a short story which represents you solving one of the brainstormed scenarios, looking to provide three examples of how to successfully manage the situation. Complete this story in your book.

Peer Groups

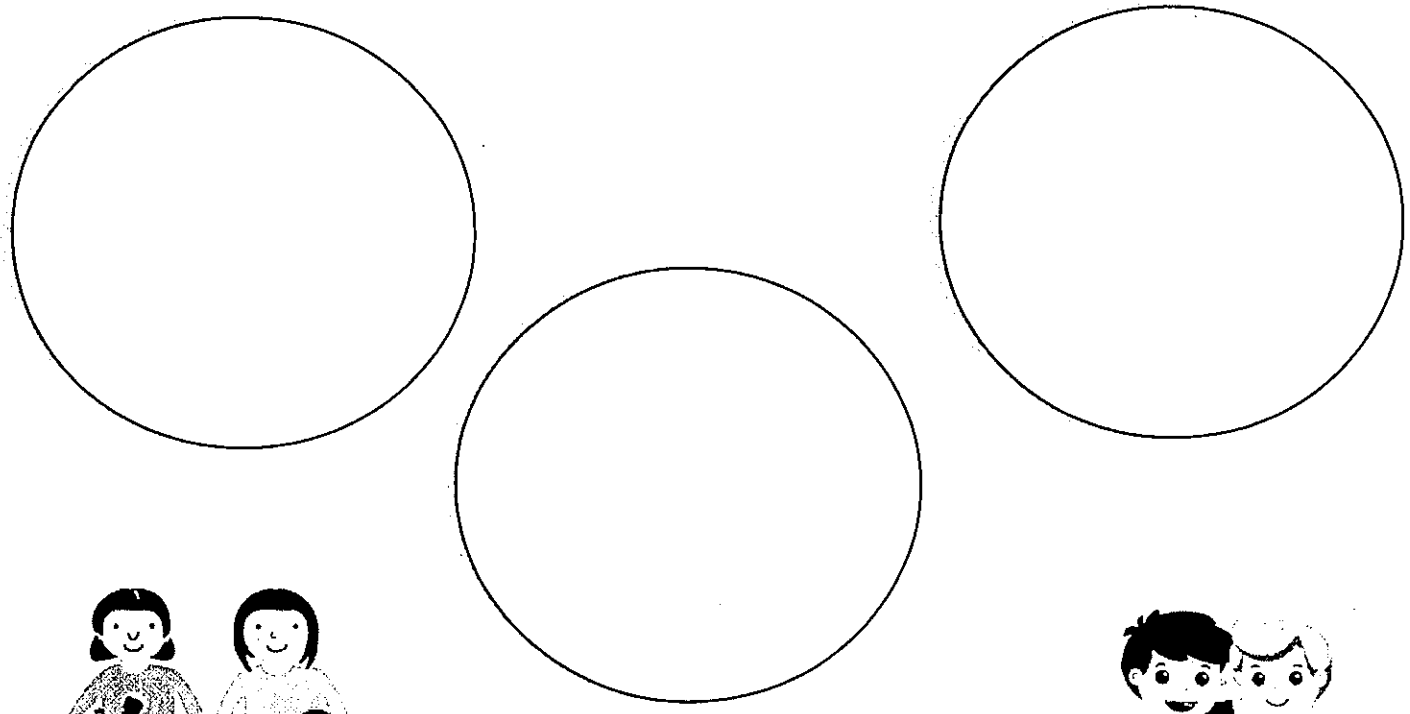
Your peer group is a group of people with which you share something in common. They may be people of your own age, your group of friends or just people with the same sporting interest or religious background.

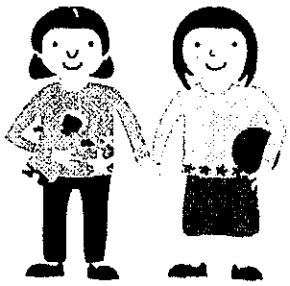
Being part of a group can make experience seem a lot more fun. Going to the movies with friends is often more enjoyable than going by yourself. Being with other people can also give you greater confidence when trying new things. Being part of a group can make you feel more connected and you gain a sense of belonging. Nobody likes to be left out and it is important to consider how other people are feeling when you are confronted by somebody who perhaps doesn't 'fit in'.

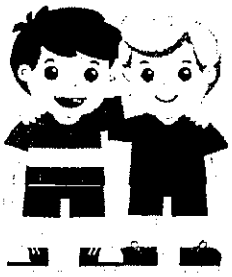
As you move through your teenage years, friends often become more important. They provide company, they can offer support through difficult times, they can give you greater confidence and often they are easier to communicate with. Good friends have open and honest communication and with these friends, you know that you can have differing opinions but still remain close.

ACTIVITY:

1. List three peer groups to which you belong. For each outline the reasons why you enjoy being a member of that group.





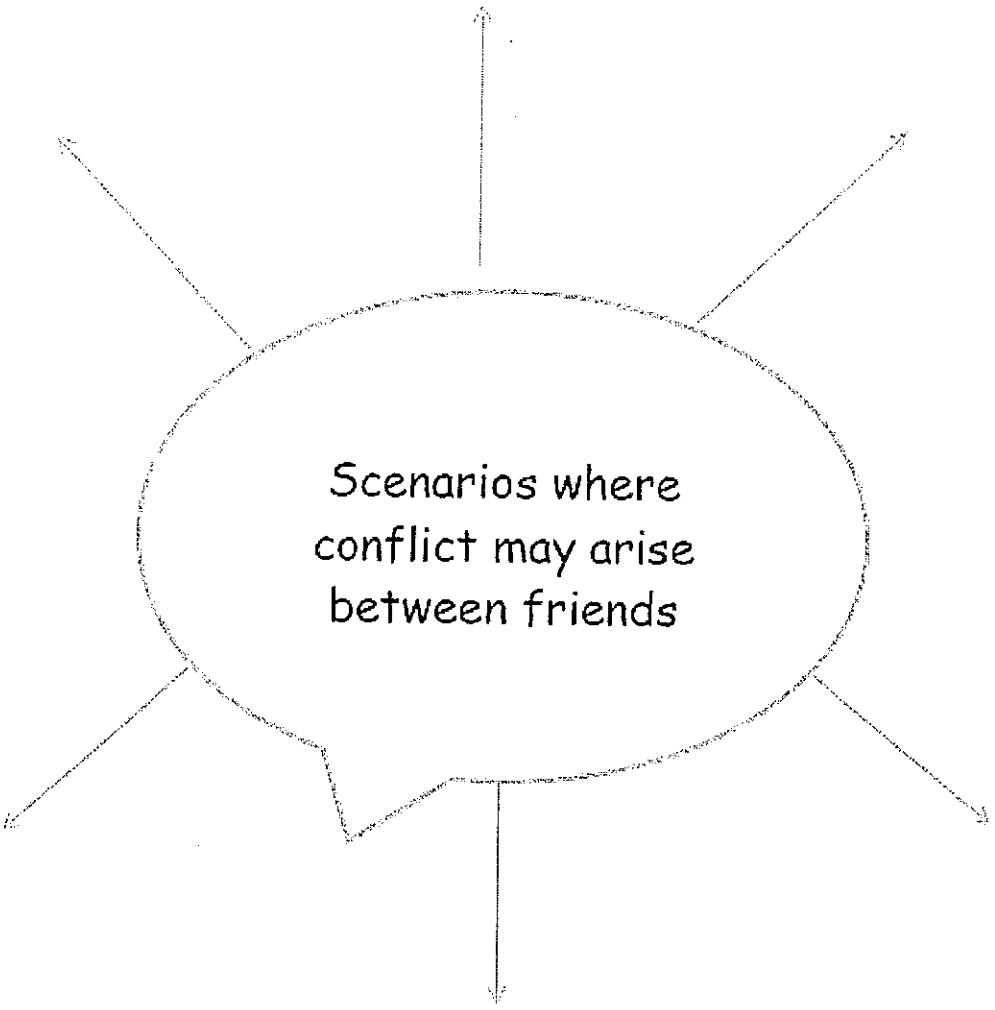


2. Think back to when you were in primary school. List 3 peer groups to which you belonged back then, and outline what you most enjoyed about each.

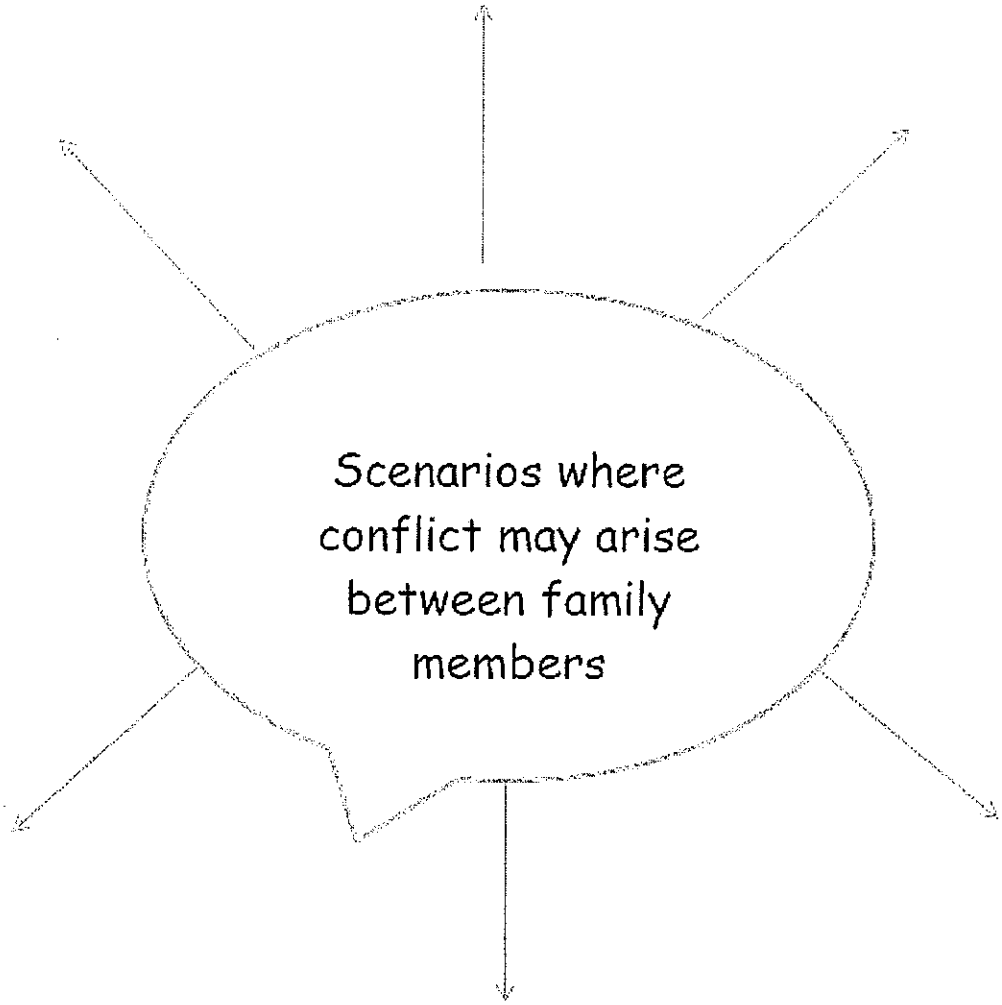
3. To speculate means to ponder or think about. Speculate as to why our peer group may change over time.

Our peer group can have a powerful influence over us. They can influence our attitudes, behaviours, appearances, values and interests. Often when we try to 'fit in' with the crowd, we might be pressured into doing things that we would not normally try. We may get so used to doing what everyone else does that we no longer do things that we used to enjoy by ourselves. Teenagers often feel they have to **conform** to other people's standards.

Brainstorm



Brainstorm


Scenarios where conflict may arise between family members

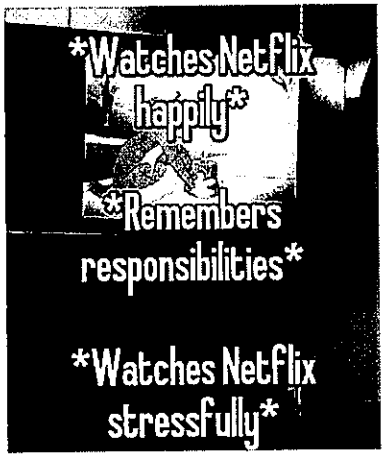
Week 10 and 11

You will need to do the following:

- Complete the Teenage Responsibilities sheet which includes:
  - ➢ Brainstorming the following
- 'What responsibilities do students have in at school?'
- 'What responsibilities do students have in at home?'
  - ➢ Answering the following questions
- How have your responsibilities changed in the last few years?
- What have you had to do to manage these new responsibilities?
- How do you feel about the added responsibilities during adolescence? (positive, negative, why?)
- Brainstorm what strategies and skills would help to manage an increase in responsibilities.
- Formative Task – Choose two of your brainstormed strategies and evaluate the effectiveness of the strategies in managing responsibilities. *Complete attached sheet. The below criteria is what will be used to mark this task.*

A	Makes a judgment about whether or not each of the three strategies are effective. Provides an ample amount of highly relevant positive and negative aspects of the management strategies. Uses a range of relevant examples to support response
B	Makes a judgment about whether or not each of the three strategies are effective. Provides relevant positive and negative aspects of the management strategies. Uses relevant examples to support response
C	Provides positive and/or negative aspects of each strategy. Provides some examples to support response
D	Provides positive or negative aspects of some of the strategies
E	Only provides one relevant point OR insufficient attempt at the task

- Timetable: Using a device (can also be done in books) you are to create a timetable of all your responsibilities at home and at school. You are to start by listing all your responsibilities e.g homework, sports training, clean their room, walk the dog, put the rubbish out etc. This is then placed into a weekly calendar to organise how you can manage each responsibility.



Teenage Responsibilities.

To become capable adults, teenagers need to learn to make good decisions on their own. To be able to do this, teenagers are often tasked with more responsibility.

As a teenager at Cecil Hills you are responsible for your uniform, equipment, homework and behaviours. At home common responsibilities include ensuring your room is tidy and performing certain household chores.

What responsibilities do students have at school?	What responsibilities do students have at home?
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

How have your responsibilities changed in the last few years?

What have you had to do to manage these new responsibilities?

How do you feel about the added responsibilities during adolescence? (positive, negative, why?)

Brainstorm


Strategies/skills to manage an increase in responsibilities

Evaluation of Strategies

Choose two of the brainstormed strategies and evaluate the strategies effectiveness in managing responsibilities.

Strategy	Positives and Negatives		Judgement about effectiveness
1.	Positives	Negatives	
2.	Positives	Negatives	

MATHLETICS
Inspiring Better Results

Special Numbers, Factors and Multiples

Student Book - Series H-1

Mathletics Instant Workbooks

Special numbers, factors and multiples

Student Book - Series H

Contents

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Author of The Topics and Topic Tests: AS Kalra

Special numbers, factors and multiples

Topic 1: Odd, even, prime and composite numbers

QUESTION **1**

a List the first five even numbers. _____

b How do you know that a number is even? _____

c List the first five odd numbers. _____

d How do know that a number is odd? _____

QUESTION **2** Complete the following.

a The sum of two even numbers is an _____ number.

b The sum of two odd numbers is an _____ number.

c The sum of an odd and even number is an _____ number.

d The product of any odd number and 2 is an _____ number.

e The product of an odd number and an even number is an _____ number.

QUESTION **3**

a Which is the only even prime number? _____

b List all the prime numbers less than 25. _____

c List the prime numbers between 30 and 40. _____

QUESTION **4**

a All even numbers end in one of five digits. List them. _____

b All odd numbers end in one of five digits. List them. _____

c What is the next odd number after 999? _____

d What is the next even number after 9999? _____

e The product of two odd numbers is an _____ number.

f The product of two even numbers is an _____ number.

g The square of an odd number is an _____ number.

h The square of an even number is an _____ number.

i The difference between two different odd numbers is an _____ number.

j The difference between two different even numbers is an _____ number.

Special numbers, factors and multiples

Topic 2 - Divisibility tests

QUESTION **1** Complete the following statements

a If the number is even it is always divisible by _____

b If the sum of the digits of a number is divisible by 3 then the whole number is divisible by _____

c If the last 2 digits of a number is divisible by 4 then the whole number is divisible by _____

d If the last digit is 5 or 0 then the whole number is divisible by _____

e If the number is divisible by 2 and 3 then the whole number is divisible by _____

f If the last 3 digits are divisible by 8 then the whole number is divisible by _____

g If the sum of the digits is divisible by 9 then the whole number is divisible by _____

h If the number ends in 0 then the whole number is divisible by _____

QUESTION **2** List the numbers that are divisible by 2

a 284 **b** 641 **c** 832 **d** 968 **e** 38561

QUESTION **3** List the numbers that are divisible by 3

a 81 **b** 292 **c** 381 **d** 693 **e** 12657

QUESTION **4** List the numbers that are divisible by 4

a 96 **b** 432 **c** 964 **d** 1062 **e** 3572

QUESTION **5** List the numbers that are divisible by 5

a 125 **b** 865 **c** 998 **d** 3560 **e** 92660

QUESTION **6** List the numbers that are divisible by 6

a 42 **b** 375 **c** 8532 **d** 1296 **e** 5184

QUESTION **7** List the numbers that are divisible by 8

a 312 **b** 264 **c** 3228 **d** 4192 **e** 6332

QUESTION **8** List the numbers that are divisible by 9

a 219 **b** 864 **c** 1251 **d** 6399 **e** 5864

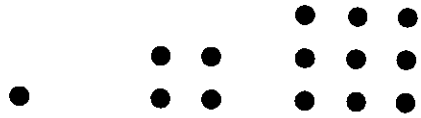
QUESTION **9** List the numbers that are divisible by 10

a 230 **b** 8640 **c** 965 **d** 5008 **e** 9690

Special numbers, factors and multiples

Topic 3: Square numbers

QUESTION **1**



a Why are these called square numbers? _____

b Extend this pattern by two more terms. _____

c What is the 7^{th} square number? _____

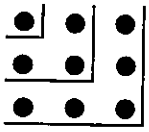
d What numbers are shown by the squares above? _____

QUESTION **2**

$1 = 1 = 1^2$

$1 + 3 = 4 = 2^2$

$1 + 3 + 5 = 9 = 3^2$



a Draw another diagram to show $1 + 3 + 5 + 7 + 9 = 5^2$

b Write three more lines of the patterns given below.

i $1 = 1 = 1^2$
$1 + 3 = 4 = 2^2$
$1 + 3 + 5 = 9 = 3^2$
$1 + 3 + 5 + 7 = 16 = 4^2$

_____
_____
_____

ii $1 = 1^2$
$1 + 2 + 1 = 2^2$
$1 + 2 + 3 + 2 + 1 = 3^2$
$1 + 2 + 3 + 4 + 3 + 2 + 1 = 4^2$

_____
_____
_____

QUESTION **3** Write each of the following in the expanded form.

a $3^2 =$ _____	b $2^2 =$ _____	c $8^2 =$ _____	d $14^2 =$ _____
e $10^2 =$ _____	f $6^2 =$ _____	g $13^2 =$ _____	h $9^2 =$ _____
i $4^2 =$ _____	j $12^2 =$ _____	k $5^2 =$ _____	l $20^2 =$ _____

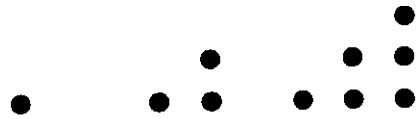
QUESTION **4** Write each of the following in the index form.

a $3 \times 3 =$ _____	b $7 \times 7 =$ _____	c $1 \times 1 =$ _____	d $6 \times 6 =$ _____
e $5 \times 5 =$ _____	f $2 \times 2 =$ _____	g $9 \times 9 =$ _____	h $12 \times 12 =$ _____
i $8 \times 8 =$ _____	j $10 \times 10 =$ _____	k $30 \times 30 =$ _____	l $25 \times 25 =$ _____
m $11 \times 11 =$ _____	n $15 \times 15 =$ _____	o $4 \times 4 =$ _____	p $20 \times 20 =$ _____

Special numbers, factors and multiples

Topic 4: Triangular numbers

QUESTION **1**



a Why are 1 _____

b Extend this pattern by two more terms. _____

c What is the 7th triangular number? _____

d What numbers are shown by the triangles above? _____

e If the 3rd triangular number is 1 + 2 + 3, write an expression for the 4th triangular number. _____

QUESTION **2** Write four more lines of the pattern given below.

$1 = 1$

$1 + 2 = 3$

$1 + 2 + 3 = 6$

$1 + 2 + 3 + 4 = 10$

_____

_____

_____

_____

QUESTION **3**

a List the first eight triangular numbers. _____

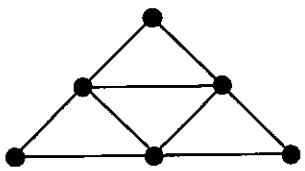
b Add the first two triangular numbers. What type of number do you get? _____

c Add the next two triangular numbers. What type of number do you get? _____

d Add any two consecutive triangular numbers. What type of number do you get? _____

e Find two numbers that are both triangular and square and less than 40. _____

QUESTION **4** A dot diagram for the first three triangular numbers is drawn for you. Draw a similar dot diagram for the first five triangular numbers.



Special numbers, factors and multiples

Topic 5: Factors

QUESTION **1** Is the first number a factor of the second? Write True or False.

a	3, 12 _____	**b**	5, 25 _____	**c**	8, 32 _____	**d**	5, 24 _____
e	4, 28 _____	**f**	6, 19 _____	**g**	11, 121 _____	**h**	3, 11 _____
i	7, 23 _____	**j**	2, 13 _____	**k**	7, 37 _____	**l**	4, 20 _____
m	9, 30 _____	**n**	6, 30 _____	**o**	9, 32 _____	**p**	7, 28 _____

QUESTION **2** Find all possible factors of each of the following numbers.

	Number	Factors
a	18	
b	29	
c	48	
d	63	
e	52	
f	100	

	Number	Factors
g	24	
h	120	
i	144	
j	169	
k	96	
l	84	

QUESTION **3** Find the value of the missing factor.

a	$3 \times \_\_\_\_ = 12$	**b**	$\_\_\_\_ \times 5 = 25$	**c**	$3 \times \_\_\_\_ = 33$
d	$7 \times \_\_\_\_ = 63$	**e**	$\_\_\_\_ \times 4 = 32$	**f**	$\_\_\_\_ \times 6 = 42$
g	$5 \times \_\_\_\_ = 30$	**h**	$\_\_\_\_ \times 12 = 48$	**i**	$9 \times \_\_\_\_ = 45$
j	$3 \times \_\_\_\_ = 27$	**k**	$3 \times \_\_\_\_ = 30$	**l**	$\_\_\_\_ \times 7 = 49$

QUESTION **4**

a What number is a factor of every number? _____

b Write the next three numbers greater than 4 that have only two factors. _____

c Complete the statement 'A prime number has only ____ factors'.

QUESTION **5** Use a factor tree to factorise each of the following numbers.

a	12	**b**	30	**c**	28
d	72	**e**	100	**f**	120

Special numbers, factors and multiples

Topic 6: The highest common factor (HCF)

QUESTION **1** Find the factors for each pair of numbers and underline the common factors.

a

Number	Factors
4	
6	

b

Number	Factors
6	
8	

c

Number	Factors
10	
20	

QUESTION **2** Find the factors for each set of numbers and underline the common factors.

a

Number	Factors
4	
6	
8	

b

Number	Factors
10	
20	
40	

c

Number	Factors
9	
12	
24	

QUESTION **3**

a List all the factors of 8. _____

b List all the factors of 12. _____

c List the common factors of 8 and 12. _____

d What is the highest common factor (HCF) of 8 and 12. _____

QUESTION **4** Complete the following, underline the common factors and find the HCF.

a

Number	Factors
10	
60	
HCF =	

b

Number	Factors
18	
24	
HCF =	

c

Number	Factors
22	
55	
HCF =	

d

Number	Factors
6	
8	
12	
HCF =	

e

Number	Factors
15	
30	
45	
HCF =	

f

Number	Factors
18	
27	
36	
HCF =	

Special numbers, factors and multiples

Topic 7: Multiples

QUESTION **1** List the next three multiples of each of the following numbers.

a 2, ____, ____, ____ **b** 4, ____, ____, ____ **c** 8, ____, ____, ____

d 3, ____, ____, ____ **e** 7, ____, ____, ____ **f** 5, ____, ____, ____

g 6, ____, ____, ____ **h** 9, ____, ____, ____ **i** 11, ____, ____, ____

QUESTION **2**

a Which of the following numbers are multiples of 3?
18, 24, 28, 36, 10, 15, 8, 23, 12, 42, 90 _____

b Are all whole numbers multiples of 1? _____

c Are all even whole numbers multiples of 2? _____

d If 3 is a factor of 12, is 12 a multiple of 3? _____

e Is it possible to find the largest multiple of any whole number? _____

QUESTION **3** Is the first number a multiple of the second? Write True or False.

a 12, 3 _____ **b** 36, 9 _____ **c** 48, 16 _____ **d** 81, 7 _____

e 8, 2 _____ **f** 15, 5 _____ **g** 52, 13 _____ **h** 72, 11 _____

i 18, 6 _____ **j** 16, 8 _____ **k** 27, 8 _____ **l** 35, 5 _____

m 23, 4 _____ **n** 11, 6 _____ **o** 56, 8 _____ **p** 63, 7 _____

QUESTION **4**

a List all the multiples of 3 less than 14. _____

b List all the common multiples of 2 and 5 between 1 and 46. _____

c List all the multiples of 7 between 1 and 34. _____

QUESTION **5** List the first five multiples of the following numbers.

	Number	Multiples
a	15	
b	20	
c	25	

	Number	Multiples
d	10	
e	40	
f	12	

Special numbers, factors and multiples

Topic 8: Lowest common multiple (LCM)

QUESTION **1**

a List the first eight multiples of 4. _____

b List the first eight multiples of 6. _____

c List the common multiples of 4 and 6 in parts *a* and *b*. _____

d What is the lowest common multiple (LCM) of 4 and 6? _____

QUESTION **2** List the first eight multiples for each pair of numbers and underline the common multiples.

a

Number	Multiples
2	
3	

b

Number	Multiples
2	
5	

c

Number	Multiples
2	
4	

d

Number	Multiples
3	
4	

QUESTION **3** Find the first eight multiples for each set of numbers and underline the common multiples.

a

Number	Multiples
2	
3	
4	

b

Number	Multiples
2	
4	
6	

QUESTION **4** Find the first five multiples for each set of numbers, underline the common multiples and find the LCM.

a

Number	Multiples
6	
12	
LCM =	

b

Number	Multiples
8	
10	
LCM =	

c

Number	s Multiple
3	
6	
9	
LCM =	

d

Number	s Multiple
2	
8	
12	
LCM =	

Special numbers, factors and multiples

Topic 9: Index notation, square roots and cube roots

QUESTION **1** Write each of the following in index form.

a $2 \times 2 \times 2 \times 2 =$ _____ b $3 \times 3 \times 3 =$ _____ c $4 \times 4 \times 4 =$ _____

d $5 \times 5 \times 5 =$ _____ e $2 \times 2 \times 2 \times 2 \times 2 =$ _____ f $6 \times 6 \times 6 \times 6 =$ _____

QUESTION **2** Write each of the following in the expanded form and evaluate.

a $2^3 =$ _____ b $3^2 =$ _____ c $4^3 =$ _____

d $5^3 =$ _____ e $6^3 =$ _____ f $7^2 =$ _____

QUESTION **3** Complete the following tables.

	Index form	Base	Index	Basic numeral
a	2^2			
b	3^3			
c	6^2			
d	2^3			
e	7^3			
f	10^5			
g	1^{15}			

	Index form	Base	Index	Basic numeral
h	3^4			
i	8^2			
j	5^2			
k	0^{25}			
l	2^5			
m	4^3			
n	9^2			

QUESTION **4** Complete the following.

a If $1^2 = 1$ then $\sqrt{1} =$ _____ b If $2^2 = 4$ then $\sqrt{4} =$ _____ c If $3^2 = 9$ then $\sqrt{9} =$ _____

d If $4^2 = 16$ then $\sqrt{16} =$ _____ e If $5^2 = 25$ then $\sqrt{25} =$ _____ f If $6^2 = 36$ then $\sqrt{36} =$ _____

g If $1^3 = 1$ then $\sqrt[3]{1} =$ _____ h If $2^3 = 8$ then $\sqrt[3]{8} =$ _____ i If $3^3 = 27$ then $\sqrt[3]{27} =$ _____

QUESTION **3** Evaluate the following.

a $\sqrt{16} =$ _____ b $\sqrt{49} =$ _____ c $\sqrt{4} =$ _____ d $\sqrt{64} =$ _____

e $\sqrt{81} =$ _____ f $\sqrt{36} =$ _____ g $\sqrt{100} =$ _____ h $\sqrt{9} =$ _____

i $\sqrt[3]{8} =$ _____ j $\sqrt[3]{64} =$ _____ k $\sqrt[3]{125} =$ _____ l $\sqrt[3]{27} =$ _____

m $\sqrt{25} =$ _____ n $\sqrt[3]{216} =$ _____ o $\sqrt[3]{343} =$ _____ p $\sqrt[3]{1000} =$ _____

q $\left(\sqrt{3}\right)^2 =$ _____ r $\left(\sqrt{4}\right)^2 =$ _____ s $\left(\sqrt{5}\right)^2 =$ _____ t $\left(\sqrt{6}\right)^2 =$ _____

Special numbers, factors and multiples

Topic 10: Problem solving with special numbers, factors and multiples

1 Write all one-digit odd numbers. _____

2 Write all one-digit even numbers. _____

3 Are there any even prime numbers? If so, write these. _____

4 Write all one-digit prime numbers. _____

5 Is 12 a factor of 48? _____

6 7 is one factor of 56; what is the matching factor? _____

7 Write all factors of 18. _____

8 List four prime numbers between 30 and 45. _____

9 What are the common factors of 12 and 30? _____

10 Find the highest common factor of 8 and 12. _____

11 Write the first three common multiples of 6 and 9. _____

12 Find the lowest common multiple of 6 and 9. _____

13 Which of these — 9, 19, 29, 39, 49, 59 — are prime numbers? _____

14 Write the first prime number greater than 10. _____

15 Is 111 a prime number? _____

16 Write the first two numbers that are both triangular and square. _____

17 Which of the following numbers are factors of 24?
1, 2, 3, 4, 5, 6, 7, 8, 9, 10 _____

18 Find the sum of the first four triangular numbers. _____

19 Find the product of the first three square numbers. _____

20 Write the smallest prime number. _____

Special numbers, factors and multiples

Unit Test

PART A

Instructions

This part consists of 12 multiple-choice questions
Each question is worth 1 mark
Fill in only ONE CIRCLE for each question
Calculators are NOT allowed

Time allowed: 15 minutes

Total marks = 12

Marks

1 The sum of the all the prime numbers between 6 and 20 is
Ⓐ 65 Ⓑ 61 Ⓒ 86 Ⓓ 67 [1]

2 The sum of two consecutive odd numbers is 16. The smaller number is
Ⓐ 5 Ⓑ 7 Ⓒ 9 Ⓓ 3 [1]

3 The square root of 5^2 is
Ⓐ 3 Ⓑ 4 Ⓒ 5 Ⓓ 6 [1]

4 The sum of three consecutive even numbers is 24. The smallest is
Ⓐ 4 Ⓑ 6 Ⓒ 8 Ⓓ 10 [1]

5 The highest common factor (HCF) of 8 and 12 is
Ⓐ 2 Ⓑ 4 Ⓒ 8 Ⓓ 12 [1]

6 The product of the first three triangular numbers is
Ⓐ 12 Ⓑ 18 Ⓒ 24 Ⓓ 30 [1]

7 The sum of the first three square numbers is
Ⓐ 10 Ⓑ 12 Ⓒ 14 Ⓓ 16 [1]

8 The sum of the first four prime numbers greater than 3 is
Ⓐ 26 Ⓑ 36 Ⓒ 46 Ⓓ 53 [1]

9 The first prime number greater than 15 is
Ⓐ 16 Ⓑ 17 Ⓒ 18 Ⓓ 19 [1]

10 The number of factors a prime number has is
Ⓐ 1 Ⓑ 2 Ⓒ 3 Ⓓ 4 [1]

11 The lowest common multiple (LCM) of 4 and 6 is
Ⓐ 4 Ⓑ 6 Ⓒ 8 Ⓓ 12 [1]

12 If 7 is one factor of 63 then the matching factor is
Ⓐ 7 Ⓑ 8 Ⓒ 9 Ⓓ 63 [1]

Total marks achieved for PART A [/12]

Special numbers, factors and multiples

Unit Test

PART B

Instructions This part consists of 15 questions
Each question is worth 1 mark
Write answers in the answers-only column

Time allowed: 20 minutes

Total marks = 15

Questions	Answers only	Marks
1 List the first three even numbers.		1
2 How do you know that a number is odd?		1
3 Which is the only even prime number?		1
4 Write the first prime number greater than 20.		1
5 What is the 6^{th} square number?		1
6 Write 7^3 in expanded form.		1
7 List the first four triangular numbers.		1
8 Write the next three numbers greater than 10 that have only two factors.		1
9 Which of the following numbers are multiples of 4? 2, 4, 6, 8, 10, 12, 14, 16, 18, 20		1
10 List the common factors of 8 and 20.		1
11 Write $7 \times 7 \times 7 \times 7 \times 7$ in the index form.		1
12 If $7^3 = 343$ then find $\sqrt[3]{343}$.		1
13 Write the product of the second triangular number and the second square number.		1
14 Find the sum of the first five square numbers.		1
15 Find the sum of the first six triangular numbers.		1

Total marks achieved for PART B 15

MATHLETICS
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Directed Numbers

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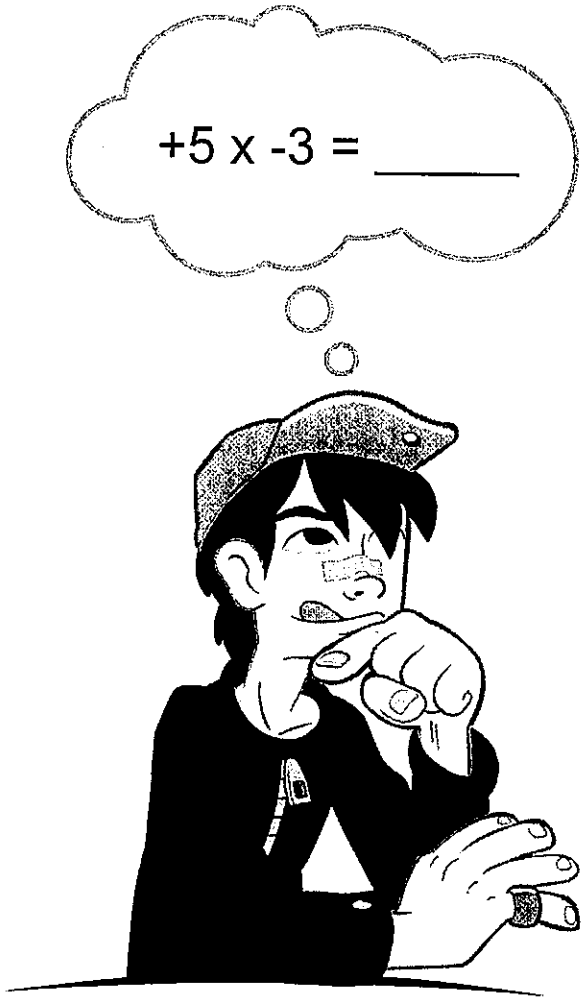

Mathletics Instant Workbooks

Directed numbers
Student Book - Series H

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Author of The Topics and Topic Tests: AS Kalra

Directed numbers

Topic 1: Plotting on number lines

QUESTION **1** Plot the following sets of points on the number line.

a {0, 2, 3, 5}

b {1, 3, 5, 7}

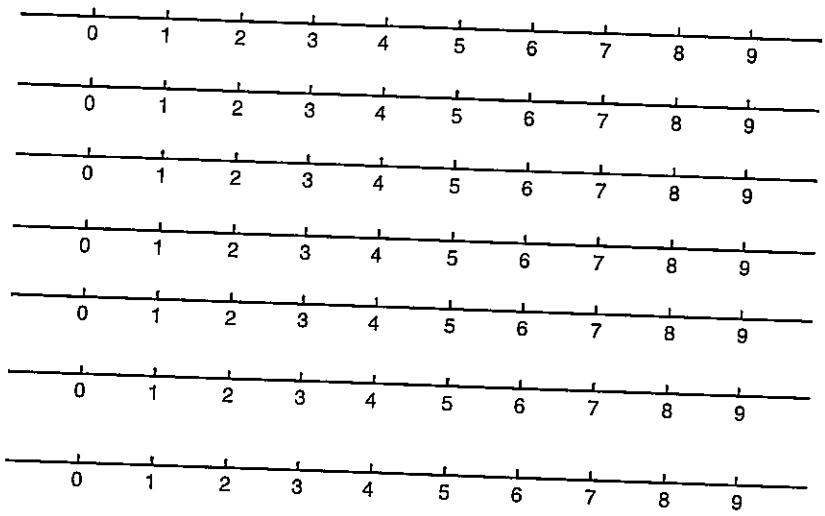
c {2, 4, 6, 8}

d {0, 3, 6, 9}

e {2, 3, 4, 5, 6}

f {1, 4, 5, 7, 8}

g {0, 1, 2, 3, 6}



QUESTION **2** Graph each set on a separate number line.

a the odd numbers less than 6

b the even numbers between 1 and 8

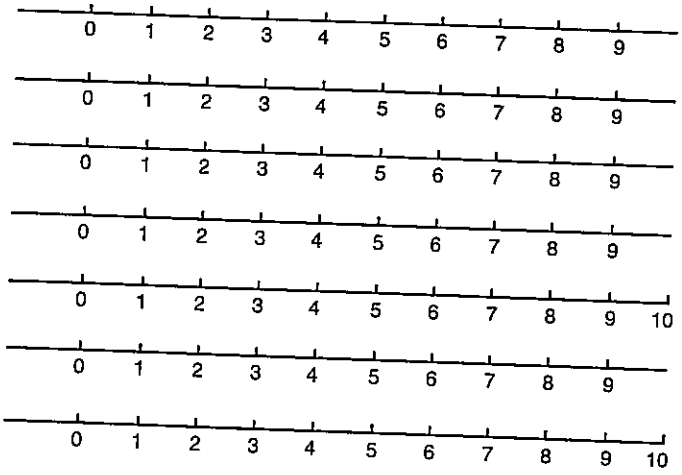
c the numbers from 1 to 5

d the numbers between and including 2 and 7

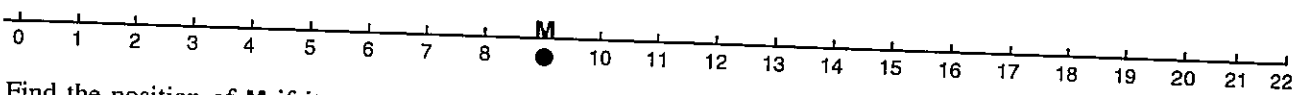
e the numbers 2, 4, 5, 6, 8, 10

f the numbers 1, 3, 5, 7, 9

g the numbers 0, 2, 4, 6, 8, 10



QUESTION **3**



Find the position of M if it moves

a 3 places to the right _____

b 5 places to the right _____

c 10 places to the right _____

d 7 places to the left _____

e 8 places to the left _____

Directed numbers

Topic 2: Opposite directions — negative numbers

QUESTION 1 What is the opposite of each of the following statements?

a going up _____

b going east _____

c going north _____

d depositing money _____

e winning $10 _____

f three floors up _____

g 5° below zero _____

h increase of $30 _____

i 15 steps to the right _____

j 80 metres above sea level _____

QUESTION 2 In each of the following statements, write a directed number to show the size and direction of the number.

a Michelle deposited $30. _____

b John walked 10 km to the east. _____

c The price came down by $12. _____

d Michael took 80 steps backwards. _____

e The water level dropped by 1 metre. _____

f I lost 15 points. _____

QUESTION 3 Showing distance and direction, state where you would be from your starting point if you travelled

a 8 km east then 3 km west _____

b 10 km west the 6 km east _____

c 3 km north then 5 km south _____

d 18 km east then 13 km west _____

e 6 km east, 8 km west and then 5 km east _____

QUESTION 4 Write a number sentence for

a a deposit of $10 and a deposit of $5 _____

b a deposit of $14 and a withdrawal of $9 _____

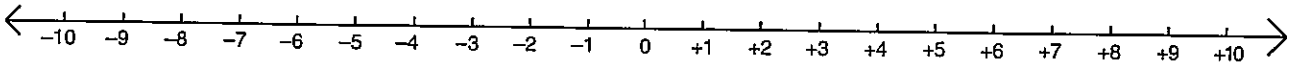
c a withdrawal of $12 and a deposit of $20 _____

d a deposit of $6 and a deposit of $9 _____

Directed numbers

Topic 3: Extending the number line

Use the number line to answer the following questions.



QUESTION **1** Represent each of the following trips on the number line using a directed number (a positive or negative number).

a from 0 to +3

b from +2 to +6

c from −3 to +2

d from +3 to +7

e from −1 to +6

f from −2 to −8

QUESTION **2** Circle the larger number.

a +8 or +5

b −9 or −3

c −3 or +3

d +2 or −7

e −2 or +6

f +8 or −8

QUESTION **3** Use the number line to complete the following.

a 3 − 7 = _____

b 3 + 7 = _____

c 5 + 2 = _____

d 2 + 4 = _____

e 8 − 5 = _____

f 9 − 3 = _____

g −1 + 8 = _____

h 6 − 3 = _____

i 6 − 8 = _____

j 5 − 9 = _____

k 7 − 10 = _____

l −2 − 3 = _____

QUESTION **4** Arrange in ascending order.

a +1, +3, −2, −7, −1 _____

b −3, −9, −2, 3, 2, 8 _____

c 5, 3, 2, −1, −7, −3 _____

d 2, −1, 5, −4, 8, 9, −8 _____

QUESTION **5** Put > or < to make true sentences.

a 7 _____ −3

b 5 _____ −7

c 2 _____ −4

d 4 _____ 8

e −6 _____ 6

f 3 _____ −5

g −5 _____ 9

h −3 _____ +3

i 7 _____ 9

j 8 _____ −2

k −8 _____ +2

l −6 _____ 7

Directed numbers

Topic 4: Addition of directed numbers

QUESTION **1** Find the sum of the following (use the number line if necessary).

a $+6 + +9 =$ _____ **b** $+2 + +3 =$ _____ **c** $+1 + +3 =$ _____

d $+5 + +1 =$ _____ **e** $+2 + +4 =$ _____ **f** $+1 + +7 =$ _____

g $+6 + +5 =$ _____ **h** $+2 + +8 =$ _____ **i** $+1 + +10 =$ _____

QUESTION **2** Find each sum.

a $+3 + -6 =$ _____ **b** $+2 + -6 =$ _____ **c** $+1 + -5 =$ _____

d $+1 + -4 =$ _____ **e** $+2 + -7 =$ _____ **f** $+3 + -8 =$ _____

g $+1 + -7 =$ _____ **h** $+2 + -11 =$ _____ **i** $+2 + -9 =$ _____

QUESTION **3** Add the following.

a $-7 + +3 =$ _____ **b** $-8 + +2 =$ _____ **c** $-9 + +3 =$ _____

d $-6 + +1 =$ _____ **e** $-7 + +2 =$ _____ **f** $-8 + +3 =$ _____

g $-10 + +3 =$ _____ **h** $-12 + +4 =$ _____ **i** $-18 + +6 =$ _____

QUESTION **4** Find the answers to these additions.

a $-2 + -1 =$ _____ **b** $-2 + -3 =$ _____ **c** $-2 + -4 =$ _____

d $-4 + -5 =$ _____ **e** $-4 + -9 =$ _____ **f** $-4 + -12 =$ _____

g $-3 + -3 =$ _____ **h** $-5 + -5 =$ _____ **i** $-8 + -8 =$ _____

QUESTION **5** Find the values of the following.

a $+7 + +2 + +3 =$ _____ **b** $+19 + -3 =$ _____ **c** $+15 + -8 =$ _____

d $-16 + +9 =$ _____ **e** $-8 + -4 =$ _____ **f** $-10 + -5 =$ _____

g $+5 + -3 + -2 =$ _____ **h** $-12 + +2 + +5 =$ _____ **i** $-8 + +3 =$ _____

QUESTION **6** Find the missing number.

a $+4 +$ _____ $= +1$ **b** _____ $+ -7 = 0$ **c** $-2 + -3 =$ _____

d $+5 +$ _____ $= +7$ **e** $+3 + -8 =$ _____ **f** $-2 +$ _____ $= -8$

g $-3 +$ _____ $= -12$ **h** $+8 + +3 =$ _____ **i** $+9 + -6 =$ _____

Directed numbers

Topic 5: Subtraction of directed numbers

Question 1 Find the answers for the following questions.

a $6 - 3 =$ _____ b $8 - 5 =$ _____ c $9 - 2 =$ _____

d $+7 - +5 =$ _____ e $+9 - +3 =$ _____ f $+7 - +5 =$ _____

g $+3 - (+2) =$ _____ h $+15 - +8 =$ _____ i $+10 - +7 =$ _____

Question 2 Complete these subtractions (use the number line if necessary).

a $+5 - -2 =$ _____ b $+8 - -3 =$ _____ c $9 - (-4) =$ _____

d $+6 - -3 =$ _____ e $+7 - -4 =$ _____ f $+10 - -5 =$ _____

g $+8 - -4 =$ _____ h $+4 - -2 =$ _____ i $+9 - -6 =$ _____

Question 3 Find each difference.

a $-17 - +3 =$ _____ b $-8 - +2 =$ _____ c $-10 - +4 =$ _____

d $-15 - +3 =$ _____ e $-6 - +4 =$ _____ f $-9 - +5 =$ _____

g $-10 - +5 =$ _____ h $-12 - +8 =$ _____ i $-7 - +4 =$ _____

Question 4 Find the answers for the following subtractions.

a $-4 - -3 =$ _____ b $-5 - -3 =$ _____ c $-5 - -2 =$ _____

d $-6 - -2 =$ _____ e $-7 - -6 =$ _____ f $-8 - -3 =$ _____

g $-8 - -4 =$ _____ h $-6 - -4 =$ _____ i $-10 - -5 =$ _____

Question 5 Find the values of the following.

a $-8 - -8 =$ _____ b $+20 - +10 =$ _____ c $+15 - -3 =$ _____

d $-17 - +8 =$ _____ e $-23 - -23 =$ _____ f $-15 - -12 =$ _____

g $-7 - -7 =$ _____ h $-16 - +3 =$ _____ i $-19 - +5 =$ _____

Question 6 Simplify the following.

a $8 - 12 =$ _____ b $-5 + 2 =$ _____ c $-5 - 7 =$ _____

d $8 - (-6) =$ _____ e $-5 - (-9) =$ _____ f $-5 - (+5) =$ _____

g $-9 - 9 =$ _____ h $-7 - 10 =$ _____ i $6 - 15 =$ _____

Directed numbers

Topic 6: Multiplication of directed numbers

Question 1 Multiply the following.

a $+3 \times +2 =$ _____ b $+1 \times +6 =$ _____ c $+7 \times +3 =$ _____

d $+4 \times +9 =$ _____ e $+7 \times +6 =$ _____ f $+3 \times +8 =$ _____

g $+1 \times +9 =$ _____ h $+1 \times +15$ _____ i $+11 \times +2 =$ _____

Question 2 Work out the following.

a $+3 \times -2 =$ _____ b $+5 \times -3 =$ _____ c $+4 \times -9 =$ _____

d $+4 \times -8 =$ _____ e $+7 \times -4 =$ _____ f $+5 \times -7 =$ _____

g $+6 \times -3 =$ _____ h $+3 \times -7 =$ _____ i $+8 \times -9 =$ _____

Question 3 Find the answers to the following.

a $-3 \times +4 =$ _____ b $-4 \times +2 =$ _____ c $-5 \times +11 =$ _____

d $-5 \times +6 =$ _____ e $-6 \times +4 =$ _____ f $-7 \times +2 =$ _____

g $-3 \times +11 =$ _____ h $-3 \times +8 =$ _____ i $-4 \times +6 =$ _____

Question 4 Simplify.

a $-3 \times -4 =$ _____ b $-4 \times -12 =$ _____ c $-8 \times -9 =$ _____

d $-2 \times -5 =$ _____ e $-3 \times -5 =$ _____ f $-5 \times -1 =$ _____

g $-6 \times -7 =$ _____ h $-4 \times -8 =$ _____ i $-6 \times -8 =$ _____

Question 5 Find each product.

a $+3 \times +9 =$ _____ b $-5 \times +8 =$ _____ c $-6 \times +1 =$ _____

d $+7 \times -3 =$ _____ e $-8 \times -7 =$ _____ f $+7 \times -6 =$ _____

g $-5 \times -12 =$ _____ h $+3 \times +12 =$ _____ i $+10 \times +9 =$ _____

Question 6 Complete the following tables.

a

×	+9	−10	−5
+7			
−6			

b

×	−8	−7	−3
+6			
−5			

c

×	+6	−12	−9
−7			
+8			

Directed numbers

Topic 7: Division of directed numbers

Question 1 Divide the following.

a $+20 \div +4 =$ _____ b $+24 \div +6 =$ _____ c $+36 \div +9 =$ _____

d $+81 \div +9 =$ _____ e $+49 \div +7 =$ _____ f $+24 \div +3 =$ _____

g $+24 \div +8 =$ _____ h $+20 \div +5 =$ _____ i $+56 \div +8 =$ _____

Question 2 Work out the following divisions.

a $+12 \div -2 =$ _____ b $+9 \div -3 =$ _____ c $+15 \div -5 =$ _____

d $+15 \div -3 =$ _____ e $+18 \div -2 =$ _____ f $+12 \div -3 =$ _____

g $+18 \div -9 =$ _____ h $+12 \div -1 =$ _____ i $+21 \div -3 =$ _____

Question 3 Simplify the following.

a $-36 \div +4 =$ _____ b $-24 \div +6 =$ _____ c $-36 \div +12 =$ _____

d $-27 \div +9 =$ _____ e $-27 \div +27 =$ _____ f $-5 \div +5 =$ _____

g $-24 \div +8 =$ _____ h $-36 \div +3 =$ _____ i $-27 \div +3 =$ _____

Question 4 If $a = -4$, $b = 2$, $c = 4$ and $d = -8$, find the value of the following.

a $a \div b =$ _____ b $c^2 \div d =$ _____ c $ac \div d =$ _____

d $c \div d =$ _____ e $a^2 \div b^2 =$ _____ f $c^2 \div b^2 =$ _____

g $a^2 \div b =$ _____ h $d \div ab =$ _____ i $d \div c =$ _____

Question 5 Fill in the missing number.

a $-40 \div$ _____ $= -10$ b $-121 \div +11 =$ _____ c $-9 \div +3 =$ _____

d _____ $\div -9 = +4$ e $+49 \div -7 =$ _____ f _____ $\div -3 = -9$

g $-64 \div -8 =$ _____ h $+63 \div +9 =$ _____ i $-21 \div +7 =$ _____

Question 6 Simplify the following.

a $-45 \div -9 =$ _____ b $-60 \div +3 =$ _____ c $-20 \div +10 =$ _____

d $+35 \div -5 =$ _____ e $+120 \div -12 =$ _____ f $-60 \div +20 =$ _____

g $+52 \div +13 =$ _____ h $-33 \div -11 =$ _____ i $-80 \div -4 =$ _____

Directed numbers

Topic 8: The four operations with directed numbers

Question 1 Find answers to the following.

a $-7 + -8 =$ _____ **b** $+9 + +3 =$ _____ **c** $+11 + +23 =$ _____

d $-9 - +3 =$ _____ **e** $-16 - +4 =$ _____ **f** $-36 - +8 =$ _____

g $-7 - -3 =$ _____ **h** $-9 - -5 =$ _____ **i** $-19 - -18 =$ _____

Question 2 Find the value of the following.

a $-18 \div +3 =$ _____ **b** $-24 \div -12 =$ _____ **c** $+34 \div -2 =$ _____

d $-5 - -10 =$ _____ **e** $-6 + -13 =$ _____ **f** $8 - (-6) =$ _____

g $+19 + -3 =$ _____ **h** $+8 + -2 =$ _____ **i** $+16 + -5 =$ _____

Question 3 Work out the following.

a $-30 \div -5 =$ _____ **b** $+63 \div -9 =$ _____ **c** $-68 \div -4 =$ _____

d $-16 \times -6 =$ _____ **e** $-64 \div +8 =$ _____ **f** $-88 \div -11 =$ _____

g $+8 \times -3 =$ _____ **h** $-81 \div +9 =$ _____ **i** $-36 \div -6 =$ _____

Question 4 Simplify the following.

a $(+3 \times +4) \times +2 =$ _____ **b** $+9 - +4 \times -4 =$ _____ **c** $-200 \div -100 \times 2 =$ _____

d $(-5 - 2) \times -3 =$ _____ **e** $-60 \div -10 \times 3 =$ _____ **f** $-3 + -7 + -9 =$ _____

g $12 \div (+2 \times -2) =$ _____ **h** $(-5 - 5) \times -2 =$ _____ **i** $8 \div (-4 + 8) =$ _____

Question 5 Fill in the missing number.

a $+54 \div -6 =$ _____ **b** _____ $\div 3 = -12$ **c** $+12 -$ _____ $= +15$

d $+3 \times -7 =$ _____ **e** _____ $\div +7 = -7$ **f** $-8 -$ _____ $= -6$

g $+8 \times -3 =$ _____ **h** $+8 \times -3 =$ _____ **i** $+6 \times$ _____ $= -54$

Question 6 Complete the following tables.

a

+	+4	−6	−8	+10	−3
−2					
+7					
−5					

b

×	−3	+4	−2	+6	−5
+3					
−7					
−4					

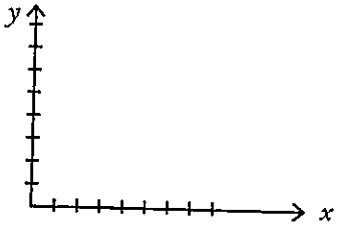
Directed numbers

Topic 9: Graphing a table of values

QUESTION **1** Complete each table using the given rule and then plot the ordered pairs on a number plane.

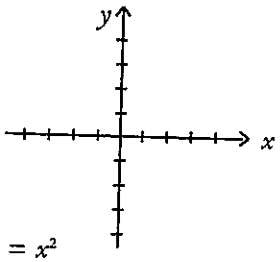
a $y = x + 3$

x	0	1	2	3
y				



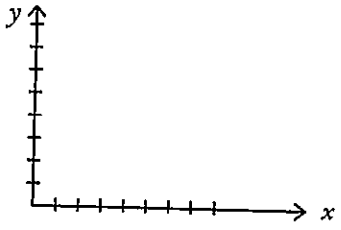
b $y = 2x - 2$

x	0	1	2	3
y				



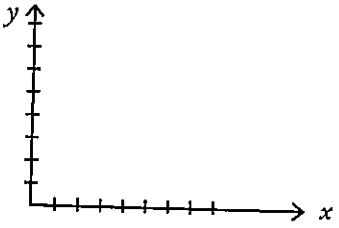
c $y = 2x$

x	0	1	2	3
y				



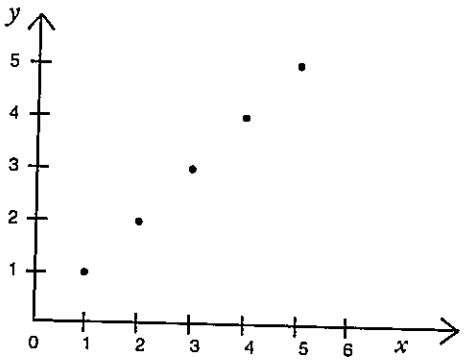
d $y = x^2$

x	0	1	2	3
y				



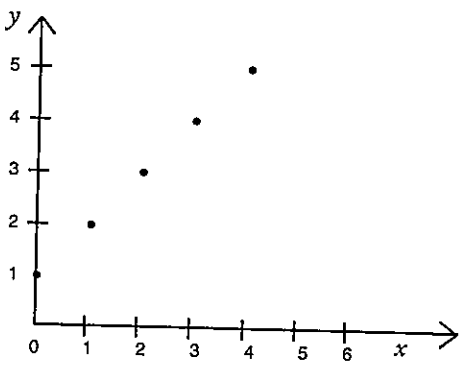
QUESTION **2** Complete the table of values for each graph.

a



x						
y						

b



x						
y						

QUESTION **3** Complete the table of values for the following rules.

a $y = 3x + 4$

x	1	4	6	7	9
y					

b $n = 2m + 6$

m	0	1	2	3	4
n					

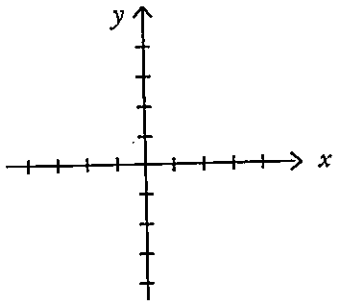
Directed numbers

Topic 10: Table of values and the number plane

QUESTION **1** Complete each table of values and then plot each set of ordered pairs on a number plane.

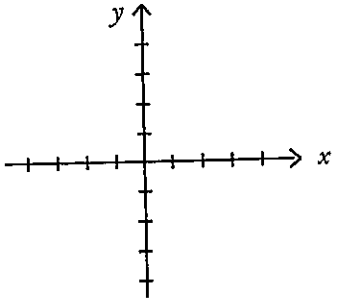
a $y = x$

x	−2	−1	0	1	2
y					



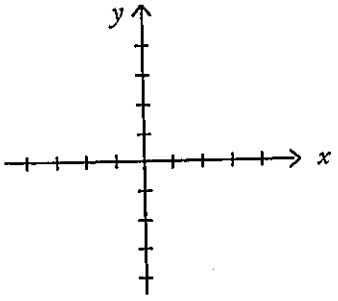
b $y = -x$

x	−2	−1	0	1	2
y					



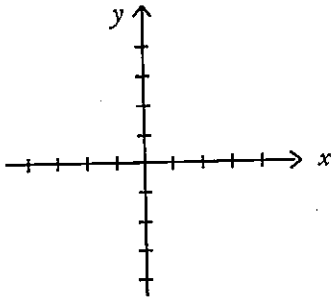
c $y = x + 1$

x	−2	−1	0	1	2
y					



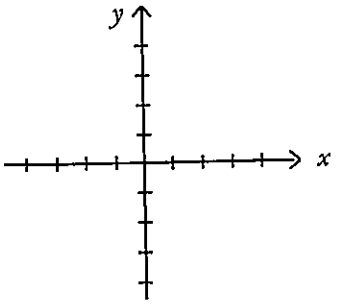
d $y = x - 1$

x	−2	−1	0	1	2
y					



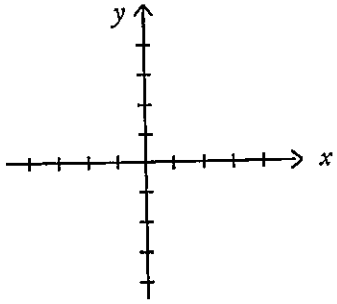
c $y = \frac{x}{2}$

x	−4	−2	0	2	4
y					



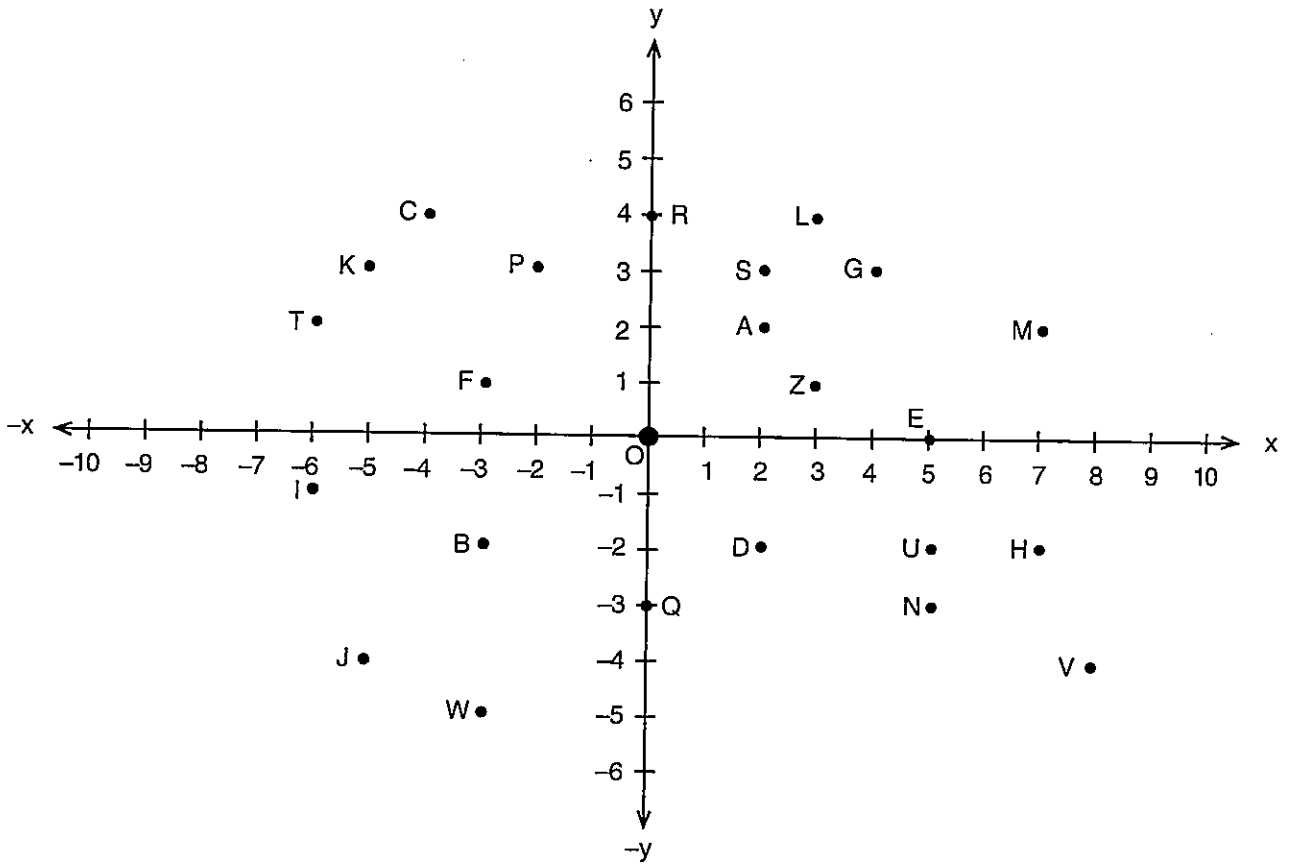
d $y = 2x$

x	−2	−1	0	1	2
y					



Directed numbers

Topic 11: The number plane



QUESTION **1** Write down the coordinates of the following points shown in the above number plane.

a	A _____	**b**	B _____	**c**	C _____	**d**	D _____
e	E _____	**f**	F _____	**g**	G _____	**h**	H _____
i	I _____	**j**	J _____	**k**	K _____	**l**	L _____
m	M _____	**n**	N _____	**o**	O _____	**p**	P _____
q	Q _____	**r**	R _____	**s**	S _____	**t**	T _____
u	U _____	**v**	V _____	**w**	W _____	**x**	Z _____

QUESTION **2** Write down the letter used to name each of the following points.

a	(5, –2) _____	**b**	(0, –3) _____	**c**	(–3, 1) _____	**d**	(5, 0) _____
e	(2, 2) _____	**f**	(–3, –2) _____	**g**	(3, 4) _____	**h**	(0, 4) _____
i	(–5, –4) _____	**j**	(0, 0) _____	**k**	(–6, –1) _____	**l**	(2, –2) _____
m	(–6, 2) _____	**n**	(4, 3) _____	**o**	(7, 2) _____	**p**	(5, –3) _____
q	(–5, 3) _____	**r**	(–2, 3) _____	**s**	(–4, 4) _____	**t**	(2, 3) _____
u	(–3, –5) _____	**v**	(7, –2) _____	**w**	(8, –4) _____	**x**	(3, 1) _____

Directed numbers

Topic 12: Problem solving with directed numbers

1 Where would I be after a trip of 3 km south followed by a trip of 5 km north?

2 What will be the net result of a deposit of $500 in my account followed by a withdrawal of $700?

3 Two numbers have a product of 30 and their sum is −11. What are the numbers?

4 If the sum of two numbers is −1 and their product is −6, find the numbers.

5 I am a negative number divisible by 5 and greater than −7. What am I?

6 Find the sum of a profit of $8000 and a loss of $13 000.

7 The temperature fell 3 degrees during the day and fell another 6 degrees during the night. What was the total change in temperature?

8 What is the combined effect of a gain in weight of 4 kg and then a loss of 6 kg.

9 Start with an integer, 3, subtract 9 from it and multiply the result by −2. What is the answer?

10 If 2 more than −5 is added to the product of 3 and 7, what is the result?

11 Multiply 5 and −3 and then add 6 to this result. What is the final answer?

12 Divide −30 by −3 and then multiply this result by −2. What is the answer?

13 Which of the integers, −8, −6, −2, 3, 9, is closest to zero on the number line?

14 From the integers, −6, −3, −1, 2, 8, find the three integers whose sum is −2.

15 Find the two numbers whose sum is −7 and product is 12.

Directed numbers

Unit Test

PART A

Instructions

This part consists of 12 multiple-choice questions
Each question is worth 1 mark
Fill in only ONE CIRCLE for each question
Calculators are NOT allowed

Time allowed: 15 minutes

Total marks = 12

					Marks
1	$-32 + +18$ equals				
	(A) -12	(B) $+50$	(C) -14	(D) -50	1
2	$-6 + -3 + -1$ equals				
	(A) -8	(B) -10	(C) $+10$	(D) $+8$	1
3	$+5 - -6$ equals				
	(A) $+11$	(B) -11	(C) $+1$	(D) -1	1
4	$(-2)^3$ equals				
	(A) 8	(B) -6	(C) $+6$	(D) -8	1
5	$-9 - -9$ equals				
	(A) 18	(B) 0	(C) 1	(D) 81	1
6	$(-6 \times 4) + 8$ equals				
	(A) -16	(B) $+16$	(C) 32	(D) 18	1
7	$-5 - (6 - -1)$ equals				
	(A) -10	(B) 12	(C) -12	(D) 0	1
8	$-8 + -2 \times -3$ equals				
	(A) 14	(B) -14	(C) 2	(D) -2	1
9	If $a = 3$ and $b = -2$ then $(a + b)^2$ equals				
	(A) 25	(B) 1	(C) 9	(D) 4	1
10	If $x = 2$ and $y = -5$ then $xy + 6$ equals				
	(A) -4	(B) 16	(C) 4	(D) -16	1
11	$-6 \times -5 \div -2$ equals				
	(A) 15	(B) 30	(C) -15	(D) -30	1
12	$+36 \div +4 \div -3$ equals				
	(A) 3	(B) -3	(C) 12	(D) -12	1

Total marks achieved for PART A 12

Directed numbers

Unit Test

PART B

Instructions This part consists of 15 questions
Each question is worth 1 mark
Write answers in the answers-only column

Time allowed: 20 minutes

Total marks = 15

Questions	Answers only	Marks
1 $-5 + 7 - 8 =$	_____	1
2 $(-8)^2 + 3 - 1 =$	_____	1
3 $-7 + -9 =$	_____	1
4 $-9 \times +7 =$	_____	1
5 $(-6)^2 + (-1)^2 + 9 =$	_____	1
6 $-3 \times -5 =$	_____	1
7 $-2 \times -3 \times -4 =$	_____	1
8 $-16 \div 8 =$	_____	1
9 $-35 \div -7 =$	_____	1
10 $60 \div -6 =$	_____	1
11 $-7 + 8 \div (-2) =$	_____	1
12 $(4 - 17) \times (-1 + 3) =$	_____	1
13 $8 + (-3) + 3 - 8 =$	_____	1
14 $-4 + (-4) - 4 =$	_____	1
15 $-2 \times [-27 \div (3 - 12)] =$	_____	1

Total marks achieved for PART B /15

MATHLETICS
Inspiring Better Results

Special Numbers, Factors and Multiples

Student Book - Series H-2

Mathletics Instant Workbooks

Special numbers, factors and multiples

Student Book - Series H 2

Contents

Topics	**Date completed**
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Topic 2 - Square numbers	__/__/__
Topic 3 - Triangular numbers	__/__/__
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Topic 5 - The highest common factor (HCF)	__/__/__
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Practice Tests

Topic 1 - Topic test A	__/__/__
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Topic 3 - Topic test C	__/__/__

Author of The Topics and Topic Tests: AS Kalra

Special numbers, factors and multiples

Topic 1: Odd, even, prime and composite numbers

QUESTION **1** Complete the following sentences with 'even' or 'odd'.

a The product of an odd number and 2 is always _____.

b The product of an even number and 2 is always _____.

c An odd number multiplied by 1 is always _____.

d An even number multiplied by 1 is always _____.

e Adding 1 to an even number always gives an _____ number.

f The sum of two odd numbers gives an _____ number.

g Adding zero to an even number always gives an _____ number.

h Between 4 and 6 there is only an _____ number.

QUESTION **2**

a Which is the only even prime number? _____

b Write the even numbers between 2 and 12. _____

c Write all the prime numbers less than 15. _____

d All even numbers end in one of five digits. List them. _____

e All odd numbers end in one of five digits. List them. _____

QUESTION **3** Complete the following.

a The product of two odd numbers is an _____ number.

b The product of two even numbers is an _____ number.

c The square of an odd number is an _____ number.

d The square of an even number is an _____ number.

e The difference between two odd numbers is an _____ number.

f The difference between two even numbers is an _____ number.

QUESTION **4** Answer the following.

a What is the next odd number after 9999? _____

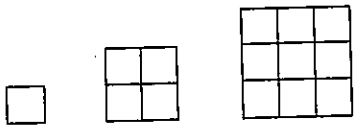
b What is the next even number after 99 999? _____

c The product of an odd number and an even number is an _____ number.

Special numbers, factors and multiples

Topic 2: Square numbers

QUESTION **1**



a Extend this pattern by two more terms.

b What is the 7th square number? _____

c Write the numbers shown by the above squares. _____

d Why are these called square numbers? _____

QUESTION **2** Extend the following patterns by three more lines.

a

$1 = 1$

$1 + 3 = 4$

$1 + 3 + 5 = 9$

_____

_____

_____

b

$1 = 1$

$1 + 2 + 1 = 4$

$1 + 2 + 3 + 2 + 1 = 9$

_____

_____

_____

QUESTION **3** Write each of the following in index form.

a $2 \times 2 =$ _____ **b** $85 \times 85 =$ _____ **c** $16 \times 16 =$ _____

d $12 \times 12 =$ _____ **e** $59 \times 59 =$ _____ **f** $5 \times 5 =$ _____

g $48 \times 48 =$ _____ **h** $3 \times 3 =$ _____ **i** $68 \times 68 =$ _____

j $31 \times 31 =$ _____ **k** $14 \times 14 =$ _____ **l** $103 \times 103 =$ _____

QUESTION **4** Write each of the following in expanded form.

a $4^2 =$ _____ **b** $20^2 =$ _____ **c** $92^2 =$ _____

d $82^2 =$ _____ **e** $8^2 =$ _____ **f** $7^2 =$ _____

g $9^2 =$ _____ **h** $5^2 =$ _____ **i** $50^2 =$ _____

j $11^2 =$ _____ **k** $48^2 =$ _____ **l** $31^2 =$ _____

QUESTION **5**

a Write the square number that we get when the first 8 odd numbers are added.

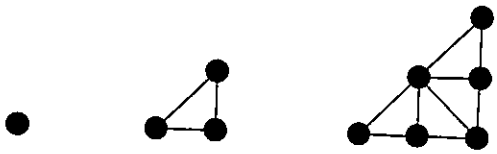
_____

b Square numbers can be written as the sum of _____ numbers.

Special numbers, factors and multiples

Topic 3: Triangular numbers

QUESTION **1**



a Extend the pattern by two more terms.

b What is the 7th triangular number? _____

c Write the numbers shown by the above triangles. _____

d Why are these called triangular numbers? _____

QUESTION **2** Extend the following pattern by 5 more lines.

$1 = 1$

$1 + 2 = 3$

$1 + 2 + 3 = 6$

_____

_____

_____

_____

_____

QUESTION **3**

a List the first ten triangular numbers.

_____

b Add the first two triangular numbers. What kind of number do you get?

_____

c Add any two consecutive triangular numbers. What kind of number do you get?

_____

d Find a number that is both a triangular number and a square number.

_____

QUESTION **4**

a Which numbers are triangular between 10 and 40? _____

b A dot diagram for the 3rd triangular number is drawn for you in Question 1.
Draw a similar dot diagram for another triangular number.

Special numbers, factors and multiples

Topic 4: Factors

QUESTION **1**

a Is 1 a factor of 10? _____

b Is 2 a factor of 10? _____

c Is 5 a factor of 10? _____

d Is 10 a factor of 10? _____

e How many factors of 10 are there? List them. _____

QUESTION **2** Find the factors of the following numbers.

a 16 _____

b 108 _____

c 200 _____

d 24 _____

e 72 _____

f 256 _____

g 225 _____

h 500 _____

QUESTION **3** Find the value of the missing factor.

a $5 \times$ _____ $= 75$

b _____ $\times 5 = 85$

c $3 \times$ _____ $= 57$

d $3 \times$ _____ $= 84$

e _____ $\times 2 = 52$

f _____ $\times 6 = 54$

g $13 \times$ _____ $= 65$

h _____ $\times 15 = 60$

i $9 \times$ _____ $= 108$

j $4 \times$ _____ $= 36$

k _____ $\times 3 = 39$

l _____ $\times 7 = 133$

QUESTION **4**

a What is a prime number? _____

b How many factors does a prime number have? _____

c What number is a factor of every number? _____

d Write all the prime numbers between 10 and 30. _____

QUESTION **5** Use a factor tree to factorise each of the following.

a 27

b 63

c 108

Special numbers, factors and multiples

Topic 5: The highest common factor (HCF)

QUESTION **1** Find the factors for each pair of numbers and circle the common factors.

a 8 _____

12 _____

b 12 _____

16 _____

QUESTION **2** Find the factors for each set of numbers and circle the common factors.

a 8 _____

10 _____

12 _____

b 12 _____

16 _____

18 _____

QUESTION **3**

a List all the factors of 12.

_____

b List all the factors of 18.

_____

c List the common factors of 12 and 18.

_____

d What is the highest common factor (HCF) of 12 and 18? _____

QUESTION **4** Find the highest common factor (HCF) of the following.

a 12 and 30

_____

_____

b 21 and 84

_____

_____

c 4, 8 and 16

_____

_____

_____

d 14, 21 and 28

_____

_____

_____

Special numbers, factors and multiples

Topic 6: Multiples

QUESTION **1** Give the first three multiples of each of the following numbers.

a 4 _____ **b** 5 _____ **c** 10 _____

d 13 _____ **e** 11 _____ **f** 14 _____

g 15 _____ **h** 25 _____ **i** 20 _____

QUESTION **2**

a List the first seven multiples of 6. _____

b List the first seven multiples of 4. _____

c What are the common multiples of 4 and 6? _____

d What is the lowest common multiple (LCM)? _____

QUESTION **3**

a Write any six multiples of 5. _____

b List all the multiples of 7 between 10 and 60. _____

c List all the multiples of 5 up to and including 80.

_____

QUESTION **4** List the first five multiples of the following numbers.

a 2 _____ **b** 3 _____

c 4 _____ **d** 8 _____

e 6 _____ **f** 9 _____

g 10 _____ **h** 12 _____

QUESTION **5**

a Are all whole numbers multiples of 1? _____

b Are all even whole numbers multiples of 2? _____

c Write the smallest multiple of any whole number. _____

Special numbers, factors and multiples

Topic 7: Lowest common multiple (LCM)

QUESTION **1**

a List the first seven multiples of 6. _____

b List the first seven multiples of 9. _____

c List the common multiples of 6 and 9. _____

d What is the lowest common multiple (LCM) of 6 and 9? _____

QUESTION **2** List the first eight multiples for each set of numbers and circle the common multiples.

a 6 and 8

_____

_____

_____

b 2 and 12

_____

_____

_____

c 3, 4 and 6

_____

_____

_____

_____

d 6, 8 and 12

_____

_____

_____

_____

QUESTION **3** List the first five multiples for each set of numbers, circle the common multiples and find the LCM.

a 12 and 16

_____

_____

LCM = _____

b 15 and 20

_____

_____

LCM = _____

c 4, 6 and 12

_____

_____

_____

LCM = _____

d 6, 12 and 24

_____

_____

_____

LCM = _____

Special numbers, factors and multiples

Topic 8: Index notation, square roots and cube roots

QUESTION **1** Write each of the following in expanded form.

a 8^2 _____ **b** 9^3 _____

c 5^3 _____ **d** 2^6 _____

e 4^5 _____ **f** 7^3 _____

QUESTION **2** Write each of the following in index form.

a $3 \times 3 \times 3 \times 3 \times 3 \times 3$ _____ **b** $7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7$ _____

c $15 \times 15 \times 15 \times 15$ _____ **d** $21 \times 21 \times 21 \times 21 \times 21$ _____

e $81 \times 81 \times 81$ _____ **f** $36 \times 36 \times 36 \times 36$ _____

QUESTION **3** Complete the following table.

	Index form	Base	Index	Basic numeral
a	12^2			
b	9^3			
c	3^5			
d	16^2			
e	2^7			

QUESTION **4** Complete the following.

a If $3^2 = 9$ then $\sqrt{9}$ = _____ **b** If $5^2 = 25$ then $\sqrt{25}$ = _____

c If $7^2 = 49$ then $\sqrt{49}$ = _____ **d** If $15^2 = 225$ then $\sqrt{225}$ = _____

e If $4^3 = 64$ then $\sqrt[3]{64}$ = _____ **f** If $6^3 = 216$ then $\sqrt[3]{216}$ = _____

QUESTION **5** Evaluate the following.

a $\sqrt{9}$ = _____ **b** $\sqrt{144}$ = _____ **c** $\sqrt[3]{8}$ = _____ **d** $\sqrt{196}$ = _____

e $\sqrt{121}$ = _____ **f** $\sqrt{256}$ = _____ **g** $\sqrt{169}$ = _____ **h** $\sqrt[3]{1000}$ = _____

i $\sqrt{400}$ = _____ **j** $\sqrt{225}$ = _____ **k** $\sqrt[3]{343}$ = _____ **l** $\sqrt[3]{729}$ = _____

m $\left(\sqrt{8}\right)^2$ = _____ **n** $\left(\sqrt{16}\right)^2$ = _____ **o** $\left(\sqrt[3]{27}\right)^3$ = _____ **p** $\left(\sqrt[3]{64}\right)^3$ = _____

Special numbers, factors and multiples

Topic 9: Problem solving with special numbers, factors and multiples

1 Is 14 a factor of 56? _____

2 9 is one factor of 72. What is the other factor? _____

3 Write all the factors of 24. _____

4 Are there any even prime numbers? If so, list them.

_____

5 List all one-digit prime numbers.

_____

6 What are the common factors of 24 and 32?

_____

7 Find the highest common factor (HCF) of 18 and 42.

_____

8 Write the first three common multiples of 8 and 12.

_____

9 Find the lowest common multiple (LCM) of 8 and 12.

_____

10 Find the first five square numbers.

_____

11 Find the first five triangular numbers.

_____

12 Find the first two numbers which are both triangular and square.

_____

13 Find all the multiples of 2 between 15 and 35.

_____

14 Find the lowest common multiple (LCM) of 6, 9 and 12.

_____

15 Find all the composite numbers between 10 and 40.

_____

Special numbers, factors and multiples

Topic Test

PART A

Instructions This part consists of 12 multiple-choice questions
Each question is worth 1 mark
Fill in only ONE CIRCLE for each question
Calculators are NOT allowed

Time allowed: 15 minutes **Total marks = 12**

Marks

1 The square root of 6^2 is

Ⓐ 3 Ⓑ 4 Ⓒ 5 Ⓓ 6 [1]

2 The sum of the first three triangular numbers is

Ⓐ 10 Ⓑ 18 Ⓒ 24 Ⓓ 30 [1]

3 The sum of the first three square numbers is

Ⓐ 14 Ⓑ 18 Ⓒ 24 Ⓓ 30 [1]

4 The sum of the first five prime numbers is

Ⓐ 14 Ⓑ 18 Ⓒ 28 Ⓓ 30 [1]

5 The sum of the first five prime numbers greater than 3 is

Ⓐ 26 Ⓑ 36 Ⓒ 46 Ⓓ 53 [1]

6 The next prime number greater than 13 is

Ⓐ 16 Ⓑ 17 Ⓒ 18 Ⓓ 19 [1]

7 The number of factors a prime number has is

Ⓐ 1 Ⓑ 2 Ⓒ 3 Ⓓ 4 [1]

8 The lowest common multiple of 6 and 8 is

Ⓐ 12 Ⓑ 24 Ⓒ 36 Ⓓ 48 [1]

9 If 7 is one factor of 84, the other factor is

Ⓐ 6 Ⓑ 12 Ⓒ 24 Ⓓ 42 [1]

10 The sum of two consecutive odd numbers is 24. The smaller number is

Ⓐ 5 Ⓑ 7 Ⓒ 9 Ⓓ 11 [1]

PART A continued

Marks

11 The sum of three connsecutive even numbers is 30. The smaller number is

Ⓐ 4 Ⓑ 6 Ⓒ 8 Ⓓ 10 — 1

12 The sum of two consecutive triangular numbers is

Ⓐ a prime number Ⓑ an odd number Ⓒ an even number Ⓓ a square number — 1

13 The only even prime number is

Ⓐ 2 Ⓑ 4 Ⓒ 6 Ⓓ 8 — 1

14 The first two numbers that are both triangular and square are

Ⓐ 1 and 4 Ⓑ 1 and 9 Ⓒ 1 and 16 Ⓓ 1 and 36 — 1

15 The sum of all one-digit odd numbers is

Ⓐ a triangular number
Ⓑ a square number
Ⓒ a prime number
Ⓓ an even number — 1

Total marks achieved for PART A ___/15

Special numbers, factors and multiples

Topic Test

PART B

Instructions This part consists of 15 questions
Each question is worth 1 mark
Write answers in the answers-only column

Time allowed: 20 minutes

Total marks = 15

Questions	Answers only	Marks
1 List the first four odd numbers.		1
2 How do you know if a number is even?		1
3 How many even prime numbers are there?		1
4 Write the next prime number greater than 59.		1
5 What is the 8th square number?		1
6 Write 9^5 in expanded form.		1
7 List the first six triangular numbers.		1
8 Write the next three numbers greater than 20 that have only two factors.		1
9 Which of the following numbers are multiples of 3? 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26		1
10 List the common factors of 24 and 36.		1
11 Write $9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9$ in index form.		1
12 If $9^3 = 729$ then find $\sqrt[3]{729}$		1
13 Write the product of the third triangular number and the fourth square number.		1
14 Find the sum of the first seven square numbers.		1
15 Find the sum of the first eight triangular numbers.		1

Total marks achieved for PART B ___/15

Special numbers, factors and multiples

Topic Test

PART C

Instructions This part consists of 4 questions
Each question is worth 5 marks
Show all necessary

Time allowed: 20 minutes

Total marks = 20

Questions | **Marks**

1 Write each of the following in expanded form. | **Marks**

a 2^7 = _____

b 6^5 = _____

Write in index form.

c $8 \times 8 \times 8 \times 8 \times 8 \times 8$ = _____

d $12 \times 12 \times 12 \times 12 \times 12 \times 12 \times 12$ = _____

e $9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9$ = _____ | 5

2 Use a factor tree to factorise each of the following numbers.

a 18 **b** 24 **c** 120

d 96 **e** 63 | 5

3 Evaluate the following.

a 3^5 = _____ **b** 5^4 = _____ **c** 9^3 = _____

d $\sqrt{196}$ = _____ **e** $\sqrt[3]{512}$ = _____ | 5

4 **a** List all the factors of 16. _____

b List all the factors of 24. _____

c List the common factors of 16 and 24. _____

d Find the highest common factor (HCF) of 16 and 24. _____

e Find the lowest common multiple (LCM) of 16 and 24. _____ | 5

Total marks achieved for PART C 20

Stages of life and perceptions of liveability

People at different ages perceive liveability differently. Based on age, life stages have a big impact on choice of place to live.

Life stage	Characteristics
	• Children need childcare facilities, playgrounds and a safe and healthy environment. • Growing family relocate to a bigger house in a 'better' suburbs. • Children have no choice, but influence the choices made by parents and caregivers.
	• Move from small towns to regional centres and cities where higher education facilities are available. • Live at home to save money for travel. • Go overseas to live and study. • Share a house with friends close to university.
	• DINKS: (double income no kids) buy a city apartment or a house in the suburbs and commute; travel and work overseas. • Stay single, live in an apartment. • Kippers (kids in parents' pockets) kids return home, no moving or downsizing. • Marriage, family, mortgage in the suburbs.
	• Sell up, buy a mobile home, become a 'grey nomad' for a few years. • Empty nesters: sell their house in the suburbs and downsize to a city apartment. • Move to a retirement home or move in with children. • Make a tree change or a sea change.

1. Study the table. Which living options would you choose for each of the three stages of life when you are no longer a dependent child and why?

2. Predict which life stage dominates the population of Oran Park. Give your reasons why, providing evidence of facilities in Oran Park.

Oran Park Town Life Stages

Visit https://www.oranparktown.com.au/why-oran-park/testimonials/

Watch the 4 videos

CHRIS & EMMA

JAYSON & JODIE

KELLY & ELLENA

IAN AND CHERYL

For each testimonial answer the following questions:

1. Describe the family unit
2. Why have these people moved into Oran Park?
3. What facilities do they use at Oran Park?

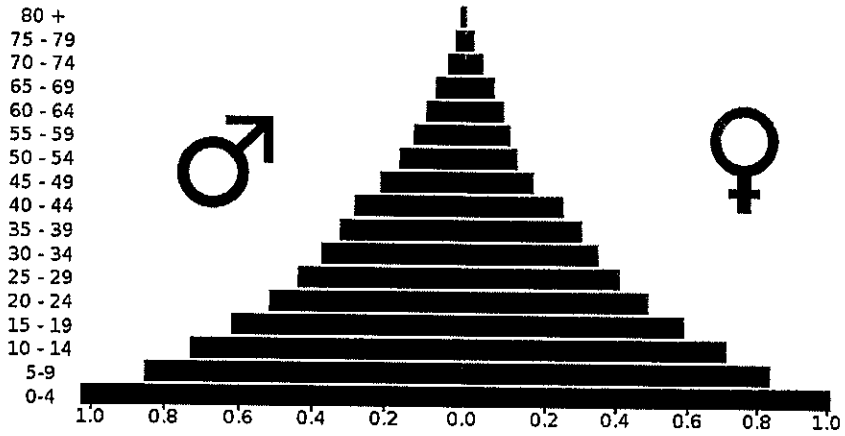
Chris and Emma	**Jayson and Jodie**
Kelly and Ellena	**Ian and Cheryl**

What do these testimonials tell buyers about Oran Park?

Why is it important to have a variety of people from different life stages living in Oran Park?

Population profiles

Population profiles reflect the liveability of places for different age and lifestyle groups. These 'pyramids of age' help councils plan facilities to meet the demands of each group in their populations. Planning age-friendly places for the older generations and liveable communities that are inclusive of all age groups are current trends across the globe.



What has Oran Park done to be inclusive of all age groups in society. Use examples to support your answer.

Study the 2016 population statistics for Oran Park, NSW and Australia and complete the activities.

Complete the 2016 Population Statistics graph for Oran Park and Australia.

Graph Oran Park on the left side of the graph, Australia on the right side of the graph.

Note: add 80—84 years and 85 years and over together.

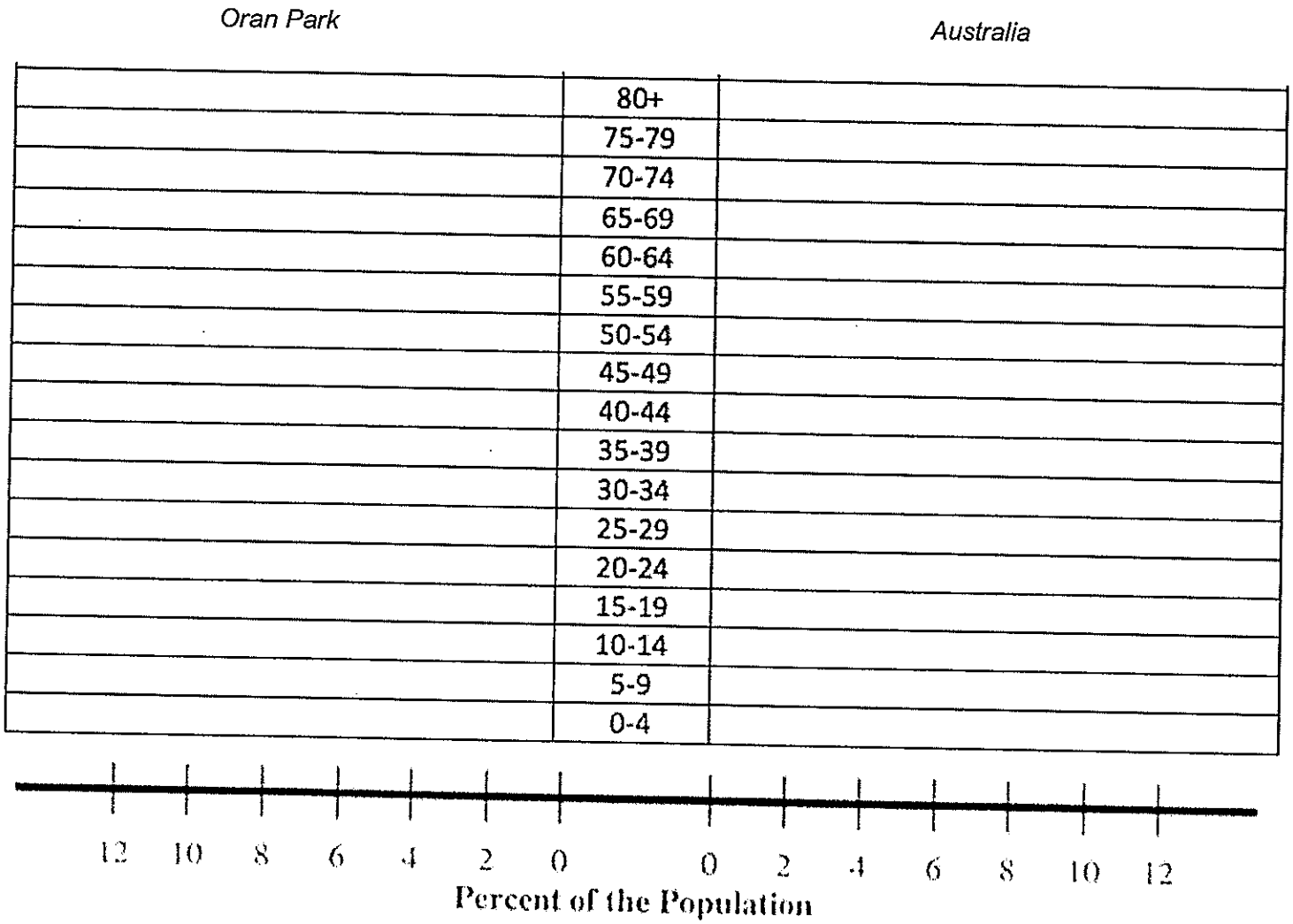
After completing your graph, answer questions 1-4 in your Geography book.

4. What are the main differences and similarities between the graphs?
5. What are the main characteristics of the population of Australia?
6. What are the main characteristics of the population of Oran Park?
7. What services and facilities would be needed and why?

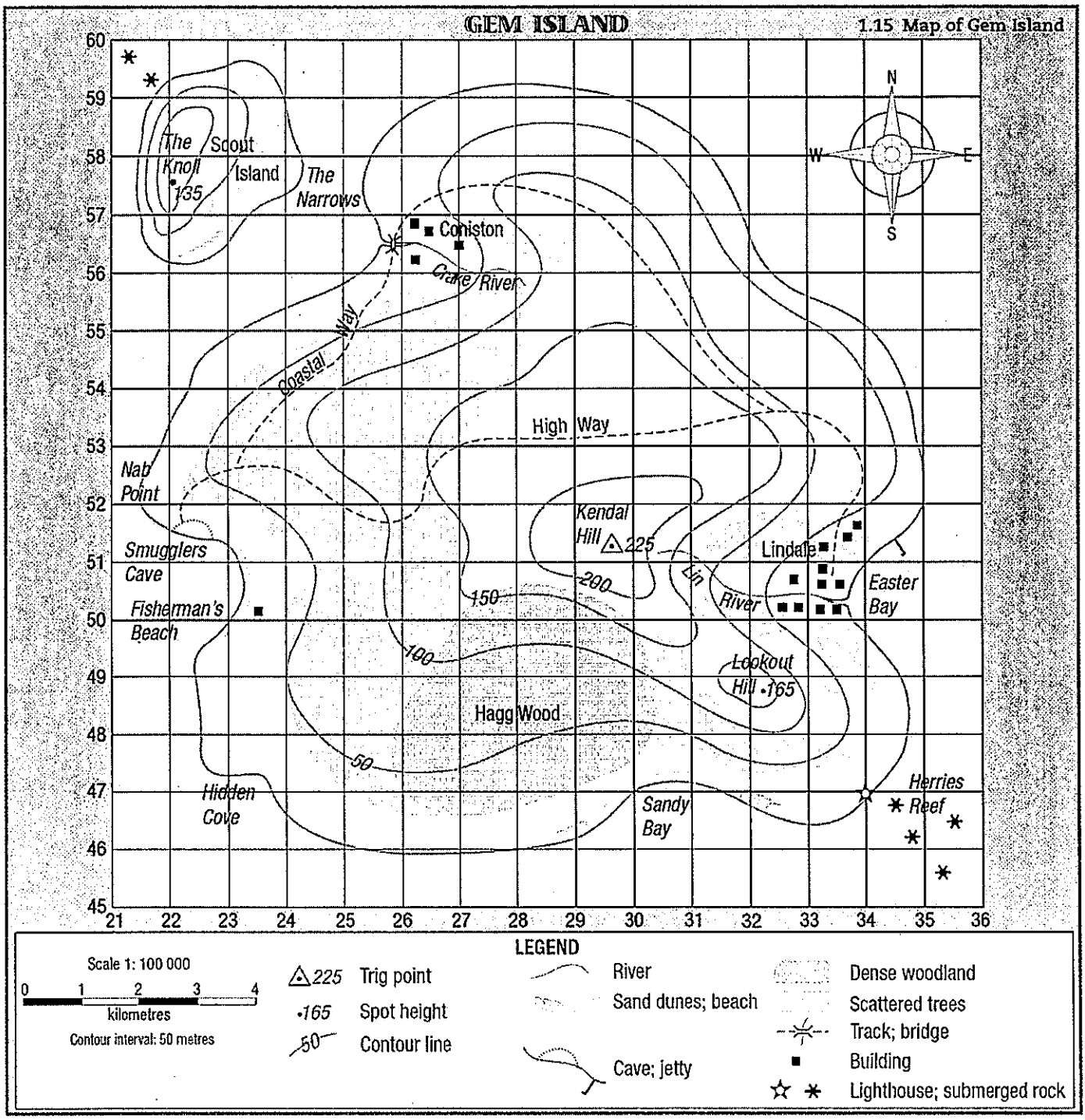
Age	Oran Park	%	New South Wales	%	Australia	%
Median age	29	--	38	--	38	--
0-4 years	594	12.5	465,135	6.2	1,464,779	6.3
5-9 years	448	9.4	478,184	6.4	1,502,646	6.4
10-14 years	283	5.9	443,009	5.9	1,397,183	6.0
15-19 years	237	5.0	448,425	6.0	1,421,595	6.1
20-24 years	286	6.0	489,673	6.5	1,566,793	6.7
25-29 years	562	11.8	527,161	7.0	1,664,602	7.1
30-34 years	609	12.8	540,360	7.2	1,703,847	7.3
35-39 years	484	10.1	499,724	6.7	1,561,679	6.7
40-44 years	320	6.7	503,169	6.7	1,583,257	6.8
45-49 years	207	4.3	492,440	6.6	1,581,455	6.8
50-54 years	150	3.1	485,546	6.5	1,523,551	6.5
55-59 years	173	3.6	469,726	6.3	1,454,332	6.2
60-64 years	149	3.1	420,044	5.6	1,299,397	5.6
65-69 years	112	2.3	384,470	5.1	1,188,999	5.1
70-74 years	64	1.3	292,556	3.9	887,716	3.8
75-79 years	40	0.8	217,308	2.9	652,657	2.8
80-84 years	32	0.7	155,806	2.1	460,549	2.0
85 years and over	19	0.4	167,506	2.2	486,842	2.1

The median age of people in Oran Park (State Suburbs) was 29 years. Children aged 0 - 14 years made up 27.8% of the population and people aged 65 years and over made up 5.6% of the population.

2016 Population statistics



Geography Skills: Gem Island



Activities

Knowledge

1 Why are maps important?

2 What are the five essential features of a good map?

3 How many figures do the following have:
i an area reference ii a grid reference?

Skills

All the following questions will help you build map-reading skills. They are based on the map of Gem Island in 1.15.

Using the legend

4 Write the scale of the map in words.

5 Draw the symbol used for sand dunes.

6 Draw the symbol used for a lighthouse.

7 What colour is used for dense woodland?

8 How many submerged rocks are there on the map?

9 How many rivers are there on the map?

10 Record three ways in which height can be shown on a map.

11 Name one of the tracks found on the island.

12 Is there a bridge in Lindale?

13 Name an area of dense woodland.

Direction

14 What is the correct term for the symbol on the map showing direction?

15 What is the direction from Lindale to Coniston?

16 What is the direction from Coniston to Smugglers Cave?

17 What is the direction from The Knoll on Scout Island to Herries Reef?

18 What is the direction from Kendal Hill to the jetty?

19 What is the direction from the lighthouse to Hidden Cove?

20 On which side of the island is Easter Bay?

21 On which side of the island is Sandy Beach?

22 Which point on the map is the furthest west?

23 If you walked north from Kendal Hill to the coast would you pass through trees?

Locating features

24 What human feature would you find in the grid square at these area references:
a 2350 b 2853 c 3451 d 2556?

25 What physical features would you find in the grid square with these area references:
a 3545 b 3051 c 2256 d 2347?

26 What is the area reference for:
a Smugglers Cave
b the top of Lookout Hill
c the trig point on Kendal Hill
d the highest point on Scout Island
e Nab Point?

27 What feature is found at each of these grid references:
a 340470 b 270565 c 259565
d 326501 e 213597?

28 What is the grid reference of each of the following features:
a the trig point on Kendal Hill
b the spot height on The Knoll
c the submerged rock nearest to Scout Island
d the building nearest the bridge in Coniston
e the building nearest the jetty in Lindale?

Distance

29 Give the distance in a straight line from the triangulation point on Kendal Hill to each of the following:
a the spot height on Lookout Hill
b the spot height on Scout Island
c the building at Fisherman's Beach
d the lighthouse
e the southern end of the jetty.

30 What is the shortest distance across The Narrows?

31 What is the distance along the Coastal Way from Smugglers Cave to the bridge in Coniston?

32 How far is it along the coast from Smugglers Cave to Hidden Cove?

33 How far is it around the coast of Scout Island?

Relief

34 What is the height of the trig Point on Kendal Hill?

35 What is the height of the summit of Lookout Hill?

36 What is the height of the summit of The Knoll on Scout Island?

37 How high is the High Way at 320535?

38 How high is the Coastal Way at 252550?

Treasure trail

39 Start at the lighthouse, travel north-west for 6 kilometres, then north for 5.5 kilometres. Follow the track heading north-west until you reach a human feature. From there travel directly west for three kilometres and then dig for the treasure. Where did you dig?

40 Draw your own treasure map. (Remember BOLTS.)

HSIE Faculty

Year 7 Assessment Task 1

Term 1 2020

STUDENT NAME	CLASS

DETAILS

Topic: Place and Liveability: Assessing the liveability of a place

Date of issue: Term 1, Week 7 (at the fieldtrip)	**Due date: Term 1, Week 10 (in your Geography class)**
Monday 9 March o Period 4 (7T, 7D) Tuesday 10 March o Period 2 (7P) Wednesday 11 March o Period 1 (7A), Period 2 (7G), Period 3 (7S) Thursday 12 March o Period 4 (7E, 7Q)	Tuesday 31 March o Period 1(7G), Period 2 (7E) Wednesday 1 April o Period 1 (7S), Period 3 (7T and 7D) Thursday 2 April o Period 1(7A), Period 3 (7P, 7Q)

Type of task: Report (hand in)

TASK DESCRIPTION

This term in Geography, you have been studying the topic *Place and liveability.*

In this unit you have been learning about what factors enhance and reduce liveability. You have been using this knowledge to develop your own perception of liveability in Oran Park.

For your assessment task, you are required to write a report (850 words) on the following question:

<u>Assess</u> the factors that enhance and reduce the liveability of Oran Park.

You have been provided with the opportunity to engage in fieldwork and visit the Oran Park Sales and Information Centre. You will be given ONE lesson to prepare your assessment. Use your excursion notes and the scaffold provided to help you prepare your task. However, more time will need to be spent at home completing this task.

The report requires you to define liveability and to understand the factors that affect the liveability at Oran Park. To successfully assess the liveability, you are required to:

- make a judgement on TWO factors that **enhance** liveability at Oran Park
- make a judgement on TWO factors that **reduce** liveability at Oran Park

Factors that affect liveability of Oran Park

Environmental	Social	Cultural	Economic	Infrastructure

• Climate: temperature and humidity
• Quality of urban design
• Architecture
• Streetscapes
• Parks and gardens
• Maintenance of public spaces
	• Law and order
	  o Level of crime
	  o Level of petty crime
	  o Alcohol-related disorder
	  o Graffiti and vandalism
	  o Personal safety
	• Education
	  o Choice of schools
	  o Quality public schools
	  o Opportunities for post-school education
	• Healthcare
	  o Access to dentists and doctors
	  o Availability of private healthcare
	  o Quality of public healthcare
	  o Age care facilities
		• Places of worship
		• Community recreational facilities
		• Entertainment venues
		• Public libraries
		• Restaurants
		• Licenses clubs
		• Ethnic diversity
			• Employment opportunities
			• Affordable housing
			• Access to shops and department stores
			• Service stations and mechanics
			• Hardware outlets
			• Personal services such as hairdressers
				• Quality of road access
				• Availability of public transport
				• Transport interchanges
				• Quality telecommunications
				• Infrastructure
				• Reliable utilities – water, electricity, sewage
				• Cycleways and pathways
				• Maintenance of public schools and hospitals

Your report must include the following parts:

Section A *Include a map with BOLTS and graphs to support your writing where necessary.*

- Introduction: Define liveability and why is it important. Describe the features, characteristics and location of Oran Park (150 words)

Section B *Include four annotated photographs, one for each liveability factor*

- Paragraph 2: Describe enhancing liveability factor 1, explain how it increases liveability for people and their wellbeing (150 words)
- Paragraph 3: Describe enhancing liveability factor 2, explain how it increases liveability for people and their wellbeing (150 words)
- Paragraph 4: Describe reducing liveability factor 1, explain how it decreases liveability for people and their wellbeing (150 words)
- Paragraph 5: Describe reducing liveability factor 2, explain how it decreases liveability for people and their wellbeing (150 words)

Section C

- Conclusion: Make an assessment – is Oran Park liveable based on your chosen liveability factors? (100 words)

NESA TERMINOLOGY

Assess -make a judgement of value, quality, outcomes, results or size

Define - state meaning and identify essential qualities

Describe - provide characteristics and features

Explain - relate cause and effect; make the relationships between things evident; provide why and/or how

MARKING CRITERIA

You will be assessed on how well you:

- demonstrate knowledge and understanding of the factors that affect liveability at Oran Park
- process geographical information such as maps, photographs, graphs and fieldwork notes
- present a logical and cohesive response using appropriate geographical terminology

OUTCOMES TO BE ASSESSED

GE4-1 – locates and describes the diverse features and characteristics of a range of places and environments

GE4-3 – explains how interactions and connections between people, places and environments result in change

GE4-6 – explains differences in human wellbeing

GE4-7 – acquires and processes geographical information by selecting and using geographical tools for inquiry

GE4-8 – communicates geographical information using a variety of strategies

SUBMISSION INSTRUCTIONS

You are to hand your assessment task to your teacher **during your Geography lesson** on the due date that relates to your class. Any submissions after this time will be considered to be late.

You are to submit your report on paper, size 12 font, double spaced (to provide space for teacher feedback).

What do I do if I am absent?

If you are absent the day of an assessment task or examination, you MUST:

- report to the teacher or head teacher of the faculty on the first day of return to school
- supply a suitable explanation e.g. letter, doctor's certificate

The Head Teacher will decide and advise you whether:

- you will sit for a substitute task, OR
- can submit the task late, OR
- be given an estimate, OR
- the task will be recorded as a Non-Attempt

Marking Guidelines

Outcomes	Assessment component	Knowledge and understanding				
		A	B	C	D	E
GE4-1 locates and describes the diverse features and characteristics of a range of places and environments	**Section A:** Define liveability and why is it important. Describe the features, characteristics and location of Oran Park .	• Comprehensive definition of liveability. • Extensive description of the features, characteristics and location of Oran Park.	• High level definition of liveability. • Strong level of detail describing the features, characteristics and location of Oran Park.	• Satisfactory definition of liveability. • Sound level description of the features, characteristics and location of Oran Park.	• Basic definition of liveability. • Some basic details about the features and characteristics or the location of Oran Park	• Simple comment about liveability. • Mentions the location of Oran Park or a feature or characteristic or the suburb.
GE4-3 explains how interactions and connections between people, places and environments result in change	**Section B:** Describe (2) enhancing liveability factors. Describe (2) reducing liveability factors	• Demonstrates an outstanding and comprehensive understanding of how the interactions and connections between people, places and environmental quality enhance liveability in Oran Park	• Demonstrates a high level of understanding of how the interactions and connections between people, places and environmental quality enhances and reduces liveability in Oran Park	• Demonstrates a sound understanding of how the interactions and connections between people, places and environmental quality enhances and reduces liveability in Oran Park	• Demonstrates a basic understanding of how the interactions and connections between people, places and environmental quality enhances and reduces liveability in Oran Park	• Demonstrates a limited understanding of how the interactions and connections between people, places and environmental quality enhances and reduces liveability in Oran Park
GE4-6 explains differences in human wellbeing	**Section B:** Explain how (2) factors increase liveability for people and their wellbeing. Explain how (2) factors decrease liveability for people and their wellbeing	• Provides a comprehensive explanation in the differences in human wellbeing in Oran Park	• Provides an explanation of the differences in human wellbeing in Oran Park	• Attempts to explain the differences in human wellbeing in Oran Park	• Mentions human wellbeing in Oran Park	• Limited understanding of human wellbeing

Outcomes	Assessment component	Geographical inquiry skills and tools				
		A	B	C	D	E
GE4-7 acquires and processes geographical information by selecting and using geographical tools for inquiry	**Section A:** Includes a map of Oran Park including BOLTS and graphs where necessary. **Section B:** Annotated photographs (4) of liveability factors in Oran Park.	• Demonstrates outstanding processing of geographical information by selecting a range of and using a variety of relevant geographical tools including a map (with BOLTS) • Detailed, relevant and annotated images and graphs for inquiry	• Demonstrates high level processing of geographical information by selecting a range of and using a variety of relevant geographical tools including a map (with BOLTS) • Relevant annotated images and graphs for inquiry	• Demonstrates sound processing of geographical information by selecting a range of and using a variety of geographical tools including a map • Some annotated images and graphs for inquiry	• Demonstrates basic processing of geographical information by selecting and using geographical tools including a map, • Basic images or graphs used	• Demonstrates limited processing of geographical information by selecting and using geographical tools that might include a map, images(s) or a graph. • No images used.
GE4-8 communicates geographical information using a variety of strategies	**Section A, B and C:** Overall writing and geographical terminology.	• Presents a sustained, logical and cohesive response using a wide range of geographical terminology	• Presents a sustained, logical and cohesive response using a wide range of geographical terminology	• Presents a logical response using geographical terminology	• Presents a basic response that attempts to use simple geographical terminology	• Presents a limited response with no geographical terminology

Comments:

Overall grade:

FEEDBACK

Areas where you have performed well:

-
-
-

Areas where you need to improve:

-
-
-

Strategies to help you improve:

-
-
-

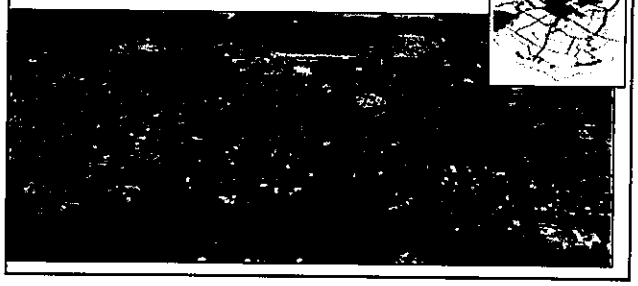
Liveability factors

Environmental factors	Social factors	Cultural factors	Economic factors	Infrastructure factors

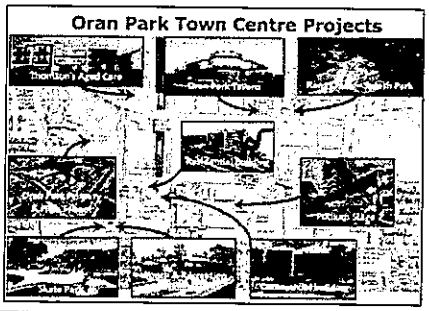
• Climate: temperature and humidity
• Quality of urban design
• Architecture
• Streetscapes
• Parks and gardens
• Maintenance of public spaces
	• Law and order
	  o Level of crime
	  o Level of petty crime
	  o Alcohol-related disorder
	  o Graffiti and vandalism
	  o Personal safety
	• Education
	  o Choice of schools
	  o Quality public schools
	  o Opportunities for post-school education
	• Healthcare
	  o Access to dentists and doctors
	  o Availability of private healthcare
	  o Quality of public healthcare
	  o Age care facilities
		• Places of worship
		• Community recreational facilities
		• Entertainment venues
		• Public libraries
		• Restaurants
		• Licenses clubs
		• Ethnic diversity
			• Employment opportunities
			• Affordable housing
			• Access to shops and department stores
			• Service stations and mechanics
			• Hardware outlets
			• Personal services such as hairdressers
				• Quality of road access
				• Availability of public transport
				• Transport interchanges
				• Quality telecommunications
				• Infrastructure
				• Reliable utilities – water, electricity, sewage
				• Cycleways and pathways
				• Maintenance of public schools and hospitals

Oran Park

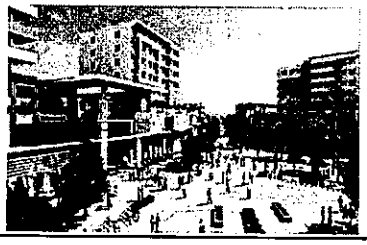
An assessment of the liveability of Oran Park



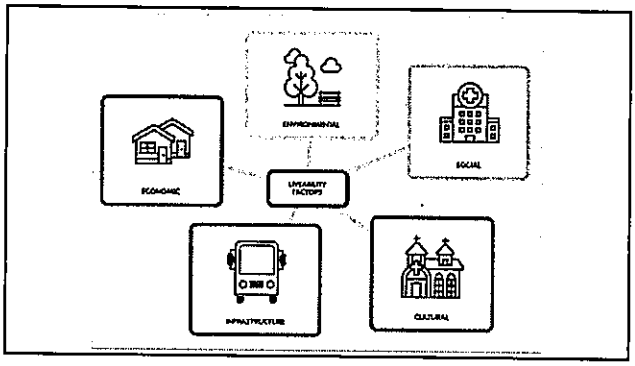
What does Oran Park have to offer?



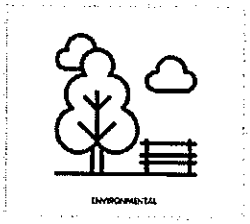
Factors that affect liveability in Oran Park



ORAN PARK TOWN

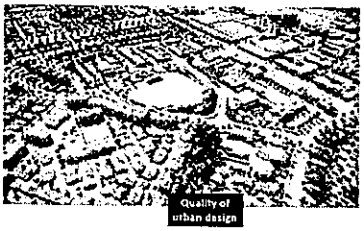


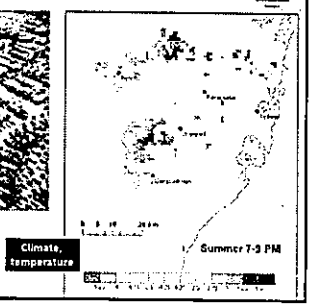
Environmental factors

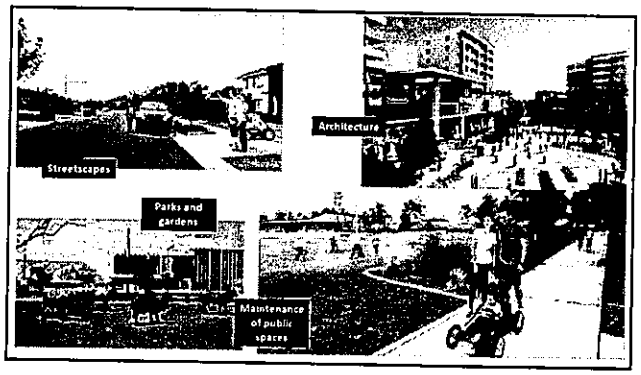


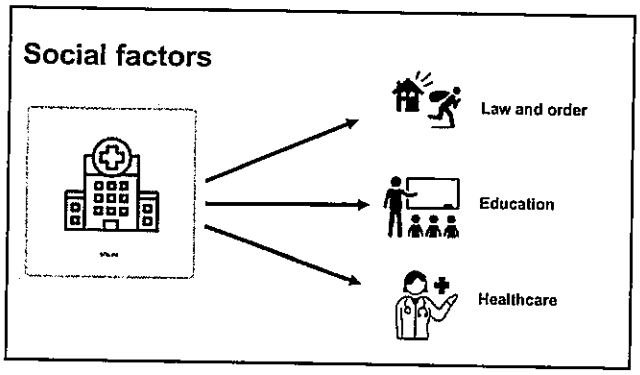
- Climate: temperature and humidity
- Quality of urban design
- Architecture
- Streetscape
- Parks and gardens
- Maintenance of public spaces

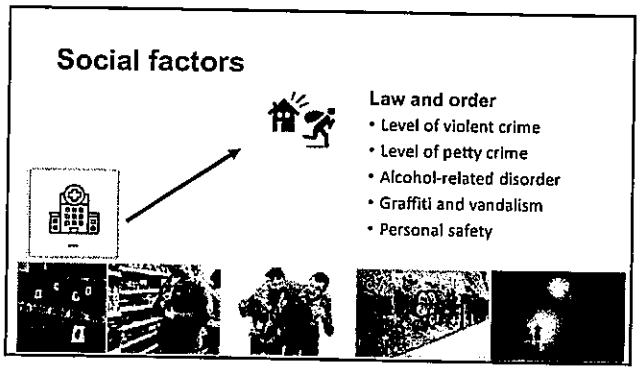
Environmental factors

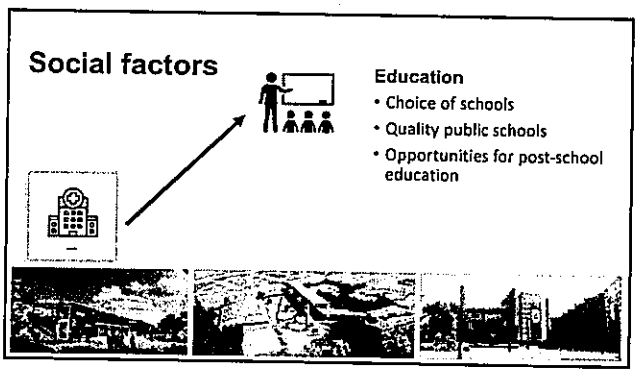


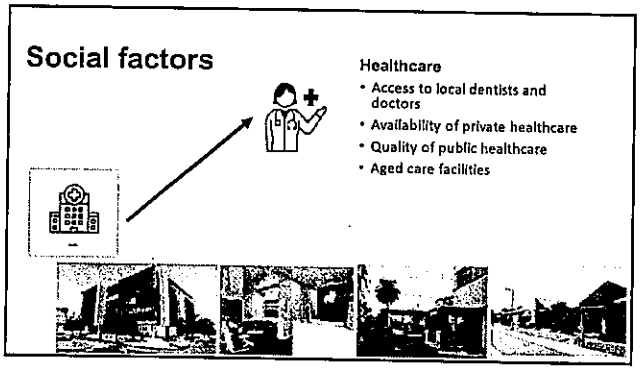


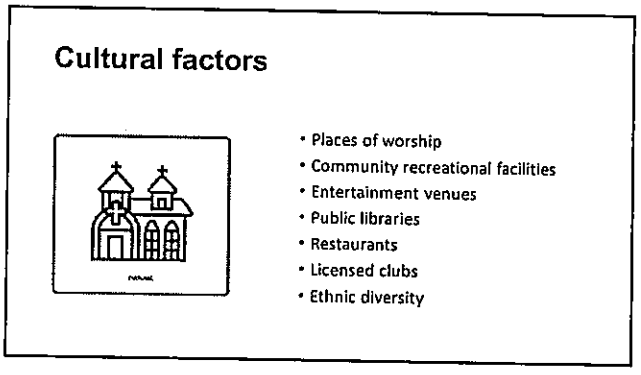

Streetscapes
Architecture
Parks and gardens
Maintenance of public spaces

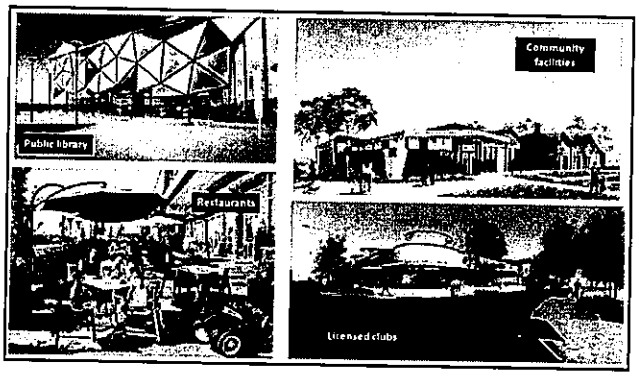

Social factors
Law and order
Education
Healthcare

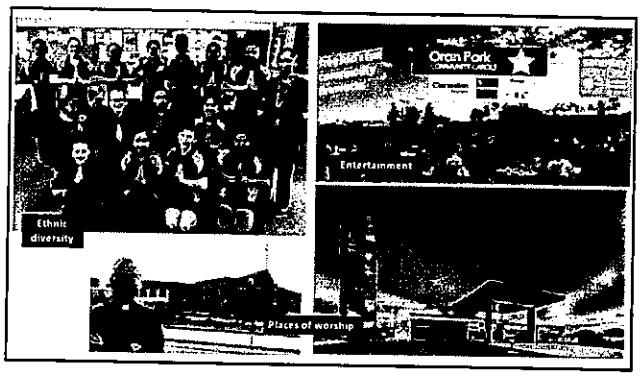

Social factors
Law and order
• Level of violent crime
• Level of petty crime
• Alcohol-related disorder
• Graffiti and vandalism
• Personal safety


Social factors
Education
• Choice of schools
• Quality public schools
• Opportunities for post-school education


Social factors
Healthcare
• Access to local dentists and doctors
• Availability of private healthcare
• Quality of public healthcare
• Aged care facilities

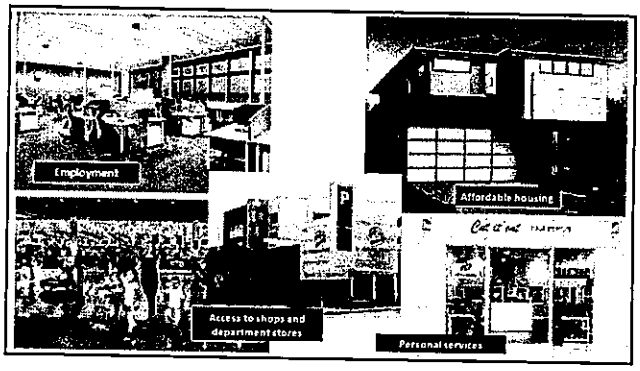

Cultural factors
• Places of worship
• Community recreational facilities
• Entertainment venues
• Public libraries
• Restaurants
• Licensed clubs
• Ethnic diversity



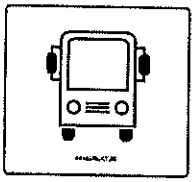


Economic factors

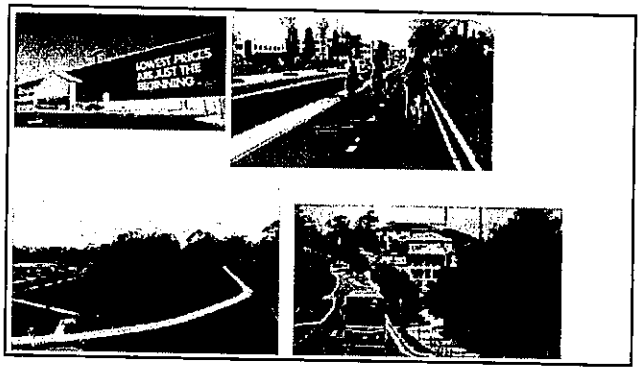
- Employment opportunities
- Affordable housing
- Access to shops and department stores
- Service stations and mechanics
- Hardware outlets
- Personal services such as hairdressers



Infrastructure factors



- Quality of road access
- Availability of public transport
- Transport interchanges and commuter parking
- Quality telecommunications
- Infrastructure
- Reliability of utilities – water, electricity, sewage
- Cyleways and pathways
- Maintenance of public schools

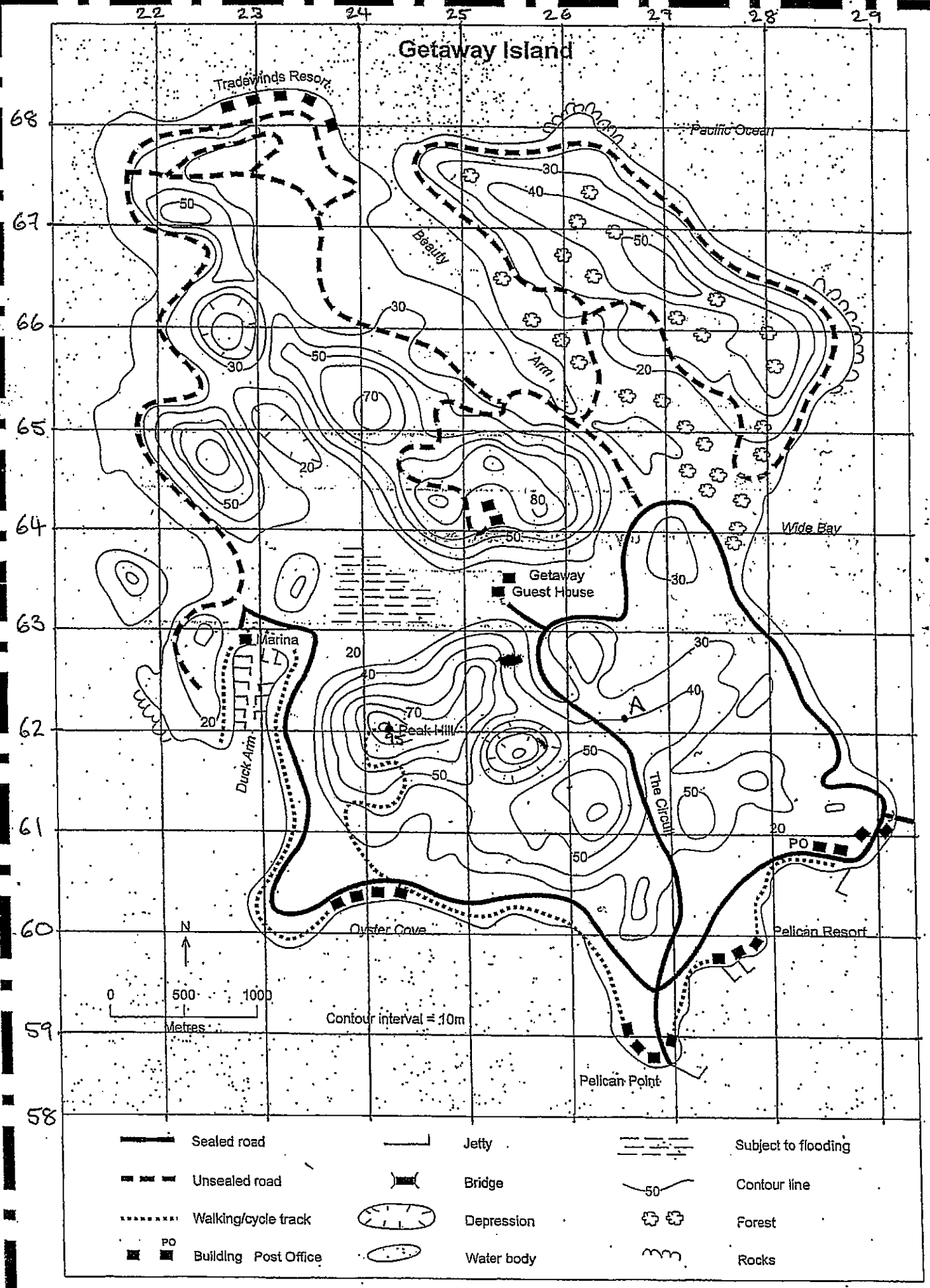


What factors enhance liveability at Oran Park?

ORAN PARK TOWN

What factors reduce liveability at Oran Park?

21 Base map – Getaway Island



Getaway Island Activities:

1. What type of map is *Getaway Island*?

   _____

2. What is the contour interval of this map? Explain the 2 ways you can work this out

   _____

3. What is the spot height of Peak Hill?

   _____

4. What is the scale of this map?

   _____

5. What human activity is located at:
   a) AR2262 – _____
   b) AR2758 – _____

6. Use the legend to identify the physical features at:
   a) GR253634 - _____
   b) GR284609 - _____

7. What is the height of the land at
   a) Point A - _____
   b) GR229656 - _____
   c) GR240602 - _____

8. What is the direction of
   a) Peak Hill to the Marina - _____
   b) Marina to Wide Bay - _____

9. Describe (features, direction, topography of the land) your journey if you travelled from Peak Hill to Duck Arm

   _____

   _____

   _____

Year 7 work for English

- Students have an assessment task to work on. (See attached.)
- There is a scaffold booklet to help them with each section of this assessment task. The can choose to use the scaffold booklet or they can work independently on each section of their assessment.
- If they finish the task there are some literacy exercises for them to work on.
- If they finish the literacy exercises we would suggest reading a book or articles of their choice.

English Faculty

Year 7 Assessment Task 1

Term 1 2020

STUDENT NAME	CLASS

DETAILS

Topic: *Identity – Self, School and Community*

Due date:	**Date of issue:**
23rd March, 2020 7A, 7D, 7E, 7G, 7P, 7S, 7T 24th March, 2020 7Q	9th March, 2020 7A, 7D, 7E, 7G, 7P, 7S, 7T 10th March, 2020 7Q

Type of task: Portfolio of work (reading and writing)

TASK DESCRIPTION

This term in English, you have been studying the topic *Identity – Self, School and Community.*

In this unit, you have been learning about different ways that identity can be represented in texts. You have been using this knowledge to respond to and compose different types of texts.

For your assessment task, you are required to submit a portfolio of **four texts:**

- Letter
- Information report
- Interview script
- Descriptive passage

You will be given time during lessons to complete your texts, however, some time may need to be spent at home polishing your work.

Text One: Letter

You are to write a letter to your future self. You are to describe your hopes and wishes for the future. You are to write as if you are talking to yourself and predict what the future may bring. You will be given time in class to compose your letter.

Tips:

- Ask yourself questions
- Use the words "I hope"
- Write in the first person using the words "I and me"

Text Two: Information report

You are to compose an information report on a topic that is of personal interest to you. Your topic needs to be discussed in class with your teacher. You will have time in class to investigate, interpret research and compose your report.

Tips:

Your information report must include:

- Introduction
- Sub-heading One
- Sub-heading Two
- Sub-heading Three
- Conclusion
- Bibliography

Text Three: Interview script

You are to compose a script for an interview. You are to spend time in class researching the daily life of a 12-13-year-old person in a different country. You are then to apply this research so that you can compose an interview with an imagined young person from your chosen country. Your interview is to address both questions and answers.

Tips:

- You need to use the appropriate interview format
- You are to create a 'voice' for both the interviewer and the interviewee
- You are to ask questions that address what a day in their life would be like

Text Four: Descriptive passage

You are to compose a passage that describes one physical place in the school. You will be given time in class to explore this place and compose your piece. Your passage should be written so that the reader can imagine actually being there.

Tips:

- Use descriptive language such as adjectives
- You need to appeal to all five senses
- Choose a place that you enjoy spending time

NESA TERMINOLOGY

Apply - use, utilise, employ in a particular situation

Describe - provide characteristics and features

Interpret - draw meaning from

Investigate – plan, inquire into and draw conclusions about

Predict - suggest what may happen based on available information

MARKING CRITERIA

You will be assessed on how well you:

- structure each of your texts
- use language to express yourself
- consider the audience and purpose of your texts
- edit and publish your work

OUTCOMES TO BE ASSESSED

EN4-1A - responds to and composes texts for understanding, interpretation, critical analysis, imaginative expression and pleasure

EN4-2A - effectively uses a widening range of processes, skills, strategies and knowledge for responding to and composing texts in different media and technologies

EN4-3B - uses and describes language forms, features and structures of texts appropriate to a range of purposes, audiences and contexts

EN4-8D - identifies, considers and appreciates cultural expression in texts

SUBMISSION INSTRUCTIONS

You are to hand your assessment task to your teacher **during your English lesson** on the due date that relates to your class. Any submissions after this time will be considered to be late.

You are to submit your portfolio on paper (either handwritten or typed).

What do I do if I am absent?

If you are absent the day of an assessment task or examination, you MUST:

- report to the teacher or head teacher of the faculty on the first day of return to school
- supply a suitable explanation e.g. letter, doctor's certificate

The Head Teacher will decide and advise you whether:

- you will sit for a substitute task, OR
- can submit the task late, OR
- be given an estimate, OR
- the task will be recorded as a Non-Attempt

MARKING GUIDELINES

Outcome	Grade	Performance Descriptor
EN4-1A - responds to and composes texts for understanding, interpretation, critical analysis, imaginative expression and pleasure	A	Composes a range of texts that demonstrate an outstanding and sophisticated use of tone and structure
	B	Composes a range of texts that demonstrate a highly accomplished use of tone and structure
	C	Composes a range of texts that demonstrate appropriate tone and structure
	D	Composes texts that show a basic use of tone and structure
	E	Composes texts that show a limited use of tone and structure
EN4-2A - effectively uses a widening range of processes, skills, strategies and knowledge for responding to and composing texts in different media and technologies	A	Presents a portfolio of texts that reflect an outstanding ability to plan, draft and edit responses to create polished texts
	B	Presents a portfolio of texts that reflect a highly developed ability to plan, draft and edit responses to create polished texts
	C	Presents a portfolio of texts that reflect a sound ability to plan, draft and edit responses to create polished texts
	D	Presents a portfolio of texts that reflect a basic ability to plan, draft and edit responses to create polished texts
	E	Presents a portfolio of texts that reflect limited ability to plan, draft and edit responses to create polished texts
EN4-3B - uses and describes language forms, features and structures of texts appropriate to a range of purposes, audiences and contexts	A	Demonstrates skilful control of language appropriate to audience and purpose
	B	Demonstrates highly effective control of language appropriate to audience and purpose
	C	Demonstrates satisfactory control of language appropriate to audience and purpose
	D	Demonstrates basic control of language with minor consideration of audience and purpose
	E	Demonstrates limited control of language with little or no consideration of audience and purpose
EN4-8D - identifies, considers and appreciates cultural expression in texts	A	Composes texts that skilfully consider cultural expression
	B	Composes texts that thoughtfully consider cultural expression
	C	Composes texts that appropriately consider cultural expression
	D	Composes texts that attempt to consider cultural expression
	E	Composes texts that make little or no attempt to consider cultural expression

FEEDBACK

Areas where you have performed well:

-
-
-

Areas where you need to improve:

-
-
-

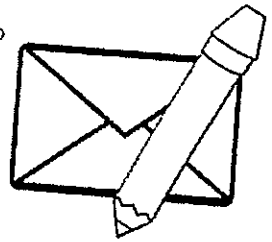
Strategies to help you improve:

-
-
-

Letter to Myself

A LETTER TO MYSELF

Directions: Write a letter to your future self, to be opened and read at the end of the school year. Use the guidelines below to help you compose your letter. During the last week of school, you will look back to see how much you have grown throughout the school year!



Guidelines:

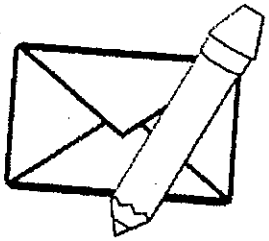
- Remember to use proper letter format (include the date, a greeting, and a closing)
- Be mindful of spelling, grammar, punctuation, and capitalization.
- Your letter should address all of the following questions:

1. What do you like and dislike about school?
2. What is your favorite and least favorite subject?
3. What are you good at? What is difficult for you?
4. What are you looking forward to this year?
5. What would you like to learn?
6. What are your goals for the year?
7. How will you reach your goals?

- Ask someone to help you edit and revise before publishing a final draft.
- Place the letter in an envelope to read at the end of the year!

A LETTER TO MYSELF

Directions: Write a letter to your future self, to be opened and read at the end of the school year. Use the guidelines below to help you compose your letter. During the last week of school, you will look back to see how much you have grown throughout the school year!



Guidelines:

- Remember to use proper letter format (include the date, a greeting, and a closing)
- Be mindful of spelling, grammar, punctuation, and capitalization.
- Your letter should address all of the following questions:

1. What do you like and dislike about school?
2. What is your favorite and least favorite subject?
3. What are you good at? What is difficult for you?
4. What are you looking forward to this year?
5. What would you like to learn?
6. What are your goals for the year?
7. How will you reach your goals?

- Ask someone to help you edit and revise before publishing a final draft.
- Place the letter in an envelope to read at the end of the year!

A Letter to Myself

Write a letter to yourself that you can read at the end of the year. It will be really interesting to see how much you have changed and achieved in one school year.

Take notes under these headings to help you write your letter.

Your likes/dislikes about school:

Your favourite/least favourite subject:

Things you are good at:

Things you find challenging:

A Letter to Myself

Is there anything you would like to learn or are looking forward to learning?

Do you have any goals for this year?

How will you reach your goals?

"Letter to Myself" Task

For this task you will be writing a letter to your future self, sealing it in an envelope and getting it returned at the end of the year. I suggest that you write at least 1-2 pages to your future self. You must write in paragraphs.

Here are some thoughtful topics you should address:

ME, NOW: my hopes, fears, dreams, intentions, goals, problems, concerns, likes, dislikes, joys, frustrations; what I like about myself; what I don't like about myself; what I'm proud of; what I think about; what bothers me; who I am, etc.

- **MY WORLD:** a description of my home, bedroom, school, neighborhood, town; my favorite places to go; chores, allowance, pet(s), possessions, clothes, religion, current events; **FAVORITES:** books, music groups, movies, TV, etc. Include a map of your room, street, etc.

- **WHAT I DO:** my hobbies, pastimes, sports, school activities; what I do when I'm alone; what I do with friends; favorite snacks and foods; chores; how I spend my weekends and vacations; special activities I do, organizations I belong to, etc.

- **PEOPLE IN MY LIFE:** my family, siblings, aunts and uncles, grandparents, friends, best friend(s), teachers, the opposite sex, "him" or "her," who I like, people I'd like to know better, people I admire and respect, important people in my life, people who annoy me, etc.

- **MY PAST:** where I was born, where I lived, growing up, childhood accidents, childhood memories, schools I attended, previous pets, trips I've taken, important events in my life so far, former friends, former teachers, teams I played on, previous romances, etc.

- **MY FUTURE:** predictions, what I want to do, my long range goals, what I'm looking forward to; what I'm dreading; my goals, my hopes and fears for the world; summer vacation, high school, college, marriage, employment, etc.

Name: _____

A LETTER TO my FUTURE self

Write a letter to your future self to be opened and read on the last day of school. Be sure to answer each of the following questions so you can see how much you've learned and grown by the end of this school year. *Remember to use proper letter format (include a greeting, the date, and a closing). Include proper punctuation like capitalization and periods.

- ❑ What do you like and dislike about school?
- ❑ What are you looking forward to this year?
- ❑ What is your favorite subject? Why?
- ❑ What subject is difficult for you? Why?
- ❑ What are your strengths in school? What are your talents outside of school?
- ❑ What would you like to learn this year?
- ❑ What are your academic goals? What are your goals outside of school?
- ❑ How will you work to successfully reach your goals?

Information Report

INFORMATION REPORT - Scaffold

Introduction

The purpose of this report is to ...

List points in order using the words firstly, secondly and thirdly to start your sentences (one sentence per point)

Body Paragraph 1 -Subheading 1

Discuss Topic 1 in paragraph form (topic sentence, expand, give evidence/provide an example, explain, conclude paragraph).

Body Paragraph 2 - Subheading 2

Discuss Topic 2 in paragraph form (topic sentence, expand, give evidence/provide an example, explain, conclude paragraph).

Body Paragraph 3 - Subheading 3

Discuss Topic 3 in paragraph form (topic sentence, expand, give evidence/provide an example, explain, conclude paragraph).

Conclusion

This report has shown that ...

List your points in order using the words firstly, secondly and finally to start your sentences.

INFORMATION REPORT – Sample/Example

Oodgeroo Noonuccal – An Australian Poet

Introduction

The purpose of this report is to provide information about the Australian poet called Oodgeroo Noonuccal. Oodgeroo was previously known as Kath Walker. She wrote many intriguing poems and many children study her poetry at school. Oodgeroo had an interesting childhood, she used poetry to express messages and one of her poems is called, "Then and Now."

Oodgeroo's Childhood

Oodgeroo was born in 1920. She grew up on Stradbroke Island in Queensland. She was an Indigenous Australian and was of the Noonuccal tribe. She left school when she was thirteen because she had to support her family. She worked as a house keeper/servant. When she was sixteen she wanted to become a nurse but she was not allowed to study nursing because she was Aboriginal. She served in the women's service of the army in World War II as a telephone operator.

Poetry and Oodgeroo's Message

Oodgeroo became involved in Aboriginal rights after the war. She wanted to change the way society treated Indigenous Australians and stop the racism. She wrote poems to express her message. Her poems are about Indigenous Australians maintaining faith in their traditions and culture despite racism, losing land and changing times.

A Poem – "Then and Now"

"Then and Now" is a poem Oodgeroo wrote. It is quite moving. It is about experiences with her tribe and she compares her memories to the present day. She longs for the past, a time when she felt free to be herself, and values her culture. An important line in the poem is, "Better when I had nothing but happiness." This tells readers she misses the past, when she did not have to live in the city or wear shoes and dresses.

Conclusion

Oodgeroo Noonuccal is an amazing Australian poet. She led an interesting life, expressed her strong views in her poems and wrote "Then and Now." Sadly, Oodgeroo passed away in 1993. All Australians should read her work.

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Interview Transcript

LEIGH SALES: What was your childhood like in Australia? Did you fit in? Was it an easy childhood? Did you adapt once your family settled in?

ANH DO: Yeah, I mean, you know, there's differences and all that, but it's all part of the fun, isn't it? I was a Vietnamese kid with a mullet hair cut. I had all Westie mates, and, geez, a Vietnamese guy with a mullet doesn't work; no wonder I couldn't get a girlfriend for so many years.

LEIGH SALES: You did a law degree. I know a lot of comedians with law degrees. What is so unappealing to people about the law that it's preferable to stand up in front of a drunken crowd and try to make people laugh?

ANH DO: Well, I reckon a lot of people go into law... like, I went into it after watching movies like a Few Good Men. Tom Cruise, "You can't handle the truth!" and being all cool and performing. It's not like that at all. You're going through contracts that thick, and then you discover stand-up and you go, "Hey, wait a minute, this is like that." And that's why I reckon a lot of lawyers turn into comedians.

LEIGH SALES: So how did you discover stand-up?

ANH DO: I was just sort of watching stand-up with some friends and my friend, he turned to me and said, "You're funnier than this guy, Anh." And I said, "No, I'm not." But in my head I went, "I reckon I am". The next time we went to see stand-up, I put my name down to go up and do a little stage-time, and it went well from there.

LEIGH SALES: We should take about your dad - we've talked about your mum, obviously, who is a very central figure in your life - but your dad less so. Why is that?

ANH DO: My father, he left the family when I was 13, so mum looked after us. I didn't see my father for many years, you know, until I was 22 years old. When I was a kid my father used to say "Anh, if you find the right woman marry her, look how happy me and your mum are." He loved my mum very much, but a little thing called the Vietnam War got in the way and he started drinking and he left the family. Now he's matured and he's a great guy, you know. I missed him very much and didn't talk to him for eight, nine years, but I'm really glad I've reconnected with him.

LEIGH SALES: Yesterday, the Government announced its so called "Malaysia solution". You've always been pretty keen not to buy into the politics of the whole asylum seeker issue, and that's obviously a very deliberate choice that you've made. Why is that?

ANH DO: Because I don't know enough about all the policies and... do you know what I mean? And people will quote me. I'm not really interested in politics at all, so I kind of just stay out of it.

LEIGH SALES: Do people pressure you at all to be like a refugee advocate, or do you see yourself in that way at all?

ANH DO: Yeah, people do pressure me lots. Just like you're doing now a little bit.

LEIGH SALES: No, I mean to be sort of a spokesperson for that cause, if you know what I mean?

ANH DO: Yeah, definitely, definitely. I do a lot, and I don't want to because I'm a comedian and, you know, that's... I'm much more comfortable making people laugh than being a political activist or, you know, something that carries more responsibility. That's why I wouldn't have made a good lawyer. I don't like the responsibility.

LEIGH SALES: Do you ever wonder how your life might have turned out if your parents hadn't had the courage to get on that boat?

ANH DO: Yeah, I do, I do. They had to because, you know, because of their association with the ANZACs and the Australians, their lives were in danger. But I go back to Vietnam and my mum goes back, and she works for charities, and I do a little bit too... and we're very grateful, you know, I'm very grateful that I'm here, very, very much so.

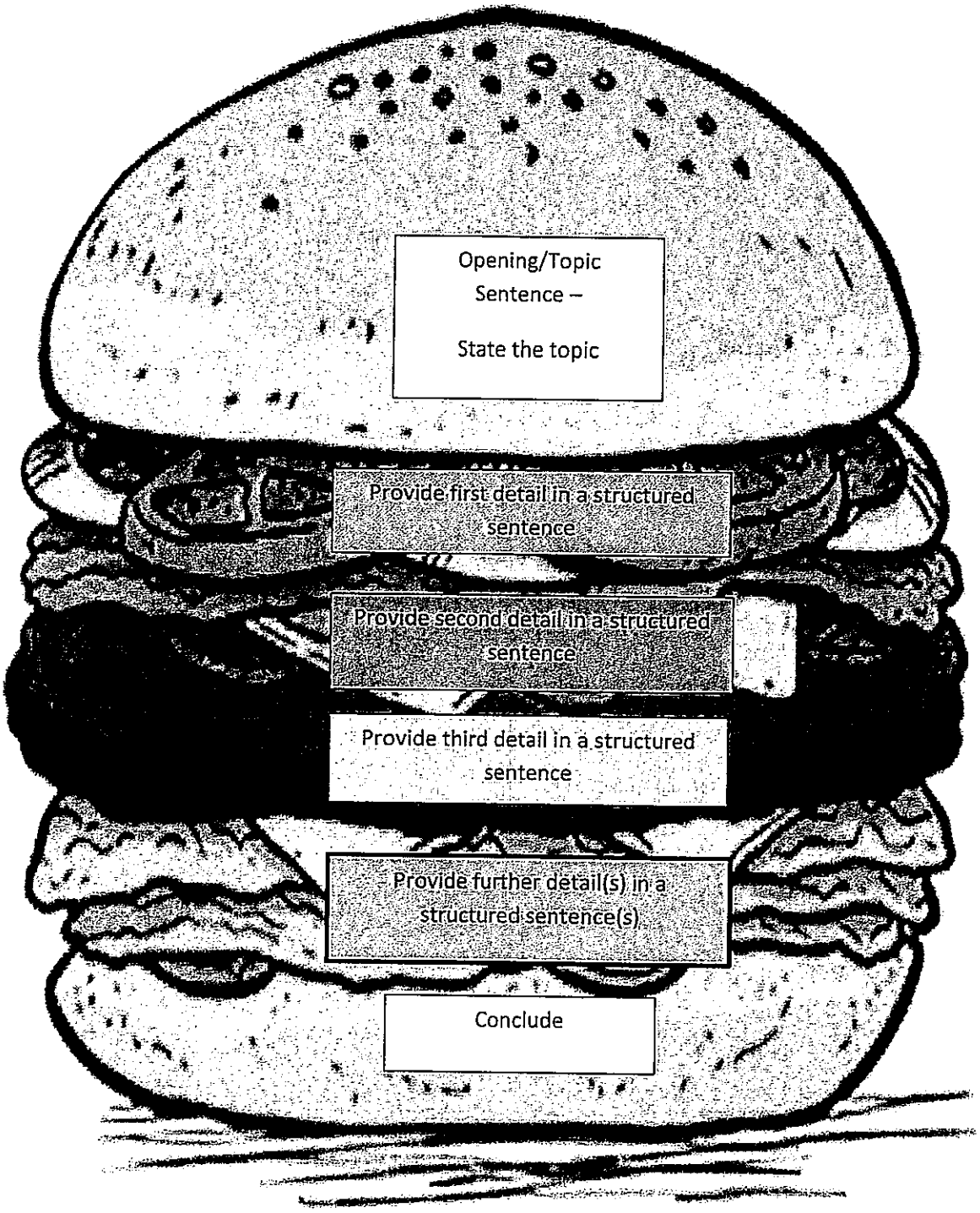
LEIGH SALES: Anh Do, congratulations very much on your award and thanks for making time to speak to us today.

ANH DO: Thank you, Leigh.

Descriptive Paragraph

DESCRIPTION

The purpose of a Description is to provide detail to to show the reader what you are referring to. Use detail and words to allow the reader to picture what you are describing. A description is the organised manner in which the details are presented (usually in the form of a paragraph).



DESCRIPTION - Scaffold

Opening Sentence

Start the paragraph with a topic sentence that identifies the item/topic/subject and (if necessary) explain the significance of this .

Continue your paragraph by describing the item in three to five sentences. Focus on one detail per sentence. (Consider – appearance, texture, scent, sound, taste)

Detail 1 –

Detail 2 –

Detail 3 –

Detail 4 –

Detail 5 –

Conclude

Finish the description with a closing remark.

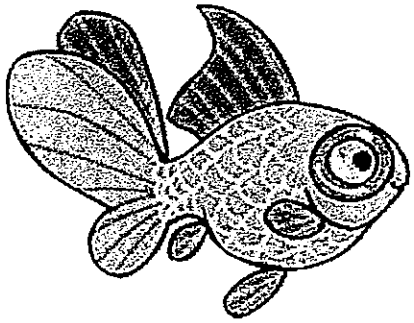
DESCRIPTION –Sample/Example

Descriptive Paragraph

The following paragraph, titled "My Pet Goldfish," follows the basic structure of opening/ topic sentence, supporting sentences (about the details), and a conclusion.

My Pet Goldfish

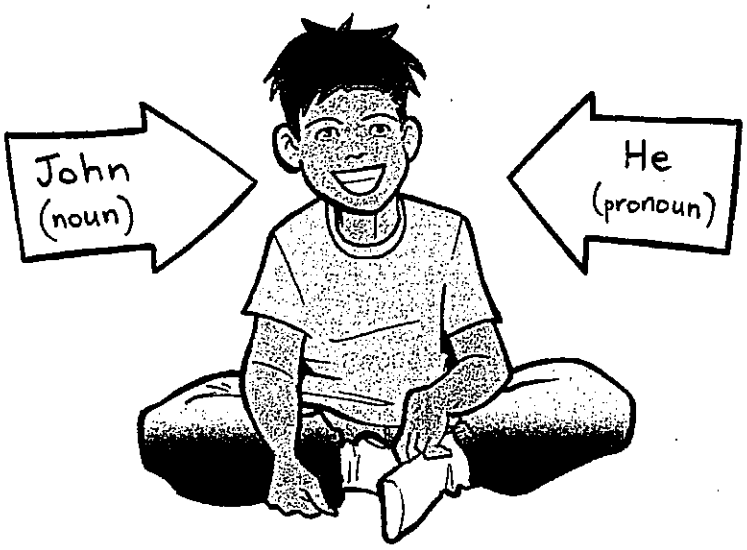
In the rectangular tank on top of my bookshelf swims my delightful pet goldfish, Jelly. His tail is quite long and delicate. It is now grey and white in colour with white tips on the end as he is getting older. His body is rather pudgy and covered in scales that are bright orange like the sunset. They gleam and sparkle as he moves through the water. His eyes are bulging and look like two small balloons that protrude out of his tiny face. Just below his eyes is his wide mouth that gulps in water and spits out small bubbles of air that float to the top of the tank in a rush. The fish is quite pretty but aging. He is a friend I will forever treasure as he is always there and listens to every story I tell.



UNIT 2 PRONOUNS

Pronouns stand in place of **nouns.**

Example
John is a young boy. John is only three years old.
John is a young boy. *He* is only three years old.



The word *you* can stand for one or more than one. 'Both of you can go.'

Personal pronouns refer to people, animals or objects.

Examples
Mary hit the ball. *She* hit *it.* Bill and Bob caught a lizard. *They* put *it* in a box.
Mr and Mrs Black went to see a film. *They* enjoyed *it.*

The **doers of the actions** (Mary, Bill and Bob, and Mr and Mrs Black) are called **subjects.** The pronouns (she, they and they) that replace them are **subjective pronouns.** The **receivers of the actions** (ball, lizard, film) are called **objects.** The pronouns (it, it and it) that replace them are **objective pronouns.**

Person	*Subjective (doer)*	*Objective (receiver)*	*Possessive (owner)*
First person singular – one of	I	me	my/mine
Second person singular – one of	you	you	your/yours
Third person singular – male	he	him	his
Third person singular – female	she	her	her/hers
Third person singular	it	it	its
First person plural – more than one	we	us	our/ours
Second person plural – more than one	you	you	your/yours
Third person plural – more than one	they	them	their/theirs

Always check that your meaning is clear when you use pronouns.

Example
'Jack told Andrew that *his* father had met with an accident.'

It is unclear whose father has had an accident. Punctuation and direct speech would make the meaning clear.

This is clearer:

Jack told Andrew, 'Your father has met with an accident,' or
Jack told Andrew, 'My father has met with an accident.'

Sometimes using pronouns can make your meaning unclear.

Other types of pronouns

Emphatic pronouns are used to emphasise the involvement of the person or thing named by the subjective (doer) pronoun.

Person	Singular	Plural
First	myself	ourselves
Second	yourself	yourselves
Third	himself herself itself	themselves

I *myself* saw him push her out of line.
We shall plan our holiday trip *ourselves*.
You must clean up your room *yourself*.
You must provide the backpacks *yourselves*.
My brother blamed me, but he did it *himself*.
They had to carry their luggage *themselves*.
The girl insisted she wanted to go by *herself*.
The watch *itself* was of little value.

Note: These same words can also act as **reflexive pronouns** when the subject of the verb (the doer) is also the object (the receiver) of the verb.

He shot *himself*.
I hurt *myself*.

Interrogative pronouns ask **questions**. They interrogate.
For people, use *who, whom, whose*.

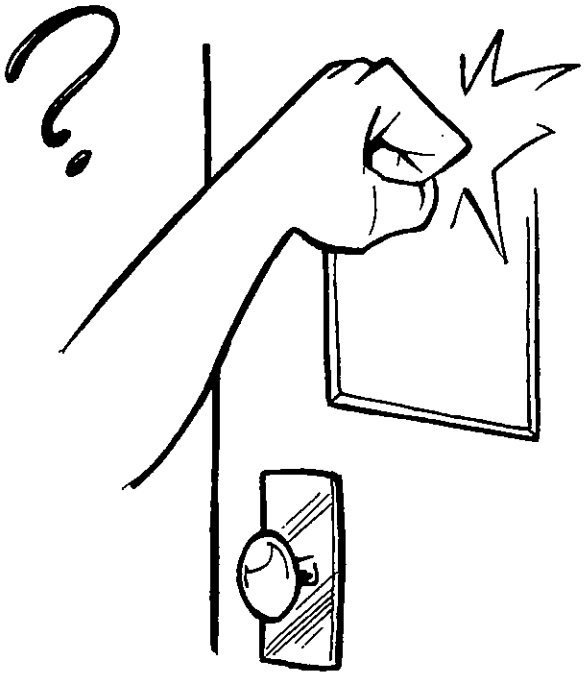
Who is knocking? (subjective)
Whom did you meet in Bali? (objective)
Whose book is this? (possessive)

For things use *what*.

What was that noise?

For people or things when the choice is restricted, use *which*.

Which of you did that?



Test yourself

Subjective	Doer	I	you	he	she	it	we	you	they
Objective	Receiver	me	you	him	her	it	us	me	them

❶ Select personal pronouns from the table above to fill the gaps.

a Sandra and Troy picked some apples.

_____ found _____ in the orchard.

b Corey and David met Maria.

_____ met _____ in the mall.

c Samantha drew a picture of her dog.

_____ drew a picture of _____.

d Abdul and I met Franz and Ang.

_____ met _____ at the school gate.

e Asha ate an ice-cream.

_____ ate _____ slowly.

❷ Underline the correct pronoun in the brackets.

a (We, us) met (they, them).

b (Her, she) left (we, us).

c (Him, he) beat (me, I).

d (I, me) saw (she, her).

❸ Fill in the correct emphatic pronouns in the following sentences.

a The small boy said, 'I must learn to tie my shoelaces _____.'

b The Prime Minister _____ presented the medals.

c Although she was small, Ann opened the door _____.

d The boys insisted on cooking the dinner _____.

e 'You must solve the riddle _____,' the wizard said.

❹ Fill in the correct interrogative pronouns in the following sentences.

a _____ do you plan to meet in Sydney?

b _____ is that outside the window?

c _____ homework is this?

d _____ do you want to do next?

e _____ of you broke the window?

Writing challenge

Write a description of a party. Make sure you include a variety of pronouns in your story. When you have completed your description, underline all the pronouns. ***Example:*** We had masses of balloons. They were all the colours of the rainbow.

2 Extend yourself

Pronouns can also show **ownership**. These are called **possessive pronouns**. (Refer to the table of pronouns at the start of this unit.)

Examples
That is *my* book. That book is *mine.*
That is *our* house. That house is *ours.*

❶ Change the following sentences to match the examples above.
Example: That is *his* football. That football is *his.*

a That is your car. _____

b That is her dressing gown. _____

c That is their shop. _____

d That is its kennel. _____

e That is our town. _____

❷ Fill in the correct interrogative pronouns in the following sentences.

a _____ are you?

b _____ did you say?

c _____ bicycle is this?

d _____ of them won the prize?

e _____ are you going to meet?

f _____ do you want to do?

❸ Change these sentences as directed. (Refer to the table on page 6 if you are unsure.)
Example: Change '*He* rides *his* bicycle' (third person singular) to first person plural.
Answer: '*We* ride *our* bicycles.'

a I shall be happy to be on my own. (*Change to third person plural.*)

_____

b You are in control of your life. (*Change to first person singular.*)

_____

c They always remember to bring their sports clothes. (*Change to third person singular. Note:* This can be either *he* or *she.*)

_____

❹ Write three sentences that show emphatic pronouns acting as reflexive pronouns.
Example: They taught themselves how to ski.

a _____

b _____

c _____

Writing challenge
Write a short story about a scary adventure. Underline **subjective pronouns** in one colour, **objective** in another, **possessive** in a third colour and **emphatic** in a fourth colour.

Challenge yourself

Pronouns can be emphatic to stress an idea.
Example: I can do it *myself.*

myself yourself himself herself itself ourselves yourselves themselves

❶ Choose pronouns from the box to make these sentences emphatic.

a Mrs Smith lives right in the village _____.

b I can tie my shoe laces _____.

c She will buy all the food but you can prepare it _____.

d The train _____ was badly damaged but the passengers _____ were not hurt.

e We saw the prime minister _____, not a photograph.

❷ Insert the correct pronouns in these sentences.
Example: The secretary of the club hopes that all members will pay their membership fees promptly.

a The directors wish all _____ employees a happy holiday and hope that _____ will return to work refreshed.

b The school principal assured the parents that _____ would do _____ best to see that _____ children received a sound education.

c The art gallery is preparing for _____ annual exhibition by local artists and hopes that _____ will invite all _____ friends to attend.

❸ Complete these partly changed instructions in this way.

a You will have your deposit returned to you when you return the hire car in good condition.

When hirers return cars in good condition, _____ _____.

b When you visit the golf club you should not walk on the greens in street shoes.

Visitors to the golf club should not _____ _____.

❹ Write three short sentences, each of which should contain two interrogative pronouns.
Example: 'Who was knocking and what did he/she want?'

a _____

b _____

c _____

Interaction challenge
Use Microsoft PowerPoint to teach the class what you have learned about pronouns. Create a series of slides highlighting the different pronouns you now know about.

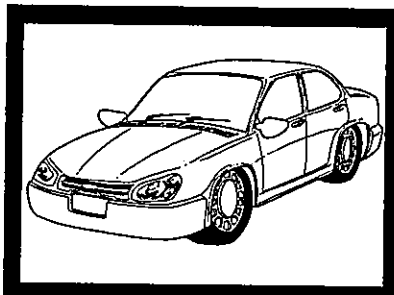
UNIT 3 VERBS AND VERB TENSES

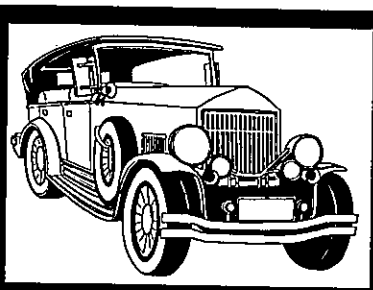
Verbs express **action**. They are *doing*, *being* and *having* words.

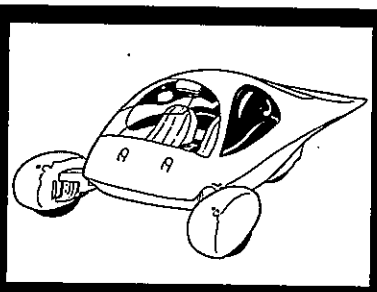
Examples
jump, think, am, exist, have, own

All verbs have a form that does not tell past, present or future. This is called the **infinitive** (of the verb). It is always made up of two words: *to* and the *verb*.

Tenses tell us when the action took place.







Present tense	*Past tense*	*Future tense*
(Happening now or from time to time)	*(Has already happened)*	*(Still has to happen)*
I run, you run, he/she/it runs	I ran, you ran, he/she/it ran	I shall run, you will run
we run, you run, they run	we ran, you ran, they ran	he/she/it will run
		we shall run, you will run, they will run

A verb can be just one word, or sometimes more than one word.
Present: I run *or* I am running (present continuous – keeps on going)
Past: I ran *or* I was running (past continuous – kept on for some time)
Future: I shall run *or* I shall be running (future continuous – will keep on)

Complete and helping verbs

Verbs can be divided into complete (finite) verbs (those that make sense on their own) and helping (auxiliary) verbs. **Helping verbs** are used to make **infinitives** or **present participles** (ending in *ing*) and **past participles** (e.g. shown, chosen, mown) into **complete verbs**.

Examples
Not 'I to make a cake' *but* 'I have to make a cake'. *Not* 'I cooking a cake' *but* 'I am cooking a cake'.
Not 'I mown the lawn' *but* 'I have mown the lawn'.

Sometimes more than one helper is needed to make a complete verb.

Example
'When he finishes the marathon James *will have been* running for over two hours.'

Types of tenses

Type	*Present*	*Past*	*Future*
Simple	run	ran	shall/will run
Continuous	is running	was running	shall/will be running
Complete (perfect)	have run	had run	shall/will have run
Complete (perfect) continuous	have been running	had been running	shall/will have been running

Functions of verbs

All verbs have specific functions called **moods**. **Verbs** change their **form** when they change their **function**. Understanding this is important.

Verbs can state facts, impose conditions or give orders.

Functions of verbs	*Present tense*	*Past tense*	*Future tense*
Stating a fact (indicative mood)	work	worked	shall/will work
Imposing limits (conditional mood)	should work would work	should have worked would have worked	should/would replaces shall/will
Expressing a command, request or entreaty (imperative mood)	Let us (let's) work (First person) Let him/her/it/them work. (Third person) Work! Come! (Second person) (the subject (you) is implied but not written)		

Examples

1 Stating a fact (indicative)

Present I walk to the shops.
Past She went to the party yesterday.
Future They will buy a new car next week.

2 Imposing limits (conditional)

Present A new car would run better than this one.
Past The light should have worked as I put in a new globe.
Future They would win more if they trained harder.

3 Expressing commands, requests, entreaties (imperatives)

Present

Let's (let us) not argue. (entreating/begging)
Come here! (command)
Please let him come to your party. (request)

① Use all present tense verbs to show what these people do.

a A plumber _____ pipes.

b An author _____ books.

c An athlete _____ races.

d A mechanic _____ cars.

e A burglar _____ from houses.

f A surgeon _____ operations.

g A surfer _____ the big rollers.

h A botanist _____ plants.

② Underline the verbs in these sentences.
(Remember that a verb can be more than one word.)

a Most test cricketers bat well.

b A guest speaker is coming to school assembly this week.

c The footballer kicked a magnificent goal.

d The camp was cancelled because of the fire danger.

③ Choose the best verb from the box to complete each sentence.

whirred grow slithered thought was climbing

a Many tall trees _____ in the Tasmanian forests.

b The mountaineer _____ in the French Alps.

c The helicopter _____ across the sky.

d I was so tired I _____ I would not be able to finish the race.

e The python _____ silently through the undergrowth.

④ Use present, past or future tense verbs to complete these sentences. (Remember that a verb can be more than one word.)

a Yesterday, I _____ the dirty car.

b Tomorrow, the weather _____ fine and sunny.

c At present, my sister _____ too young to get her licence.

d When my grandmother _____ young, she _____ in Greece.

⑤ Identify whether the following sentences are stating a fact, imposing a limit, or expressing a command, request or entreaty.

a Stop talking! _____

b He will be selected in the basketball team. _____

c You would finish your work faster if you stopped talking. _____

Writing challenge

Instruct your eight-year-old brother how to make a salad sandwich without making a mess so that your mother will not know that you have been in the kitchen. (Take care with the verb tenses.)

Extend yourself

Helping verbs

To be and *to have* make the main helping verbs (auxiliaries).

Helping verb	to be	to have
Present	am, is, are	has, have
Past	was, were	had
Future	shall, will	shall have, will have

Other helping verbs

should be/have	can	ought
could be/have	do, did	dare
may be/have	need	used
might be/have	must (have to)	

Examples

You need to do (helper + infinitive = verb) your work.
He should arrive (helper + present tense = verb) soon.
He was running (helper + present participle = verb) fast.
She had chosen (helper + past participle = verb) a book.

❶ Use a one-word verb to describe what the following do.
Example: glass breaks

a vegetables _____ **b** bees _____

c flowers _____ **d** ice _____

e elastic _____ **f** soldiers _____

❷ Rhyming jokes. You fill in the verb!
Example: Did you ever see a flower glower?

a Have you ever heard a deer _____?

b Have you ever seen a pig _____?

c Have you ever heard a giraffe _____?

d Have you ever heard a king _____?

e Have you ever seen a mango _____?

❸ Write a suitable sentence to illustrate the following verb functions.

a Imposing limits

_____

b Expressing a request

_____

c Stating a fact

_____

Writing challenge
Select an Olympic event and describe what happens before, during and after it.

Ordinary verbs can be **regular** – that is, they follow the same pattern for first, second and third person and most tenses (like *run*). They can also be **irregular** – that is, they change like the examples below.

Present tense	I eat	I buy	I fall	I throw
Past tense	I ate	I bought	I fell	I threw
Past participle	I have eaten	I have bought	I have fallen	I have thrown
Future tense	I shall eat	I shall buy	I shall fall	I shall throw

Participles (part verbs) can be **present**, ending in *ing* (talking, catching) or **past** with various endings (shown, crept). **Helpers** (auxiliaries) must be added to complete the verb.

❶ Complete this table. Present participles sometimes drop or double a letter before adding *ing*. Past participles have irregular endings.

Infinitive	*Present participle*	*Past participle*
to bring	bringing	brought
to choose	choosing	
to freeze		frozen
to bite	biting	
to creep		crept
to beat	beating	
to bind		bound
to drink	drinking	
to forget	forgetting	

❷ Fill the gaps below using correct verb forms. This may mean including any of those forms described on this or the preceding pages.

I *had left* school later than usual as I *had been watching* the football match in progress on the oval. Dark clouds _____ overhead. Soon lighting _____ and thunder _____. Torrential rain _____ down and soon deep puddles began _____ at the edges of the road. I _____ as rapidly as I _____ on my bicycle _____ being drenched. After I _____ home, I _____ quickly. I _____ my dog, Max, who _____ thunderstorms, _____ shelter under my bed. I _____ him out and we sat _____ together in front of the fire which _____ in the fireplace.

Writing challenge
Recount your experiences at an event such as a performance, the local show, an unusual sporting event or something else. Select verbs that give the fine frame of actions.

Wiki task
Add a table of verbs and verb tenses to your wiki. You can base the verbs you choose around your current class assignments, in all your subjects. This allows you to use the wiki for revision.

Website explorer
Use the internet to search for the most common verbs in English and see what is found.