Student Pack KS3

English

KS3

KS3 Home Learning Task Booklet

What is the point?

Home Learning is very important in English; it will help you to become a more confident learner by developing your key skills within the subject.

In English, the purpose of Home Learning is to:

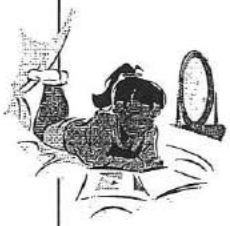
- Help you to find time and develop your love of reading outside of lessons;
- Help you to build confidence in your writing skills;
- Help you to develop your proof-reading skills, which will be crucial across all subjects and in preparation for GCSEs.

How much do I have to do?

You will have three Home Learning activities set per fortnight.

1 x Reading

20 minutes: completed books to be recorded in your reading log



1 x Improving Literacy Skills task

These tasks can be found in this booklet

1 x Lesson Based Task

Your teacher will decide on this task. It could include tasks such as: individual project work; completing class work; writing a diary entry from a character; research tasks; preparing for speaking and listening assessments and many others.

Your teacher will monitor your Home Learning tasks when they mark your books and will keep your parents informed about how much Home Learning is taking place.

What's this booklet for?

This booklet contains a selection of tasks for Improving Literacy Skills. You should complete the tasks in your exercise books, with "HL" clearly labelled in the margin. This booklet will also be available online for you and your parents to access.

Section One: Punctuation Practice

Task One

- Rewrite the following sentences, putting commas in the place where you think they should be.

1. Slow children crossing.
2. Look at that huge hot dog!
3. Go get him doctors!
4. After we left Grandma Dad and I went to the cinema.
5. James walked on his head a little higher than usual.
6. What is this thing called honey?
7. The student said the teacher is crazy.

- Now, try to alter the meaning of the sentences, by rewriting them and putting commas in different places.
- Choose one sentence and explain how moving the comma has changed the meaning of the sentence.

Task Two

a) Copy these sentences into your books, putting speech marks in the correct place:

Example: Are you coming to tuck? asked John.
"Are you coming to tuck?" asked John.

1. Beckham is a great free-kick taker, said Joe.
2. No he isn't, argued Pete.
3. Joe replied, but he kept us in the World Cup, he's brilliant.
4. Well, he's not as good as Lampard, said Pete
5. You're talking rubbish! Joe shouted back.

b) Sometimes, what one person says in one go is broken up by narrative (story) ...

Example: Well, I had no idea you felt like that!

said Clare,

"Well," said Clare, "I had no idea you felt like that!"

Now try adding speech marks in these sentences ... be careful!

1. Hello, said Andy, I haven't seen you about in ages.
2. No, replied Nicky, I've just got back from holiday.
3. Where did you go? Andy asked. Was it sunny?
4. I went skiing with the school, Nicky grinned. It was fantastic but really cold.
5. I've always wanted to go. Was it difficult staying on the skis?

Use linguistic, grammatical, structural and presentational features to achieve particular effects.

SECURE THERAPY

Breaking down the skill:

- I have a good knowledge of literary devices and use some of them to create effects in my writing.

TASK 1. Revise the four major word classes by studying the table below.

Type of Word	Definition	Examples
Noun	Words which name a person, object, place, thing or abstract concept.	John, table, Spain, love
Adjective	A word which describes or gives more information about a noun.	Big, wooden, exotic, passionate
Verb	A word used to describe an action, state or occurrence.	Run, is, went
Adverb	A word used to give more information about a verb.	Quickly, suddenly, gently.

TASK 2. Using your knowledge of the above, tick the correct box to indicate the class of the words in the left-hand column.

	Noun	Adjective	Verb	Adverb
Amy				
Terrible				
France				
Overpriced				
Mouldy				
Saturday				
Camera				
Hesitated				
Slowly				
Contemplate				
Stroll				
Miserably				

TASK 3. Now use the table below to revise some possible sentence structures for creating vivid descriptions.

Use a **one-word** sentence.	**Perfect.**
Start one sentence with an **adverb + comma**.	**Gently, the wind whispered through the trees.**
Start one sentence with an **adjective + comma**.	**Stunned, I gazed out to sea.**
Always start one sentence with an – **ing verb + comma**.	**Rolling as far as the eye could see, the sand was a crisp white.**
Always use at least one drop-in **who** clause.	**The locals, who are very relaxed, ride everywhere on bicycles with baguettes in their baskets!**
Always use at least one drop-in **which** clause.	**A serene evening, which was very warm, melted our hearts.**

TASK 4. Now think about a place where you have been on holiday. Use the structures above to write a paragraph describing your memorable place, ticking them off as you go. You do not have to use the sentences in the order they appear above and you may add other sentence structures.

WORD BANK

POSITIVE: Drift, paradise, sunshine, serene, golden, breeze, whisper, relaxing, cooling, warmth, breathtaking, dazzling, stunning

NEGATIVE: Monotonous, terrifying, frightful, plain, lacklustre, bland, dull, unsatisfactory

What is description writing?

Description questions can vary, but they will always require you to create for the reader an impression of something. This means giving the reader the ability to 'feel' what the place or experience was like. The following exercises are based on WJEC style description tasks.

Example 1: Write an article describing a difficult journey that you have made.

This question tests your ability to convey an impression of places and experiences. You need to give the reader an insight into your surroundings and your feelings on the journey.

TASK 5. Match the sentences below to the correct labels.

Like a seal dragging itself across a sandy beach, I lugged the suitcases across the airport tarmac.	**Direct Speech**
The light aircraft which would transport us to the island seemed to be laughing at me as I struggled.	**Metaphor**
"We expect bad weather, so everybody fasten seatbelts," the pilot insisted monotonously.	**Personification**
The dizzying rollercoaster of turbulence lasted almost the whole flight.	**Onomatopoeia**
Crying and wailing, the propellers clawed through the thick rain and wind.	**Simile**

TASK 6. Find definitions for the following words used above:

Turbulence _____

Dizzying _____

Wailing _____

Monotonously _____

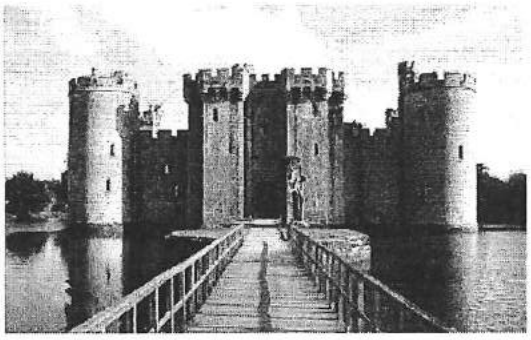
Example 2: Think about a place that is special or memorable. Write a description of the place and what makes it special or memorable.

This question tests your ability to describe a place and the emotions you connect with it. You need to give the reader an insight into the place and your feelings towards it.

TASK 7. Add examples of the techniques on the right-hand side to the boxes on the left.

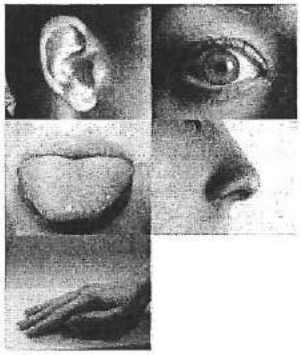
- Direct Speech
- Metaphor
- Personification
- Alliteration
- Simile

If you are struggling for inspiration, use the photographs below for ideas:



Example 3: Describe a moment in your life when you felt frightened.

This question tests your ability to convey your feelings and describe the situation which made you feel frightened.



Using the senses for effect

Good description tells us what impression the world would make on our senses. We need to consider how to convey to the reader our sense of sight, smell, sound, taste and touch.

TASK 8. *Read the following passage which describes a sailor caught in a storm.* Highlight and label where the writer uses the following features:

Sight

Sound

Touch

Onomatopoeia

Personification

Repetition

By midnight on the first night [the wind] had blown up. The barometer fell and the wind howled through the rigging. Changing sails on the foredeck was lethal. Kingfisher tried her best to cling to the water's surface while I just tried to cling to her. I was being pounded, thrown again and again on to the deck as her hull flicked up to hit me while I was slammed down by the motion of falling from the wave before – it was unrelenting. With each impact I closed my eyes and gritted my teeth, hanging on as tightly as possible. I tried everything to calm her, but the waves were enormous, and whether we charged over them or fell down them, it was going to hurt.

Ellen MacArthur, 'Taking on the World.'

TASK 9. Now let's develop some vocabulary and devices to describe your frightening moment. Fill in the blanks in the passage below, following the instructions in the brackets.

This passage is about a boy who has lost his mum in a crowd.

_____ *(adverb) I was alone – I had lost my mum. It seemed like she had*

_____ *(verb) into thin air, never to be seen again. The crowd*

_____ *(verb) me up like a* _____ *(simile). My heart beat*

_____ *(adverb) and I began to* _____ *(verb) like a* _____

(simile). _____ *(adverb) I shouted for* _____ *(noun) but none came. I gave up and* _____ *(verb) on the floor. It was hopeless. I was lost. Stunned, I* _____

(verb) at the pavement, wondering what to do. The crowds, who _____ *(verb) around me like fog on a winter's afternoon, ignored me and carried on about their business. "David,"* _____ *(verb) a familiar voice, like a* _____

_____ *(simile). I wasn't lost. My ordeal was over. Breathe.*

TASK 10. Describe a moment in your life when you felt frightened. Using the ideas and techniques you have developed, write your description below.

Continue on a separate sheet.

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Task Three

Rewrite the following sentences, putting apostrophes in the correct plac

1) My best friends sister is called Jodie.
2) I havent done my homework.
3) Mrs Williams English lessons are the best.
4) If they go down the shops theyll miss the start of the football.
5) Frank Lampards goal this weekend was brilliant.
6) There werent any eggs left after Jamie dropped the box.
7) "Youre my best friend," said Hasib.
8) Michelle shouldve caught the half-past eight bus, but she missed
9) Judys car isnt very reliable, its always breaking down.
10) Im always late for school in the mornings, its my dads fault.
11) Weve won lots of cups this year; were Worcestershires best school.
12) There arent many cars Id drive but I like Mazdas, like Miss Smiths.

Remember!

There are two types of apostrophe...

The possessive apostrophe

To show that something belongs to somebody:

Lucy's coat.
Jane's cake.

The omission (contraction) apostrophe

To show that a letter has been missed out or that a word has been shortened:

It is = It's
Can not = Can't
I have = I've

Task Four

Rewrite the following passage, putting in the correct punctuation where it is needed. See if you can spot the spelling mistakes too!

Top Tip

Begin a new sentence for a new thought. Use full stops, capital letters and commas. What someone says should go inside speech marks and when a new speaker begins to talk, this should be on a new line.

when we reached the circus we found it was really busy lots of people bumped into us including small woman who starting shouting get out of my way really loudly how rude replied my dad some children started shouting their parents told them off and they were hustled and bustled into the big top we went in too and were surrounded by rows and rows of people waiting expectantly for the show to begin i was escited that at last i would see what all the fuss was about

Task Five

Can you explain how to use the following pieces of punctuation to Homer Simpson?

See if you can write a sentence which explains, simply, the rules for each piece of punctuation:

1. Full stops
2. Capital Letters
3. Commas
4. Apostrophes
5. Speech Marks
6. **Extension:** Semi-colon

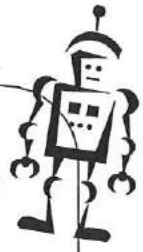
Task Six

Give a reason why each of these words begins with a **capital letter.**

a) Thomas Hardy	b) The Daily Mail	c) Fiat Uno
d) Queen Elizabeth	e) I	f) Wednesday
g) Doctor Shwarma	h) 'Neighbours'	i) Russia
j) H.M.S. Belfast	k) Manchester United	l) The White House
m) The King's Arms Hotel	n) Islam	o) The Conservative Party
p) Globe Theatre	q) 'James and the Giant Peach'	r) Nescafé

Task Seven

Rewrite the following passage, putting in the correct punctuation where it is needed. See if you can spot the spelling mistakes too!



Top Tip

Begin a new sentence for a new thought or point. Use full stops, capital letters and commas. What someone says should go inside speech marks and when a new speaker begins to talk, this should be on a new line. Remember your homophone spellings...

the iron man stood up straight slowly he turned till he was looking directly at hogarth we're sorry we trapped you and buried you shouted the little boy we promise we'll not deceive you again follow us and you can have all the metal you want brass too aluminium too and lots of chrome follow us the iron man pushed aside the boughs and came into the lane hogarth joined the farmers slowly they drove back down the lane and slowly with all his cogs humming the iron man stepped after them they led through the villages half the people came out to stare half ran to shut themselves inside bedrooms and kitchens nobody could believe their eyes when they saw the iron man marching behind the farmers at last they came to the town and there was a great scrap-metal yard everything was there old cars by the hundred old trucks old railway engines old stoves old refrigerators old springs bedsteads bicycles girders gates pans - all the scrap iron of the region was piled up there rusting away

Task Eight

Rewrite the following passage, correcting all of the mistakes that have been made. Once you have finished, highlight the changes that you have made for your teacher by underlining them or using a highlighter.

by the timje I was 7 I knew that I was the greatest footballer The world had ever seen I kneww that I wos better than pele And maradona put together. The truth is if I wanted to I could av been bought by machester united for a million Milion poundss. But I'm rich enough Already so I dont care so there id rather be the greatest teecher the world has ever seen like Iyam'

Task Nine

Rewrite this passage inserting **35** missing **capital letters**.

my cousin ella was coming from hong kong to spend christmas with us in devon. as I had never met her i was really excited. her father and mother, my uncle charles and aunt anne worked for the foreign office and they were being sent to china with british airways. ella was travelling down from london on the riviera express and we were to meet her at exeter station on the friday, the day before christmas eve. on boxing day we were going to see 'cinderella' at the theatre royal, plymouth.

Task Ten

Full stops are used to indicate the end of a sentence. They can also be used to show initials and abbreviations.

1) Write out these abbreviations in full.

a)	Capt.	b)	Rd.	c)	Hants.	d)	abbrev.
e)	Sq.	f)	anon.	g)	adj.	h)	adv.
i)	Hon. Sec.	j)	Feb.	k)	V.I.P.	l)	s.a.e.
m)	e.g.	n)	m.p.h.	o)	a.s.a.p.		

2) What do these letters stand for?

a)	B.C	b)	P.E	c)	O.B.E.	d)	G.B.
e)	M.P.	f)	H.Q.	g)	U.S.A.	h)	S.W.
i)	M.A.	j)	M.D.				

Top Tip

You might want to use a computer or somebody at home to help you do this...

Perhaps you'd like to challenge your parents or grandparents to see if they know!

Task Eleven

Punctuation scoring is an excellent way of proof-reading your writing. It will encourage you to include as much punctuation that is needed in any piece of writing.

Have a go at punctuation scoring a piece of your work that you have completed. Then, try and re-write a paragraph of the piece, including more punctuation.

Punctuation Scores

. , " " = 1 point

() ! ? Paras ' = 5 points

: ; - / = 10 points

Task Twelve

YOU NEED TO KNOW ..... A **verb** is a word for an action - 'a doing word'.

1. In these short sentences which word is the action (the **verb**)?

a) Joe helped the old woman. (What did Joe do? Answer: *helped*)
b) A tree grew in the garden.
c) Lucy won the race.
d) The cat killed the bird.
e) Kelly likes chocolate.
f) Jack reads a great deal.

The last six verbs were all single-word verbs but sometimes a verb is made up of more than one word to show a different time (**tense**) like past, present or future, as in question 2.

2. Copy each sentence and underline the verbs. Part **a** is done for you.

a) Joe <u>was helping</u> the old woman.
b) The cat had killed the bird.
c) A tree was growing in the garden.
d) Lucy will win the race.
e) Jack has read a great deal.
f) Kelly used to like chocolate.

A verb can also be a state of being – part of the verb *to be*.

This has many forms such as: (I) *am*, (you, we, they) *are*, (he, she, it) *is*, (I, he, she) *was*, (we, they) *were*, as well as *will be, was being, would have been* - all part of *being*.

3. Find the verbs in these sentences:

a) I am hungry.
b) The sky was blue.
c) Jane is sad.
d) People were waiting.
e) Ducks are funny.
f) It was open.

4. Copy out this passage and underline the 15 verbs.

Dan awoke suddenly and wondered what had disturbed him. It was dark so he switched on the lamp. Light flooded the room for a moment before the bulb exploded and it seemed blacker than before. He heard the church click strike three. He had woken at the same time the previous night. He groped his way to the window and opened the curtains. It was there again and this time it spoke.

Task Thirteen

YOU NEED TO KNOW ..... Remember the verb *to be* from the previous homework. You need to know the various forms it takes.

Present Simple Tense	Past Simple Tense
I am	I was
you (s) are	you (s) were
he / she / it is	he / she / it was
we are	we were
you (pl) are	you (pl) were
they are	they were

It is surprising how many people make **mistakes of agreement** and say things like "we was..." "they is..." "I were..." "they was ..."

1. Copy the following table and fill in the gaps.

Present	Past	Future
I walk	I walked	I will walk
She breaks	---------	----------
----------	They wrote	----------
----------	----------	They will be
He teaches	----------	----------
----------	----------	We will take
----------	It stood	----------

2. Look carefully at the Verb Table at the top of this page and choose the correct verb form in these sentences:

a) The turkeys was / were kept in a large pen.
b) I is / am / are hoping to see you soon.
c) There is / are a long row of houses.
d) Mr and Mrs Driver is living / are living at No. 1 Station Road.
e) We was / were thirty altogether in the class.

Task Fourteen

YOU NEED TO KNOW .....

An **adverb** is a word which tells us more about a **verb** (or sometimes about other words). There are various kinds of **adverb** but in these questions we shall deal with **adverbs of manner, time** and **place.**

1. In the following sentences which word tells us something about the **verb** by answering the question "How?" (The verb is underlined.)

a)	The elephant <u>wandered</u> aimlessly.	b)	The river <u>flowed</u> slowly.
c)	Theseus <u>fought</u> bravely.	d)	I want you to <u>shout</u> loudly.
e)	Wildly he <u>threw</u> his spear.	f)	Suddenly the space ship <u>was gone</u>.

2. The six words above are **adverbs of manner.** They answer the question *How ...?*
They are formed from **adjectives** by adding *–ly*.
Change these **adjectives** into **adverbs.**

bright	beautiful	immediate	direct	awkward
warm	mean	generous	spiteful	angry

When you change the following do not forget to change the *–y* into *–i.*
(happy = happily)

sunny	crazy	stony	cosy	frosty
pretty	grubby	rocky	weedy	glossy

3. These are adverbs of time or place – they answer the question *When ..?* or *Where...?* Sort them into two lists of six.

yesterday	here	soon	often	weekly	in
over	out	there	late	near	next

Task Fifteen

YOU NEED TO KNOW .....

A **preposition** is an important little word which shows the position of one **noun** or **pronoun** in relation to another. Here are some words which can be used as **prepositions:**

to, at , before, after. since, on, off, under, beneath, above, against, until, near, with, without, of, across, for, from, over, around, by, along, between, among, opposite, below, through, beside, up, in.

1. Use a suitable **preposition** from the list above to complete each of these sentences.

a) The cat sat ..... the mat.
b) The cow jumped ..... the moon.
c) Alice went ..... the looking glass.
d) E.T came ..... Outer Space.
e) Jack went ..... the hill ..... Jill.
f) 24 blackbirds were baked ..... a pie.
g) Pride comes ..... a fall.
h) Which egg fell ..... a wall?
i) The robin was a victim of ..... archery.
j) The sparrow was blamed ... the murder.
k) T.Dum was similar ..... T.Dee.
l) A spider sat ..... Little Miss Muffett.
m) O.K Cindy, you can stay ..... twelve.
n) You won't get in ..... a ticket.
o) Who set the cat ..... the pigeons?
p) Sinbad sailed ..... the sea.
q) Mrs Farmer chased ..... the rodents.
r) The rugged rascal ran ..... the rocks.

2. Which **preposition** would be most suitable to use with each of these words?

ashamed .....
according .....
prevented .....
interfere .....
rely .....
part ..... (a person)
part ..... (a thing)
blame .....
involved .....
responsible .....
apologise .....
exposed .....
afraid .....
comment .....
opposite .....
divide .....

TWO MORE RULES:

- You should never end a sentence with a **preposition**.
- After a **preposition** "who" is changed to "whom".

EXAMPLES: 'You are the person to *whom* I wrote.' is better English than:
'You are the person who I wrote to.'
She is someone *in whom* I can trust. Be careful *with whom* you talk.

4. Correct these sentences by obeying the Rules above.
   a) Miss Oliver is a teacher who I have a great deal of respect for.
   b) She is a star who there have been many rumours about.
   c) They are neighbours who there have been many disputes between.
   d) Am I the person who your remarks are aimed at?
   e) John was the boy who charges were made against.
   f) I cannot read who the letter is addressed to.

Task Sixteen

Match up the standard English version with the non standard English one

Copy this chart in your book and write the bubbles in the correct columns

Standard English	Non standard English

Now match the bubbles with the rule it goes with.

- Keep it clear and formal
- Use 'me', 'I' 'us' and 'we' correctly
- Make sure your verb (action word) matches the subject (the thing taking the action)
- Make sure your verb is in the right tense
- Don't repeat a meaning more than once in a sentence
- Avoid dialect words

Section Three: Superb Sentences

Task Seventeen

In your writing, you need to use a variety of sentences: Simple, Complex and Compound. You can use connectives to join two simple sentences together, to create a compound sentence.

1. Using *and, but* or *or* join these pairs of sentences together.
   You may leave out the words in brackets.

a)	We went to the cinema.	(We) bought some popcorn.
b)	Mike bought a cap.	It was too small.
c)	Erica caught the train.	(She) went into Birmingham.
d)	Would you like tea?	Would you prefer coffee?
e)	We found the café.	It was closed.
f)	The twins won the first set.	(They) lost the match.

> **Top Tip**
>
> *Remember that before you use some connectives, you will need to use a comma.*
>
> *Make sure you punctuate your sentences correctly at the same time!*

2. Now use *so* to join these sentences.

a)	The bus was late.	I decided to walk.
b)	The fridge was empty.	We went to a restaurant.
c)	Max did not like swimming.	He chose to go climbing.
d)	Mary had broken her ankle.	She had a home tutor.

3. Join these groups of three sentences together in a suitable order.
   Use any of these words: *and, but, or, so, because, although*

a) I broke her pencil.
I bought a new one.
I was playing with it.

b) He ran five miles a day.
Martin trained very hard.
He was not chosen for the team.

c) The weather was terrible.
We went to Bristol.
We wanted to buy a tent.

d) The shop was closed.
Mrs Vinney opened up for us.
We needed bread.

e) The plane was late.
Tom Cruise flew in from New York.
He missed the premiere.

f) Do you want it in red?
Do you like yellow better?
These are all we have.

Task Eighteen

Now try joining your sentences using a more varied range of connectives. Use *when* to join these pairs of sentences. (WARNING: They are not in the correct order.)

> **Top Tip**
> *Some of these sentences might need you to place "when" at the beginning and some might need you to place it in the middle!*
>
> *Remember to use your commas!*

I am exhausted.	We stay at Granny's house.
She always comes home.	The play ended at ten.
The heroine died.	There is time to walk the dog.
We drive to Sheffield.	I have walked home.
I get home at five thirty.	We lost interest.
We went for a meal.	The term ends.

2. Now use *while, before, after, whereas* to join these pairs of sentences. You might want to change some of the words. Remember to use commas to make sure your sentences make sense!

I was walking up the hill.	It started to snow.	(*while*)
Jan did some shopping.	Jan went to the cinema (later).	(*before*)
John is going to Spain.	We will be in France.	(*while*)
You are going to bed.	Would you like a hot drink?	(*before*)
I will have my tea.	I will go for a walk.	(*after*)
Man has two legs.	Animals have four legs.	(*whereas*)

Task Nineteen

Write down your mobile phone number. If there are any zeros in it then change these to any number of your choice between 1 and 9. If you don't have a mobile phone, use your home phone number.

1. Choose one of the following titles:

Christmas	**The Mistake**
Theft	**Loneliness**

2. Select one of the following genres:

Horror	**Fantasy**
Romance	**Comedy**

3. Write a paragraph for your selected title and genre making sure that the number of words in your sentences follows the pattern of your telephone number. For example, if your telephone number is 447798146372, then the

first sentence must contain 4 words only, the second also 4 words, the third seven words etc.

Writing under these artificial constraints will help you to focus on sentence structure. It will also demonstrate to you how varying sentence length can make your writing more interesting and can also change the mood and dramatic impact of your writing.

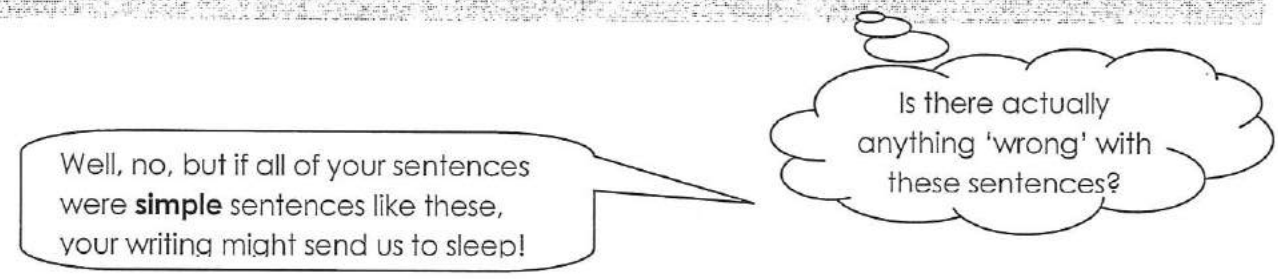
Task Twenty

Shake up your sentences? But why would you want to do that?
Does shaking up your sentences:

a) make more work?
b) make your writing more interesting?
c) make you look really clever?

Take a look at these two sentences:

The girl was walking down the street. She was singing.



Now write two simple sentences of your own. If you prefer, you can just change the details in the example.

Use the techniques below to add variety to your writing.

1. In your exercise book, use a **connective** (but, and ...) to turn the sentences into one **compound sentence:**

The girl was walking down the street **and** she was singing.

2. **Combine** the sentences and **start with a verb**.

Highlight the **verbs** (doing words) in the sentences, then reorder them. You may have to change the tense:

Singing, the girl was walking down the street.

3. Start with an **adverb.**

Add **adverbs** (words which describe or add to a verb) to your sentences and then try starting with one:

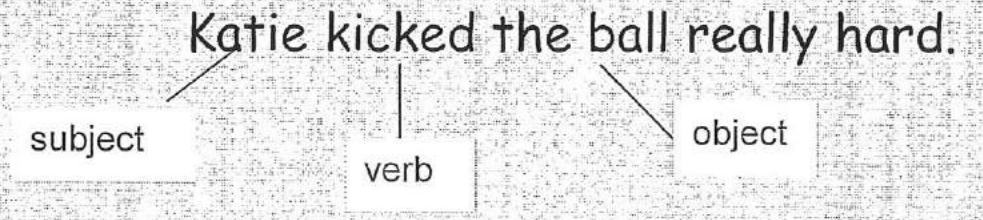
Happily starting to sing, the girl walked down the street.

Slowly walking down the road, the girl sang **loudly.**

Using a variety of these techniques will help make your writing more engaging, and your readers will stay awake!

Task Twenty-One

VERB – a doing or action word
SUBJECT – the person or thing doing the verb
OBJECT – the person or thing having the verb done to them!



Copy the following sentences into your book, using three different colours to underline the verbs, subjects and objects.

1. Imran gave Suzie some chewing gum.
2. Pete's dog dug a deep hole in the garden.
3. My dad baked a fantastic cake for my birthday.
4. Andy watched TV all night long.
5. I failed to complete my homework on time again.
6. Every July we go on holiday to Tenerife.

7. My grandad cried when he received a letter from his long lost brother.
8. Even though it was raining hard, he wanted to play football in the park.

Section Four: Spellings

Task Twenty-Two

The simple way to change **singular** (one) to **plural** (more than one) is to add *–s.*
EXAMPLES: cat becomes cats, bell becomes bells, stone becomes stones.
But ..... there are exceptions:
If a noun ends in *–s, -sh, -ch, -x,* then add *–es*

1. Bearing that rule in mind change the following singular nouns to plural:

bus,	flash,	pet,	church,	fox,
chair,	bench,	box,	boss,	rush.

If a word ends in *–y* with a consonant before it, change the *–y* into *–ies* to make it plural.
If a word ends in *–y* with a vowel before it, simply add *–s* to make it plural.

2. With that further rule in mind change the flowing singular nouns into plurals.

baby,	boy,	play,	city,	fly,
hobby,	guy,	dummy,	Saturday,	spy.

For words ending in *–f* or *–fe* sometimes we just add *–s.*
But ..... Sometimes we change the *–f* to *–v.* (Your Dictionary should tell you.)
For words ending in *–ff,* just add *–s.*

3. Using your Dictionary, if you need to, change these words to plural.

knife,	cliff,	roof,	dwarf,	leaf,
shelf,	life,	muff,	wolf,	hoof.

For words ending in a vowel plus *–o* we usually add *–s;* other words ending in *–o,* add *–es.*

4. These words follow the rule above so it should be easy for you to turn them into plural.

hero,	potato,	tomato,	domino,
folio,	stereo,	cuckoo,	echo.

5. These words are exceptions to the rules. The best way to learn them is to put them into a sentence.

radio – radios,	rodeo – rodeos,	piano – pianos,
solo – solos,	cello – cellos,	mother-in-law - mothers-in-law,
louse – lice,	cactus – cacti,	passer-by - passers-by,
mouse – mice,	sheep – sheep,	runner-up - runners-up
tooth – teeth,	volcano – volcanos, - (or volcanoes),	flamingo – flamingos. - (or flamingoes).

Task Twenty-Three

YOU NEED TO KNOW .... This rule only applies in words where the letters make an *'ee'* sound.

1. Sort these words into two lists: those that make the *'ee* sound' (9), and those that do not (6).

weight	deceive	leisure	chief	wield
retrieve	perceive	believe	height	reign
shield	conceited	eighty	skein	pieces

2. Now sort the nine words in your first list: those with *ie* (6) and those with *ei* (3).
Has the Rule worked?

3. Now complete the following words with *ie* or *ei.*

bel–f	rec—ve	v—n	shr—k	gr—f	d—sel
pr—st	f—nd	fr—nd	s—ge	hyg—ne	fr—ght
rel—ve	conc—t	h—ress	c—ling	---ghbour	sl—gh
--ght	--ther	n—ther	w—ld	d—gn	

Note there are exceptions including *seize, protein* and some names like *Neil, Sheila, Keith*
Note that words containing *ie* as two syllables do not follow the Rule.
EXAMPLES: society, aliens, science, audience, convenience, client.

4. This paragraph contains twelve spelling mistakes, all to do with *ie* or *ei.*
Find them and write out the corrected paragraph.

Sheila was only eighteen when she recieved her appointment as Hygeinic Adviser to the Liesure Division of Bradford Scientific Industries Ltd. Her freinds were iether thrilled to peices or jealous of her considerable acheivement. Shiela almost lost her pateince with her nieghbour, Beth, who said she could hardly beleive it but was releived to see her leaving to do something useful in society.

Task Twenty-Four

YOU NEED TO KNOW:
Prefixes are letters added to the beginning of words.
They frequently change the meaning to the opposite.

EXAMPLES:	healthy = *un*healthy	believe = *dis*believe
	understand = *mis*understand	convenient = *in*convenient
	logical = *il*logical	perfect = *im*perfect
	responsible = *ir*responsible	

So what are the rules for deciding which prefix to use when?

un- is the most common **prefix** and is almost always used with an **adjective.**
EXAMPLES: happy = *un*happy kind = *un*kind
(There are a few **verbs** such as do = undo, dress = undress, hinge = unhinge, but not many.)

dis- is mostly used with **nouns** and **verbs.**
EXAMPLES: able = *dis*able, *dis*ability; appear = *dis*appear, *dis*appearance

mis- does the same job as *dis-* but tends to mean 'badly'
EXAMPLES: *mis*print = to print badly; *mis*treat = to treat badly

in- is a frequent alternative to ***un-*** but there are several rules to learn about ***in-***:
in- becomes ***im-*** when used in front of *b, m* or *p.*
EXAMPLES: *im*balance, *im*mature, *im*practical

in- becomes ***il-*** when used in front of *l.*
EXAMPLES: *il*logical, *il*literate (note the double l)

in- becomes ***ir-*** when used in front of *r.*
EXAMPLES: *ir*regular, *ir*rational (note the double r)

1. Using the rules above, add the correct prefix to each of these words to make its opposite. When in doubt, look it up in the dictionary.

agree	fasten	correct	possible	legible
lead	certain	decent	personal	regular
behave	fortunate	sane	material	relevant
use	tie	direct	movable	legal
apply	conscious	secure	mortal	recoverable
match	willing	accurate	passable	resistible

2. Add the correct negative prefix to each of these words.

   Take care! – there are some "odd men out".

colour	honest	lodge	trust	wrap	connect
agree	taken	approve	comfort	known	embark
interested	place	proper	prove	illusion	order
satisfied	inform	similar	service	unite	regard
respect	loyal	address	pleased	mount	

3. These sentences contain some incorrect prefixes.
Rewrite each sentence correctly.

a) Such inmature and inconsiderate behaviour fills me with unbelief.

b) We were disinformed and given inaccurate information that the road was unpassable.

c) Misfortunately we were inconscious that the ticket was unvalid.

d) It was disbelievable that it should be unlegal because the writing was unlegible.

e) They were mistaken in imagining that the lorry involved was unmovable.

4. To these words add negative prefixes. This time they are all mixed up.
As a real test of your understanding try to do them without referring to the rules or using a dictionary.

done frequent pure qualify moral
comfort dependent obey wanted visible
convenient patient place expected believe
arm probable sensitive understood partial
audible employed responsible regard finite

Task Twenty-Five

YOU NEED TO KNOW .....

Some **Verbs** and **Nouns** can be turned into **Adjectives** by adding *–able* or *–ible*.

Unfortunately there is no rule about which to use, so you must use your dictionary to find which ending fits and then learn it.

(It may help to know that *–able* is more common than *–ible*.)

1. Turn these nouns and verbs into adjectives by adding *–able*.
honour fashion prefer laugh depend
understand reason suit perish objection
2. Change these by adding *–ible*.
digest contempt resist flex horr(or)
3. For these words you need to drop the final *-e* before adding *–able*.
move use love believe endure
value commute excite advise cure
4. The same applies to these words before adding *–ible*.
force defense reverse sense response
5. Some words ending in *–y* change the *–y* to *i* before adding *–able*.
rely justify verify vary identify
6. Most words ending in *–ation* change to *–able*.
adoration irritation variation reputation estimation

7. Words ending with a soft *–ce* or a soft *–ge* tend to keep their final *e*.

notice	manage	replace	trace	change

8. So the last list is up to you (and your dictionary)!

agree	desire	navigation	deny	misery
respect	recognise	impression	mistake	charge

Task Twenty-Six

YOU NEED TO KNOW .....

There = in that place; *their* – belonging to them; *they're* = short for 'they are'

1. Insert the correct words from the above three into these sentences.
   a) ..... are some ripe ones. Where? Over ..... .
   b) ..... books were too large for ..... bags.
   c) ..... aiming to win and ..... fairly confident.
   d) ..... sure to return to collect ..... luggage.
   e) ..... hotel is in Margate where ..... are lots of hotels.
   f) ..... looking for ..... friends up ..... on that mountain over ..... .

YOU NEED TO KNOW .....

two = 2; *too* = also/ in excess; *to* = in that direction / used with a verb.

2. As in question 1, insert the correct words and write out each sentence.
   a) ..... heads are better than one but four legs are faster than ..... .
   b) ..... much of the wrong food will make one ..... Fat.
   c) ..... quote from a famous play: "..... be or not ..... be."
   d) ..... men, travelling ..... Birmingham, went ..... far ..... Crewe.
   e) The train to London arrived at ..... twenty, ... late ..... make my interview.
   f) The ..... of us were invited ..... the other party ..... but it was all ..... much.

YOU NEED TO KNOW .....

were = past tense of are; *we're* = short for 'we are'; *where* = a 'place' word.
(Much depends on where you live and how you pronounce these words. Try to make them sound different.)

3. Sound the difference, insert the correct words and write out the sentence.
   a) ..... you asleep or ..... you awake when they arrived?
   b) ..... abroad in June but ..... hoping to be back for the wedding.
   c) The money is not ..... you said it was, so ..... is it?
   d) ..... you aiming to throw it ..... it landed?
   e) ..... you happy with ..... the trees ..... planted?
   f) ..... they ..... going last year is .... going this year.

4. This passage contains 24 errors involving the three sets of words on this page.
Rewrite the passage, underlining each correction you make.

We we're travelling too Scotland, the to of us, were their where too castles we where planning two visit. Were interested in old buildings for there history and there beauty. Edinburgh and Stirling where the too castles we we're going too see on this journey. It was two far too see the to in one or to days so we where planning two stay their for a week because there well

Task Twenty-Seven

YOU NEED TO KNOW .....

They all make the same sound (-er) at the end of words.
There are rules but they are full of exceptions, so you need to learn many of the spellings.

1. *-er* is the most common ending. It is always used to mean 'more something'.
EXAMPLES: long – longer, high – higher.
This is called the **comparative of adjectives**. Test it on these words.

short	bright	black	low	shiny	cloudy
friendly	sad	wet	hot	great	sunny
light	heavy	wise	green	fit	

2. *-er* is also common as the ending for verbs (doing words, words of action.)
EXAMPLES: wand*er*, deliv*er*
Can you solve the following?

a)	s - er (to experience pain)	b)	e - er (to go in)
c)	s - er (to throw about)	d)	b - er (to annoy)
e)	g - er (t bring together)	f)	sh - er (to break glass)
g)	c – er (think about it!)	h)	d – er (to find)
i)	h – er (to float above ground)	j)	m – er (to speak quietly)

3. Many people and their occupations end in *–er*.
EXAMPLES: plumb*er*, driv*er*, groc*er*.
See if you can solve the following.

a)	One who takes messages.	b)	One who works the land.
c)	One who makes beer.	d)	One who loads and unloads ships.
e)	One who works underground.	f)	One who organises funerals.
g)	One who works in a classroom.	h)	One who is locked up.
i)	One who serves meals.	j)	I don't know this one.

4. The *–er* ending usually follows *-ct, -at, -it, -ess, -rr.*
Try out this rule on these words:

direct -	edit -	profess -	work -	visit -	mirr –
offic -	act -	possess -	dictat -	doct -	plaster –
instruct -	solicit -	senat -	minist -	confess -	terr –
creat -	passeng –				

5. The *–ar* ending frequently follows the letter *'l'* . Try these:

regul -	coll -	circul -	simil -	schol –

6. The *–our* ending is often used with abstract nouns (things you cannot see or touch).
EXAMPLES: hon*our*, hum*our*.
Try the –our ending on these words:

fav -	rum -	endeav -	behavi -	val –

Task Twenty-Eight

One out of Three

Rewrite the following sentences, choosing out of the three words in the brackets the one which is correct for meaning and spelling.

1. I had not carried the heavy parcel long before my arms began to (*ace, ache, hake*).
2. If you bring me some flour from the shop, I can (*back, bake, beak*) some bread.
3. The (*bark, brake, break*) on his bicycle needs repairing.
4. May I please (*borrow, barrow, burrow*) your felt pens?
5. There was a loud (*chair, char, cheer*) from the crowd as the team came out.
6. We have a (*daily, dally, dale*) delivery of milk.
7. My (*dreary, dairy, diary*) gives the times of sunrise and sunset.
8. When I was not looking, John (*eight, ate, eat*) my piece of cake.
9. You ought to have a ticket to show that you have paid your (*fair, fare, fear*).
10. We have a special (*guessed, guest, guise*) for dinner today.
11. The prince is the (*hare, hair, heir*) to the throne.
12. The factory is closed and the machines stand (*idle, idol, idyll*).
13. Another egg has been (*lade, laid, laird*) in the nest.
14. The postman was late delivering the (*male, meal, mail*) today.
15. We have a secret hide-out where we (*meat, meet, mete*) every Saturday.
16. A (*nave, navy, navvy*) is a labourer.
17. The first prize in the draw has been (*one, own, won*) by ticket number seven.

18. When I was bridesmaid, I carried a (*pose, poser, posy*) of flowers.

19. This is the (*receipt, recipe, recite*) for the money you paid last week.

20. It does not (*same, seem, seam*) four weeks since we broke up for the holidays.

21. There is a weather-vane on the (*spare, spear, spire*) of the church.

22. Did you know that you have a flat (*tire, trier, tyre*) ?

23. It took me a long time to get the cotton (*though, thorough, through*) the eye of the needle.

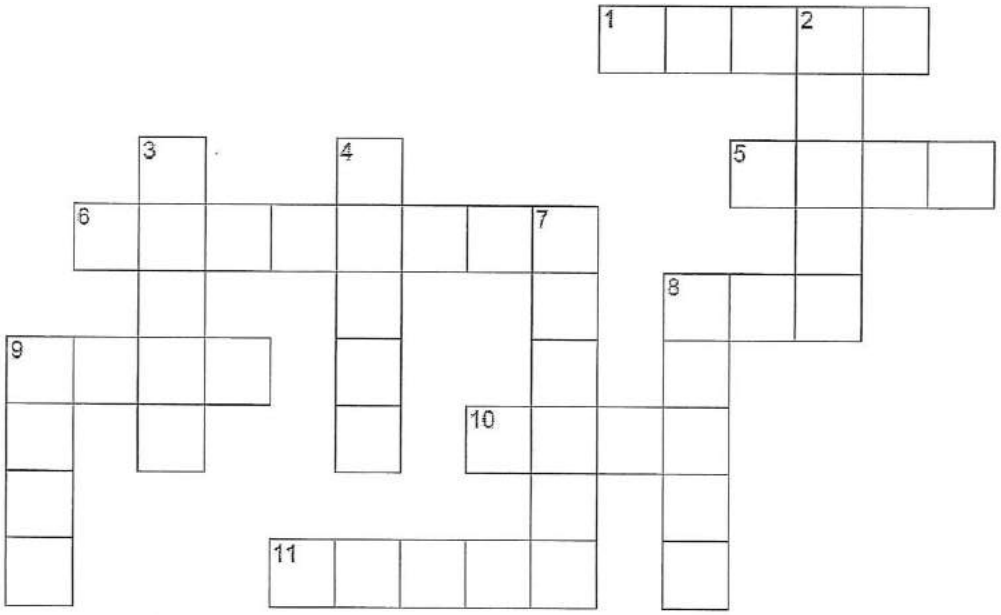
24. The bag of sugar should (*way, weigh, whey*) one kilogram.

25. Try this belt around your (*waste, whist, waist*).

Task Twenty-Nine

Antonyms

Fill in the puzzle with the words that mean the opposite.



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ACROSS

1 Opposite of Quiet
5 Opposite of Run
6 Opposite of Black and White
8 Opposite of Cold
9 Opposite of Low
10 Opposite of Go
11 Opposite of Small

DOWN

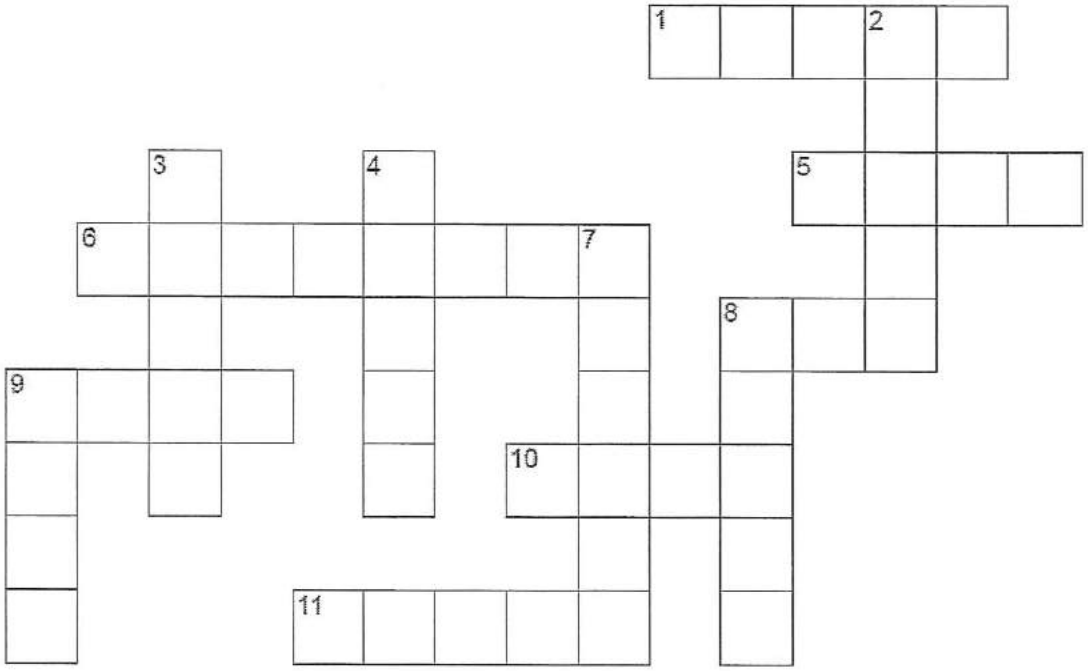
2 Opposite of Finish
3 Opposite of Smooth
4 Opposite of Smile
7 Opposite of Big
8 Opposite of Sad
9 Opposite of Soft

WORD BANK: Colorful, frown, happy, hard, high, hot, large, little, noisy, rough, start, stop, walk.

Task Thirty

Antonyms

Fill in the puzzle with the words that mean the opposite.



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WORD BANK: Colorful, frown, happy, hard, high, hot, large, little, noisy, rough, start, stop, walk.

Task Thirty-One

1. What is your favourite word? Write it in your exercise book with a reason why it is your favourite.
2. What is your least favourite word? Write it in your exercise book with an explanation.
3. Ask five people at home what their favourite words are. Write them all down with reasons why.

Use linguistic, grammatical, structural and presentational features to achieve particular effects.

SECURE THERAPY

Breaking down the skill:

- I have a good knowledge of literary devices and use some of them to create effects in my writing.

TASK 1. Revise the four major word classes by studying the table below.

Type of Word	Definition	Examples
Noun	Words which name a person, object, place, thing or abstract concept.	John, table, Spain, love
Adjective	A word which describes or gives more information about a noun.	Big, wooden, exotic, passionate
Verb	A word used to describe an action, state or occurrence.	Run, is, went
Adverb	A word used to give more information about a verb.	Quickly, suddenly, gently.

TASK 2. Using your knowledge of the above, tick the correct box to indicate the class of the words in the left-hand column.

	Noun	Adjective	Verb	Adverb
Amy				
Terrible				
France				
Overpriced				
Mouldy				
Saturday				
Camera				
Hesitated				
Slowly				
Contemplate				
Stroll				
Miserably				

TASK 3. Now use the table below to revise some possible sentence structures for creating vivid descriptions.

Use a **one-word** sentence.	**Perfect.**
Start one sentence with an **adverb + comma.**	**Gently, the wind whispered through the trees.**
Start one sentence with an **adjective + comma.**	**Stunned, I gazed out to sea.**
Always start one sentence with an – **ing verb + comma.**	**Rolling as far as the eye could see, the sand was a crisp white.**
Always use at least one drop-in **who** clause.	**The locals, who are very relaxed, ride everywhere on bicycles with baguettes in their baskets!**
Always use at least one drop-in **which** clause.	**A serene evening, which was very warm, melted our hearts.**

TASK 4. Now think about a place where you have been on holiday. Use the structures above to write a paragraph describing your memorable place, ticking them off as you go. You do not have to use the sentences in the order they appear above and you may add other sentence structures.

WORD BANK

POSITIVE: Drift, paradise, sunshine, serene, golden, breeze, whisper, relaxing, cooling, warmth, breathtaking, dazzling, stunning

NEGATIVE: Monotonous, terrifying, frightful, plain, lacklustre, bland, dull, unsatisfactory

What is description writing?

Description questions can vary, but they will always require you to create for the reader an impression of something. This means giving the reader the ability to 'feel' what the place or experience was like. The following exercises are based on WJEC style description tasks.

Example 1: Write an article describing a difficult journey that you have made.

This question tests your ability to convey an impression of places and experiences. You need to give the reader an insight into your surroundings and your feelings on the journey.

TASK 5. Match the sentences below to the correct labels.

Like a seal dragging itself across a sandy beach, I lugged the suitcases across the airport tarmac.	Direct Speech
The light aircraft which would transport us to the island seemed to be laughing at me as I struggled.	Metaphor
"We expect bad weather, so everybody fasten seatbelts," the pilot insisted monotonously.	Personification
The dizzying rollercoaster of turbulence lasted almost the whole flight.	Onomatopoeia
Crying and wailing, the propellers clawed through the thick rain and wind.	Simile

TASK 6. Find definitions for the following words used above:

Turbulence _____

Dizzying _____

Wailing _____

Monotonously _____

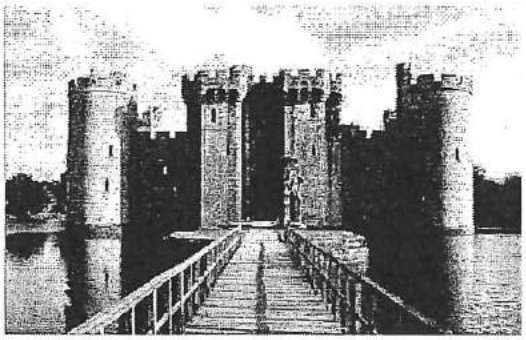
Example 2: Think about a place that is special or memorable. Write a description of the place and what makes it special or memorable.

This question tests your ability to describe a place and the emotions you connect with it. You need to give the reader an insight into the place and your feelings towards it.

TASK 7. Add examples of the techniques on the right-hand side to the boxes on the left.

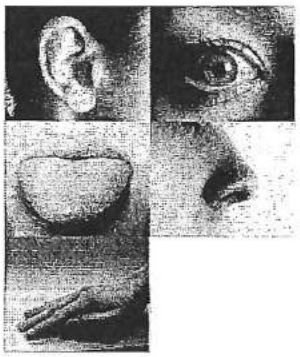
- Direct Speech
- Metaphor
- Personification
- Alliteration
- Simile

If you are struggling for inspiration, use the photographs below for ideas:



Example 3: Describe a moment in your life when you felt frightened.

This question tests your ability to convey your feelings and describe the situation which made you feel frightened.



Using the senses for effect

Good description tells us what impression the world would make on our senses. We need to consider how to convey to the reader our sense of sight, smell, sound, taste and touch.

TASK 8. *Read the following passage which describes a sailor caught in a storm.* Highlight and label where the writer uses the following features:

Sight

Sound

Touch

Onomatopoeia

Personification

Repetition

By midnight on the first night [the wind] had blown up. The barometer fell and the wind howled through the rigging. Changing sails on the foredeck was lethal. Kingfisher tried her best to cling to the water's surface while I just tried to cling to her. I was being pounded, thrown again and again on to the deck as her hull flicked up to hit me while I was slammed down by the motion of falling from the wave before – it was unrelenting. With each impact I closed my eyes and gritted my teeth, hanging on as tightly as possible. I tried everything to calm her, but the waves were enormous, and whether we charged over them or fell down them, it was going to hurt.

Ellen MacArthur, 'Taking on the World.'

TASK 9. Now let's develop some vocabulary and devices to describe your frightening moment. Fill in the blanks in the passage below, following the instructions in the brackets.

This passage is about a boy who has lost his mum in a crowd.

_____ *(adverb) I was alone – I had lost my mum. It seemed like she had*

_____ *(verb) into thin air, never to be seen again. The crowd*

_____ *(verb) me up like a* _____ *(simile). My heart beat*

_____ *(adverb) and I began to* _____ *(verb) like a* _____

(simile). _____ *(adverb) I shouted for* _____ *(noun) but none came. I gave up and* _____ *(verb) on the floor. It was hopeless. I was lost. Stunned, I* _____ *(verb) at the pavement, wondering what to do. The crowds, who* _____ *(verb) around me like fog on a winter's afternoon, ignored me and carried on about their business. "David,"* _____ *(verb) a familiar voice, like a* _____

_____ *(simile). I wasn't lost. My ordeal was over. Breathe.*

TASK 10. Describe a moment in your life when you felt frightened. Using the ideas and techniques you have developed, write your description below.

Continue on a separate sheet.

Commissioned by The PiXL Club Ltd.

Science

KS3

Contents

BIOLOGY

Cells – the Building Blocks of Life

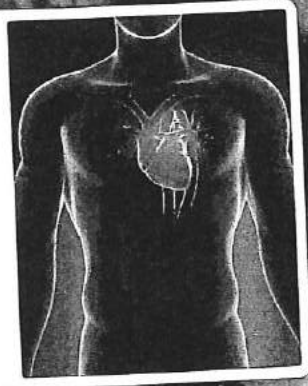
Ideas you have met before

Body systems

We can think of a human body as being made up of different systems.

Each system has a specific purpose in the body.

We have a circulatory system that pumps blood around, a skeletal system that supports us and a digestive system that gets energy from the food we eat.



Reproduction in plants

The flowering plant also has different systems – these are the roots, stems, leaves and flowers.

Flowers enable reproduction in plants, through pollination and seed dispersal. Plants have evolved different ways of carrying out these processes.

Human development

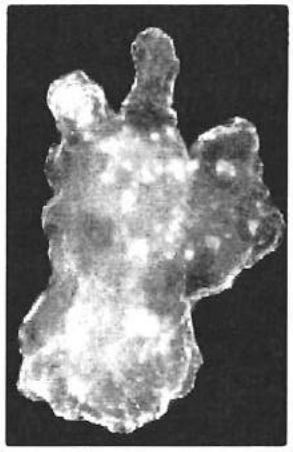
Humans change throughout their lifetime, from the moment of conception to the time they grow old.

Some changes occur much faster than others. We change fastest during the first few months of our existence.

In this chapter you will find out

How cells work for an organism

- Cells are the building blocks of life. They contain structures called organelles, which all have specific jobs.
- A human body has a highly organised set of body systems, organs, tissues and cells.
- Many cells, such as muscle cells and nerve cells, are specialised enabling them to carry out a specific task more effectively.
- Some organisms, such as bacteria and protozoa, consist only of a single cell. They can, nevertheless, carry out all seven life processes.

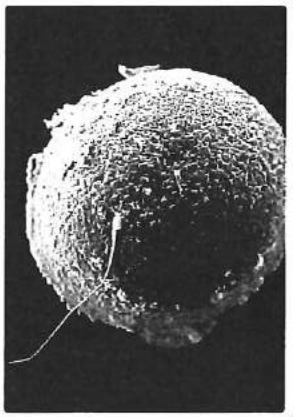


How plants are adapted to reproduce

- Pollen is the male sex cell in plant reproduction.
- Flowers are adapted in many ways to attract pollinators or use the wind to help pollination.
- We rely on bees and other insects to pollinate our crops for food – some of our actions put these organisms at risk.
- Plants have adapted different mechanisms to disperse their seeds, increasing their chances of survival.

Reproduction in humans

- The male and female human reproductive systems are adapted for successful reproduction.
- Boys and girls experience changes during puberty, preparing them for reproduction.
- When an egg is fertilised it develops into a foetus. This grows in the uterus until it becomes a fully grown baby.
- Many factors affect the growth and development of a foetus, including the mother's use of alcohol, cigarettes and drugs.



Historical ideas about living things

We are learning how to:

- Summarise some historical ideas about living things.
- Explain how evidence can change ideas.
- Select evidence to support or disprove ideas.

For many years people believed that living things came from non-living things. Today, water found in meteorites and moons suggests that life could have come to Earth from space.

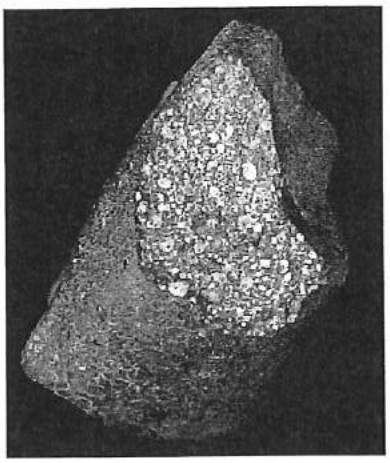


FIGURE 1.1.2a: Meteorites like this may hold clues to the origins of life on Earth.

Spontaneous generation

From the time of Aristotle (384–322 BCE) to the 1600s, most people believed in the idea of spontaneous generation – that is, they thought that many **organisms** (living things) came from inanimate objects (non-living things). For example, observing mice coming out from a stack of corn, they would draw the **conclusion** that the corn had produced the mice.

1. Do the following observations seem to support or disprove the idea of spontaneous generation?
   - **a)** kittens coming out of a barn
   - **b)** fish swimming in a puddle
   - **c)** lambs being born
2. Can you think of other examples where people might think that animals come from non-living things?

Redi's experiment

In 1668, Francesco Redi set out to disprove this idea. He put the same amount of fresh meat in three jars. He left one jar open, covered the other with a cheesecloth, and sealed the third. After a few days, maggots appeared in the open jar – there were no maggots in the closed jars. The maggots came from flies that had got into the open jar and laid eggs, not from the meat itself.

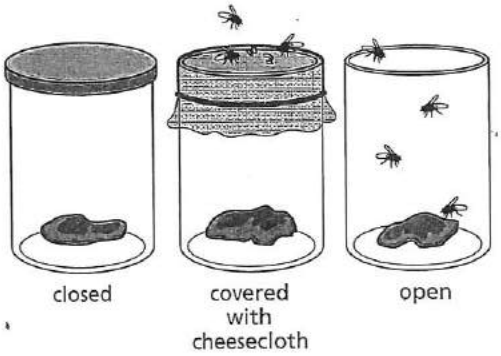


FIGURE 1.1.2b: Redi's experiment to disprove the idea of spontaneous generation.

3. What scientific question was Redi trying to investigate?
4. How did Redi make his experiment a fair test?
5. How did his findings disprove the idea of spontaneous generation?

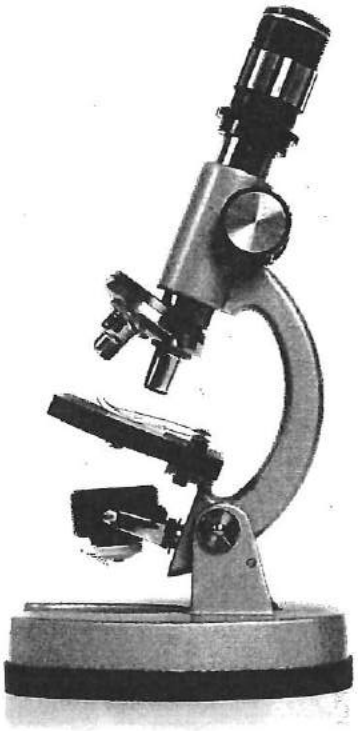
Disproving the idea

In 1864, the scientist Louis Pasteur added the same amount of boiled broth to specially designed bottles. He sealed some bottles and removed the tops from the rest, then left them for a long time. He observed no life in any of the bottles that had been sealed, but the open bottles were teeming with life.

With the invention of the **microscope** in 1590, scientists observed that living things were complex structures, which could not have possibly been formed from inanimate objects. From studying samples of cork bark, Robert Hooke discovered that organisms were made from simple building blocks. We call these individual building blocks **cells**. They are too small to be seen with the unaided eye.

Did you know...?

Today, scientists can use special high-power microscopes to study structures within cells to find cures for diseases. Modern-day microscopes are also used to study the structure of crystals and metals. Some can even view atoms.



1938 Ernst Ruska develops the electron microscope to improve the magnification and resolution. Viruses and molecules are studied

1932 Frits Zernike invents a microscope to study transparent and colourless specimens

18th Century improvements in microscopes result in their greater use by scientists

1675 Anton van Leeuwenhoek uses a simple microscope to look at blood, insects and pond water. He was the first person to describe cells and bacteria

1667 Robert Hooke makes a microscope to study various objects

1590 Dutch lens grinders Hans and Zacharias Jansen make the first microscope by placing two lenses in a tube

FIGURE 1.1.2c: The invention of the microscope enabled the discovery of cells.

6. What conclusions would you reach based on the **evidence** from Pasteur's experiment?
7. Which investigation would you trust the most – Pasteur's or Redi's? Give a reason for your answer.
8. Why did it take so long for people to change their ideas after Redi's investigation?
9. What impact do you think microscopes have had on our understanding of living things?

Key vocabulary

organism
conclusion
microscope
cell
evidence

Comparing plant and animal cells

We are learning how to:

- Develop models to explain the differences between animal cells and plant cells.
- Record evidence using a microscope.
- Communicate ideas about cells effectively using scientific terminology.

Every cell is a chemical processing factory, with over 500 quadrillion chemical reactions occurring every second! Without these reactions, the organism would die.

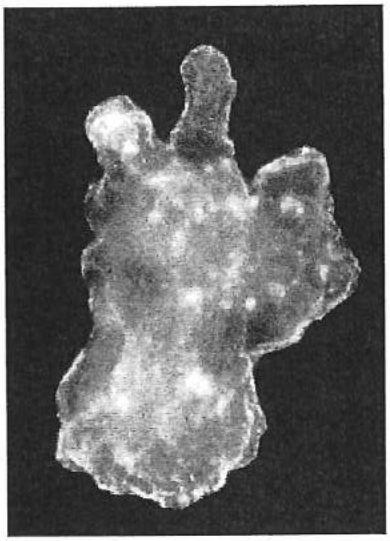


FIGURE 1.1.3a: An amoeba is a single-celled organism.

Cells as building blocks

All living organisms are made of cells – they are the building blocks of life. Cells cannot be seen except under a microscope. This is why it took so long to discover them. Some organisms are made of only one cell; most are made of millions of cells working together.

1. How can we see cells?
2. Is a cell living?

Common structures in animal and plant cells

All plant cells and animal cells have three main structures – the **nucleus**, the **cytoplasm** and the **cell membrane**.

Every cell, except red blood cells, contains a nucleus. The nucleus contains DNA, which controls the reactions inside the cell and is involved in making the cell reproduce.

The cytoplasm is a jelly-like material that makes up the bulk of the cell. All the chemical reactions occur here. Smaller structures within the cytoplasm, called organelles, make new materials to keep the cell and the organism alive.

The cell membrane surrounds the cell and contains the cytoplasm. The cell needs water, oxygen, glucose and nutrients – the membrane lets these in. During the chemical reactions, the cell makes waste products that it must get rid of, including carbon dioxide and urea. The membrane lets these substances out of the cell.

In the cytoplasm, special organelles called **mitochondria** convert glucose and oxygen into a form of energy that the cell can use.

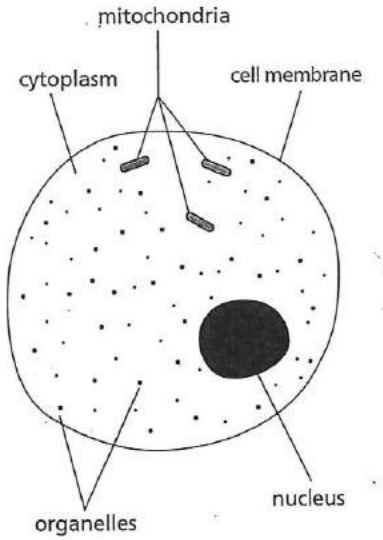


FIGURE 1.1.3b: The main structures of an animal cell

3. Which two parts of the cell are found inside the cytoplasm?
4. What main substances are allowed through the cell membrane?

Differences between animal and plant cells

Animal cells are the simplest type of cell, containing a nucleus, cytoplasm, a cell membrane and mitochondria in the cytoplasm. Plant cells share these parts, but also have other important structures.

The **cell wall** is an extra protective layer outside the cell membrane. It gives the cell shape and strength.

The **vacuole** is a large bubble full of liquid, storing water, sugars, nutrients and salts in the cytoplasm. It provides internal pressure for the cell, keeping it firm and in shape. It also helps to control water movement inside and between cells.

Leaf cells also contain small, round, green organelles called **chloroplasts**. These contain a green pigment called chlorophyll, which absorbs energy from the Sun and helps the plant make glucose.

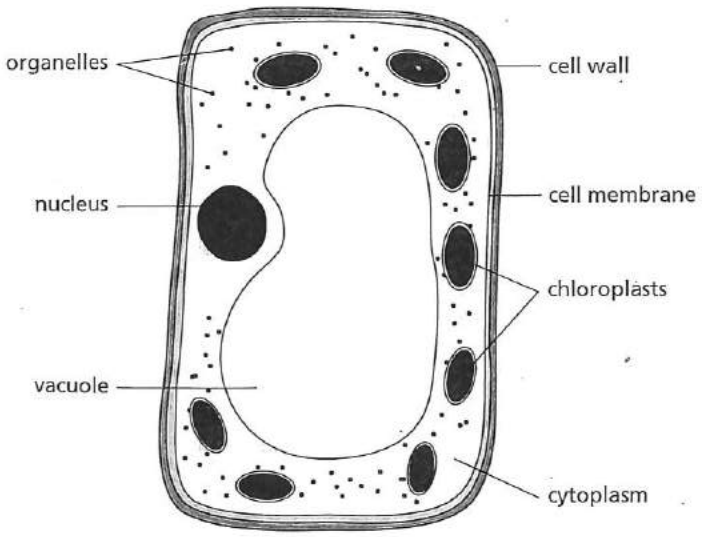


FIGURE 1.1.3c: A plant leaf cell

5. Which two structures give a plant cell its shape?
6. Which cell do you think will be larger – a plant cell or an animal cell? Explain your answer.
7. Why do you think plant cells need extra structures that are not found in animal cells?

Did you know...?

Each human consists of about 100 trillion cells working together.

Key vocabulary

nucleus
cytoplasm
cell membrane
mitochondria
cell wall
vacuole
chloroplast

Describing cells

We are learning how to:

- Classify specialised cells as animal cells or plant cells.
- Describe different specialised animal cells and plant cells.
- Explain the structure and function of specialised cells using models.

All young cells start out exactly the same – these are called stem cells. When they grow, stem cells change their structure to carry out a certain job within the organism. Any stem cell can be made to become any type of specialised cell.

The right cells for the job

Many animal cells look very different from each other, although they contain the same basic structures. Cells become *specialised* so they can carry out a particular job. In an organism, many different jobs need to be done to keep it alive. These include movement, detecting information about the environment, sending messages, carrying chemicals around the body, making chemicals the body needs, reproducing and absorbing food.

1. Where would you find cells that detect:

a) light? **b)** sound? **c)** heat?

Specialised animal cells

Nerve cells have very long extensions of cytoplasm. This enables them to carry messages from one part of the body to another.

Muscle cells are made from protein fibres that can rapidly expand and contract to create movement. They have the most mitochondria of all cells because they need lots of energy.

Sperm cells have tails and huge heads. Their main job is to carry genetic material to an **egg cell**, so that it can be fertilised. Sperm cells have lots of mitochondria because they must swim long distances.

2. Name the animal cells in Figure 1.1.4a.

3. Which cell:

a) transmits electrical messages?

b) contracts and expands to create movement?

c) carries genetic material for fertilisation?

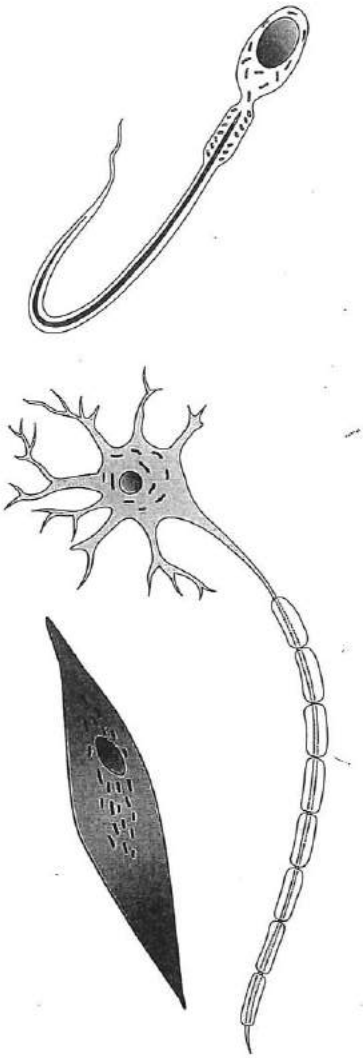


FIGURE 1.1.4a: Can you find the nucleus, cell membrane, cytoplasm and mitochondria of each cell?

Specialised plant cells

Plant cells are also highly specialised. Plants make their own food by a process called photosynthesis. Many of the specialised cells in a plant are linked to this function. Cells collect light and water, and take in carbon dioxide. Specialised leaf cells like the one shown in Figure 1.1.3c in Topic 1.3, use these materials and turn them into sugar.

Specialised plant cells are also linked to the process of reproduction. Pollen cells are the male sex cell in plants. Some are carried by the wind, and others stick to insect or bird pollinators. There are over 300 000 different types of pollen cells.

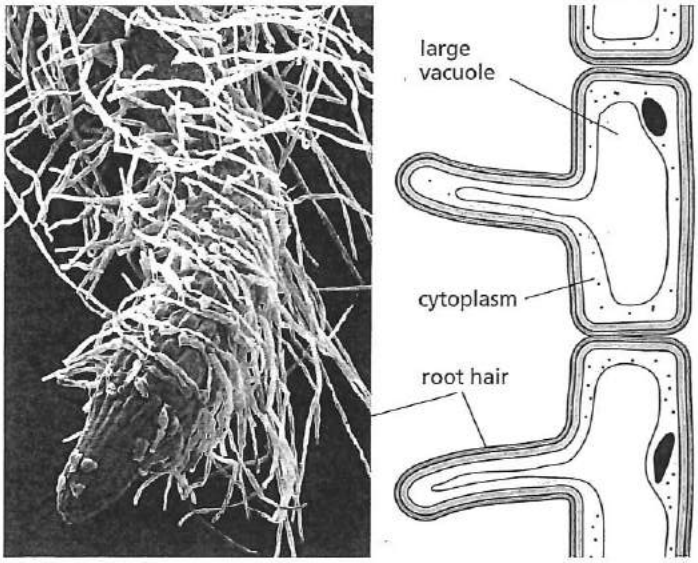


FIGURE 1.1.4b: How are these root hair cells different from the leaf cell shown in Figure 1.1.3c?

4. Look at Figure 1.1.3c showing a leaf cell and at Figure 1.1.4b showing a **root hair cell.** Describe the features of each and suggest how these features enable the cells to carry out their jobs.
5. Compare and contrast the specialisation of a wind-transferred pollen cell and an insect-transferred pollen cell. Look at Figure 1.1.4c to help you.
6. Which is more specialised – a pollen cell or a sperm cell? Give reasons for your answer.

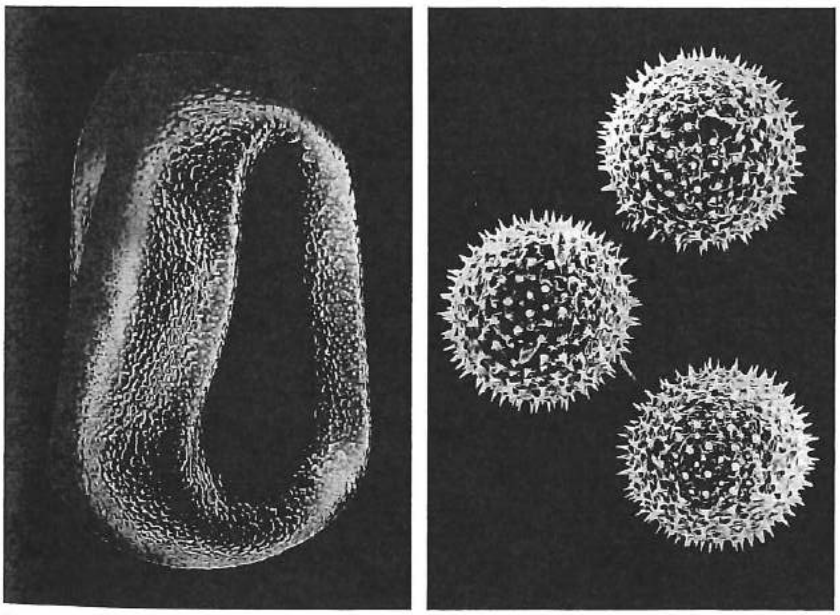


FIGURE 1.1.4c: Wind- and insect-transferred pollen cells.

Did you know...?

There are more than 200 different types of specialised cells in the body. In 2012, a Nobel Prize was awarded for the discovery that specialised cells can be changed to become stem cells.

Key vocabulary

nerve cell
muscle cell
sperm cell
egg cell
root hair cell

Understanding unicellular organisms

We are learning how to:

- Recognise different types of unicellular organisms.
- Describe differences in unicellular organisms.
- Compare and contrast features of unicellular organisms.

The oldest unicellular organisms were found in rocks dated to 3.8 billion years ago. They used chemicals in the ocean for 'food'. Around 3.5 billion years ago, organisms that could make their own food also evolved. Unicellular organisms were the main form of life on the planet for nearly 2 billion years.

Unicellular organisms

Unicellular organisms are made up of just one cell. They carry out all the life processes needed to exist independently. They differ from each other in their structure, how they feed and how they move. Algae are plant-like unicellular organisms containing chloroplasts and make their own food. Animal-like unicellular organisms take in food through their cell membrane. Some have developed tiny hairs to help them move, so they can find food or escape from predators. Some are themselves predators and will devour other unicellular organisms. Fungus-like unicellular organisms are called **yeasts**. They have a cell wall but cannot make their own food.

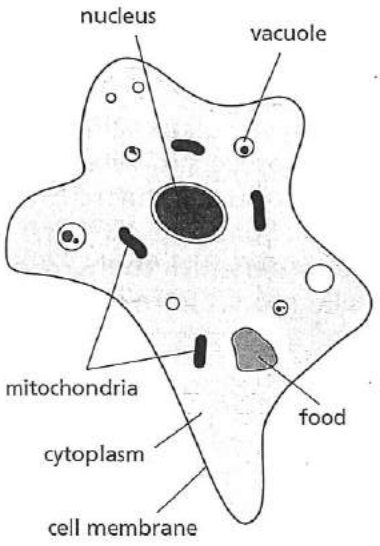


FIGURE 1.1.5a: An amoeba can carry out all life processes.

1. Name three different unicellular organisms.
2. List three ways unicellular organisms differ from each other.

Prokaryotes

Unicellular organisms can be classified into two main groups – **prokaryotes** and **eukaryotes**. Prokaryote means 'before life' – prokaryotes are thought to be the first organisms to live on Earth. They do not have a nucleus, and their genetic material floats within the cytoplasm. They can be up to 200 times smaller than eukaryotes. **Bacteria** are examples of prokaryotes. They come in different shapes and sizes, live in different environments and have a range of food sources. Some bacteria take in chemicals from their environment, such as iron and sulfur, and use these as food. Others contain chloroplasts and use sunlight to make their own food – many

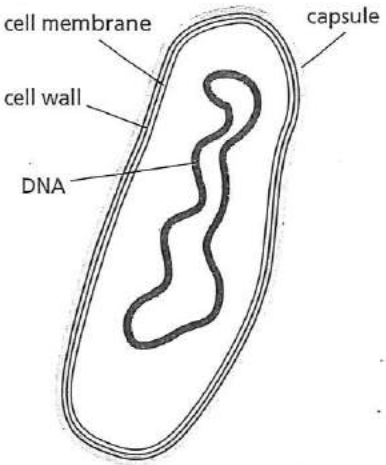


FIGURE 1.1.5b: A bacterium has no nucleus and no mitochondria.

can absorb nutrients from their environment. Bacteria can be found in extreme conditions, from under-sea volcano vents to places with temperatures well below freezing.

3. Look at Figure 1.1.5a and Figure 1.1.5b. Which is a prokaryote and which is a eukaryote?
4. What differences can you see between prokaryotes and eukaryotes?

Eukaryotes

Eukaryotes contain a nucleus, surrounded by a nuclear membrane. They also contain many organelles (which prokaryotes do not), including mitochondria, chloroplasts and vacuoles. Examples of eukaryotes are euglena (a type of algae containing chloroplasts), yeast, amoeba, and paramecium – the last two are types of **protozoa**. Eukaryotes can be up to 200 times bigger than prokaryotes and often have external features to help them to survive. The amoeba can move around because its cytoplasm can flow; paramecium has cilia that beat and enable it to move, and the euglena has a flagellum, or tail, to enable it to move.

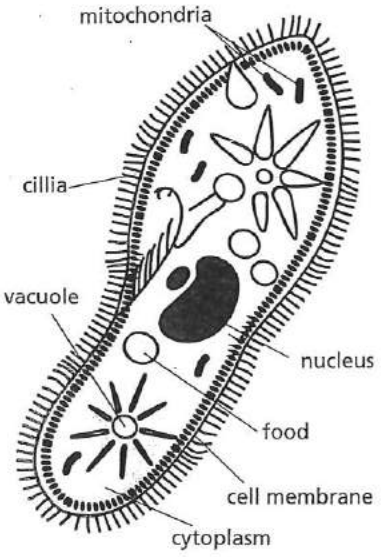


FIGURE 1.1.5c: A paramecium

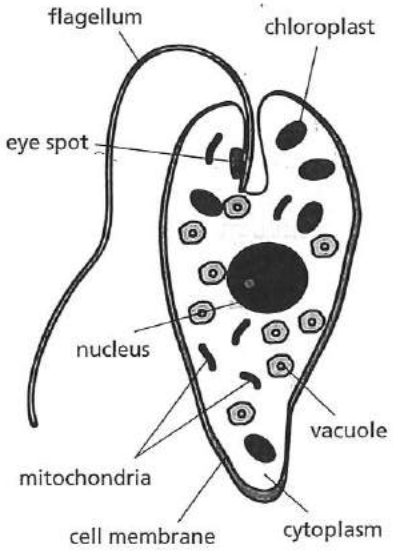


FIGURE 1.1.5d: Euglena

5. Look at Figure 1.1.5d. How does euglena get its food?
6. Which is the most effective form of movement between the three eukaryotes? Justify your choice.
7. Summarise, in a table, the main similarities and differences between unicellular organisms.

Did you know...?

Nummulites are the largest known unicellular organisms. Nummulite fossils as large as 16 cm in diameter have been found, which is about the size of a tennis ball. Some are thought to have lived for over 100 years.

Key vocabulary

yeast
prokaryote
eukaryote
bacterium
protozoa

Understanding diffusion

We are learning how to:

- Describe the process of diffusion and its relation to the cell.
- Plan a fair test investigation to explore the factors affecting diffusion.
- Explain how the different factors speed up or slow down diffusion.

How do substances move from the outside of a cell to the inside of a cell? One answer lies in the process of diffusion. Using this, and other processes, cells allow only the substances they need to enter the cell, and keep themselves safe from unwanted and toxic chemicals.

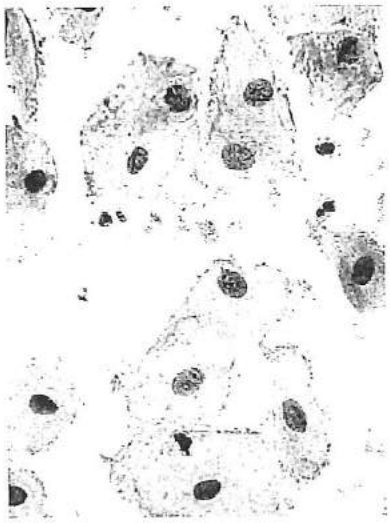


FIGURE 1.1.6a: Substances need to pass in and out of the cell membrane.

Chemicals on the move

All cells require chemicals including **glucose**, oxygen, nutrients and minerals in order to survive. These pass through the cell membrane by **diffusion**, a process by which substances move from an area of high concentration to one of low concentration, until the concentrations are equal. There have to be more particles outside the cell than inside for them to move into the cell.

Cells also produce waste products, such as carbon dioxide and urea. They move out of the cell by diffusion because there are more waste particles inside the cell compared to outside.

1. Look at Figure 1.1.6b. Which way will the particles move?
2. Draw an outline of a cell showing the movement of named substances into and out of the cell.

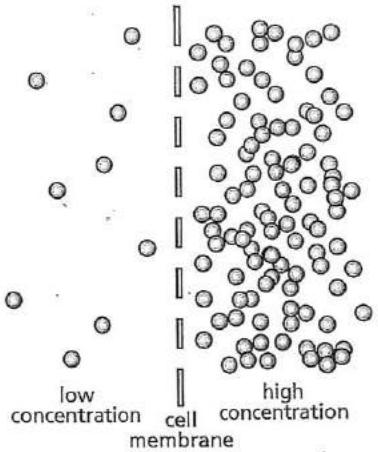


FIGURE 1.1.6b: Particles have a different concentration on either side of the cell membrane.

Factors affecting diffusion

Many factors affect how quickly diffusion occurs. It occurs more rapidly at higher temperatures because the particles have more energy and move faster.

The number of particles in a given volume is called the concentration of a solution. In a highly concentrated solution, there are many particles packed into a small space. The particles try to move away from each other as quickly as possible. If a cell is placed in a high concentration of nutrients, the nutrients diffuse faster into the cell compared to when it is in an area of low concentration.

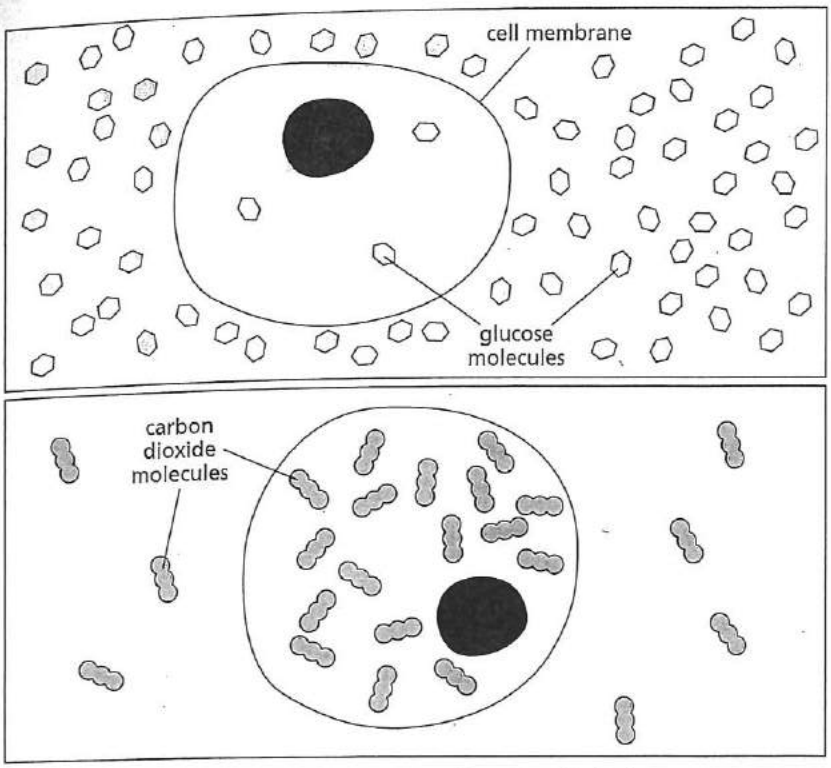


FIGURE 1.1.6c: Diffusion will occur in these 'cells'. Why will this happen?

3. Draw two identical boxes. Using small circles to represent particles, show a concentrated solution in one and a dilute solution in the other.
4. Suggest and explain whether temperature or concentration has a greater effect on the rate of diffusion.

Effect of surface area

The survival of unicellular organisms depends on the rate of diffusion of chemicals into and out of the cell. The ratio of the **surface area** of the cell to its **volume** affects how quickly diffusion across the cell membrane can occur. With a higher surface-area-to-volume ratio, the rate of diffusion into and out of the cell is faster.

The surface area of a cube can be calculated by working out the area of one side and multiplying this by the number of faces. The volume of a cube is its length × breadth × height. The surface-area-to-volume ratio is worked out by dividing its surface area by its volume.

5. What can you say about the ratio of the surface area to volume as the size of cells increases?
6. Why are most unicellular organisms microscopic?

Did you know...?

The first study of diffusion was performed by Thomas Graham in 1831. Observing gases with different particle sizes, he expected the heaviest to fall to the bottom and the lightest to stay at the top. Instead, they were evenly mixed throughout.

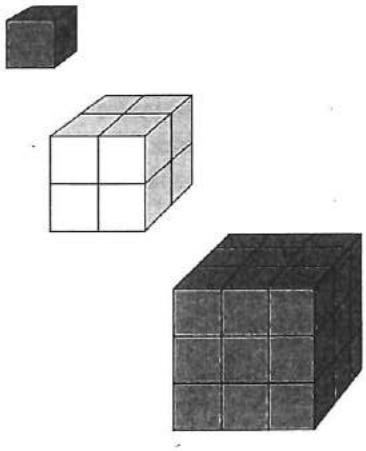


FIGURE 1.1.6d: These cubes represent cells of different sizes.

Key vocabulary

glucose

diffusion

surface area

volume

Understanding organisation in multicellular organisms

We are learning how to:

- Define the terms tissues, organs and organ systems.
- Explain the organisational structure in multicellular organisms.
- Compare the strengths and weaknesses of multicellular organisms and single-celled organisms.

The first simple multicellular organisms are thought to have evolved about 1.2 billion years ago. These eventually increased in organisation and size to form complex multisystem, multicellular organisms. There are 15 different organ systems within human beings, all working together to help us to survive.

Cells, tissues and organs

Groups of similar specialised cells working together are called **tissues.** Examples of human tissues are muscles and bones. Different tissues work together to make up an **organ**. Every organ has a specific job – the eye is an organ made up of many different tissues including a lens and an iris. They work together to enable us to see. Examples of other organs are:

- the heart, which pumps blood to the cells
- the kidneys, which clean the body and balance water in the body
- the brain, which allows us to control all parts of our body quickly.

Organs work together to make **organ systems**. Some of the organ systems in the human body are the circulatory system, the skeletal system, the respiratory system, the digestive system, the reproductive system and the nervous system.

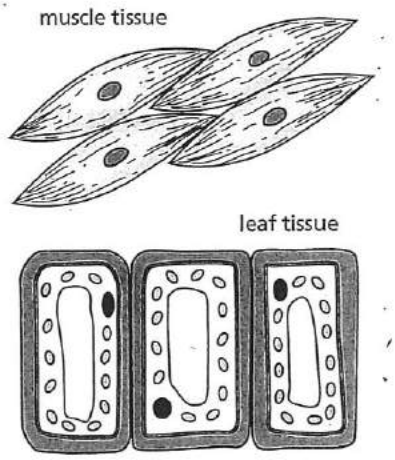


FIGURE 1.1.7a: Two types of tissue as seen under a microscope. What do you notice about the cells in each type of tissue?

1. Name three other organs and describe their functions.
2. The skin is described as an organ, not a tissue. Suggest why.
3. **a)** Name an organ in each of the six organ systems listed in the text.
   b) State the function of each of these organ systems.

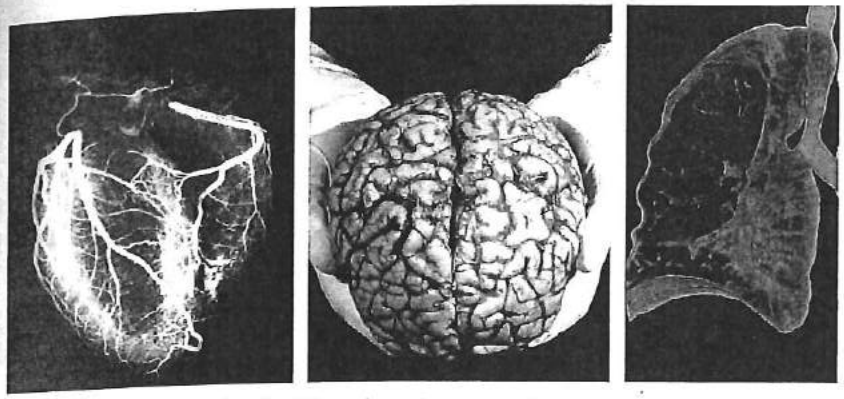


FIGURE 1.1.7b: What do all of these have in common?

Unicellular organisms

Unicellular organisms can live independently of other cells. They have no organ systems, just organelles working together. Because of their small size, they can reproduce very quickly. However, because they are unicellular, there is a limit to how big they can grow and most remain microscopic. If they become too big they cannot obtain the chemicals they need from the environment quickly enough by diffusion. However, being small means they are vulnerable to attack from bigger unicellular, or multilcellular, organisms.

4. Unicellular organisms make up most of the mass of biological material on the planet. What does this say about the success of unicellular organisms?
5. Is being small an advantage or a disadvantage? Give reasons.

How cell types evolved

Some cells evolved to join and work together, forming colonies of cells. An advantage of this was that in times of food shortage, food could be caught, digested and shared more effectively by cells working together. Eventually some of the cells within the colonies became specialised and took on particular jobs. This eventually led to the formation of simple multicellular organisms. These could grow to be much larger than the unicellular organisms and so were better protected and could move further in search of food. However, they needed to evolve complex organ systems in order to become much larger. This requires a lot of energy, and the larger the organism became, the slower the rate of reproduction.

6. What are the advantages of multicellular organisms over unicellular organisms?
7. Why did some cells form colonies?

Did you know...?

Many unicellular organisms live as parasites within multicellular organisms. Most are harmless, but some cause diseases such as malaria and typhoid. The number of bacterial cells living in our gut and on our skin is bigger than the number of our own cells.

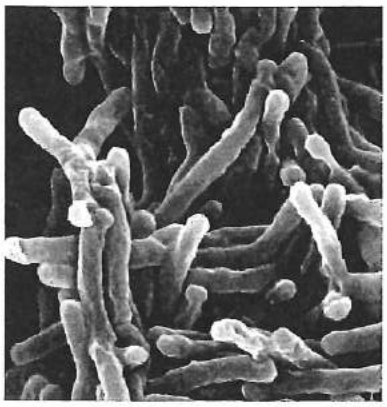


FIGURE 1.1.7c: How do these bacterial cells survive better by working together?

Key vocabulary

tissue

organ

organ system

Applying key ideas

You have now met a number of important ideas in this chapter. This activity gives an opportunity for you to apply them, just as scientists do. Read the text first, then have a go at the tasks. The first few are fairly easy – then they get a bit more challenging.

The skin is an organ

The skin is the largest organ in the human body. It is our first line of defence against heat, light, injury, and infecting bacteria and fungi. It also protects us from harmful radiation from the Sun, which can cause cancer. Skin cancer is the most common type of cancer, with over a million new cases reported every year worldwide.

The skin is about 2 mm thick and is composed of three different layers of tissue.

The top layer of skin tissue is called the epidermis. These cells are lost regularly and are replaced every six to eight weeks. We lose about 30 000 to 40 000 skin cells every hour!

The middle layer of tissues is called the dermis. This contains blood vessels, nerve cells and elastic tissue called collagen, which keeps the skin from sagging.

The bottom and thickest layer of tissue is the hypodermis. This layer is responsible for storing fat cells.

Specialised cells in the skin perform different jobs:

- cells that collect information about heat, pain and pressure
- cells that store fat to keep us warm
- pigment-containing cells that protect us from harmful rays from the Sun
- hair follicles that are useful in controlling temperature
- sweat glands that also help to control the body's temperature.

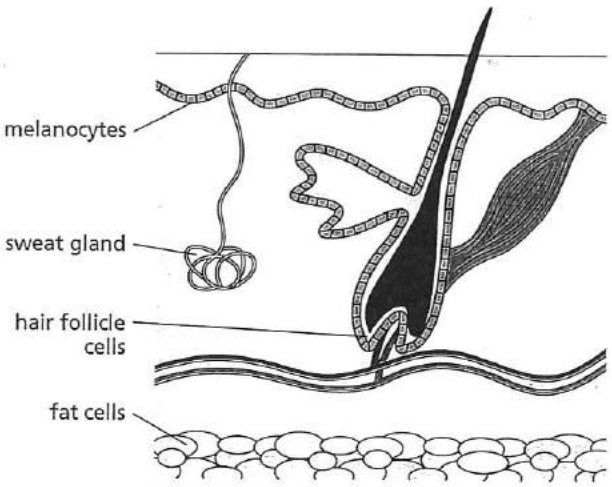


FIGURE 1.1.8a: Specialised skin cells

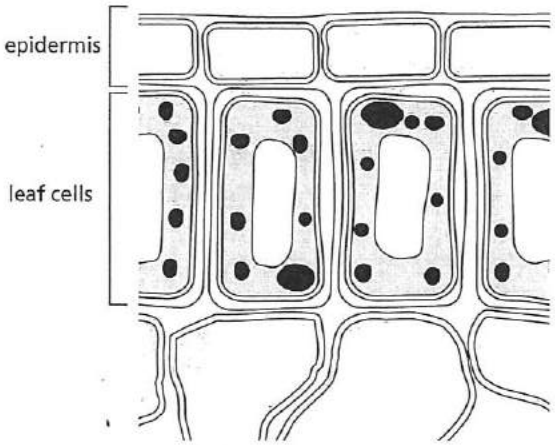


FIGURE 1.1.8b: Plant epidermis

In plants the epidermis is just one cell thick. It is a waterproof layer with a waxy coating. There are far fewer specialised cells here compared with animal skin.

Task 1: Animal cells

Draw a labelled diagram of a non-specialised animal cell in the epidermis of the skin.

Task 2: Plant cells

Draw a labelled diagram of a non-specialised plant cell in the epidermis of a plant. Describe how the animal cells and plant cells are alike and and how they are different.

Task 3: Organisation in multicellular organisms

The skin is an organ composed of tissues and specialised cells. Giving examples, explain what is meant by the terms 'organ', 'tissue' and 'specialised cell'.

Task 4: Specialised cells

Explain the features of two specialised cells in human skin. Explain how these features allow them to carry out their jobs.

Task 5: Unicellular organisms

Impetigo is a skin condition caused by bacteria. Athlete's foot is another skin disorder, caused by a fungus. Use diagrams to explain the differences between bacteria and fungi.

Why might it be hard for paramecium or euglena to live in the epidermis?

Comparing flowering plants

We are learning how to:

- Describe the structures and functions of parts in flowering plants.
- Explain why different plants have such diverse structures.
- Evaluate the differences between wind-pollinated plants and insect-pollinated plants.

The first plants on Earth were mosses. These relied on moisture and touch to transfer pollen. The first flowering plants, using wind and insects to transfer pollen, are thought to have evolved about two-hundred million years ago. Nowadays about 70 per cent of plant species use insects, birds or mammals to transport pollen.

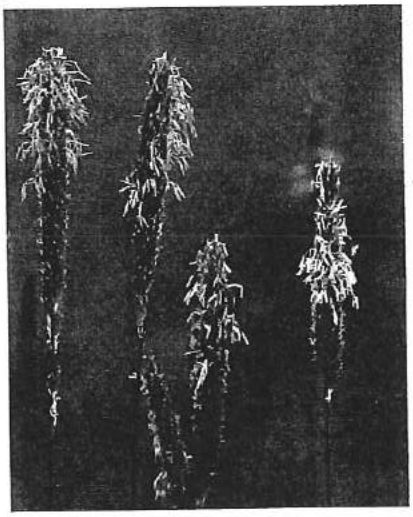


FIGURE 1.1.9a: Which flower is wind pollinated and which is insect pollinated?

Flowers as reproductive organs

Most flowers have male and female parts. The male part is the stamen, consisting of an **anther** and a **filament**. The anther produces **pollen**, which contains the male sex cell. The female part is the carpel. This consists of an **ovary** (with the female sex cells in the ovules), the **style** and the **stigma**, which has a sticky top. The purpose of the flower is to produce pollen in the anther and transfer it to the stigma of a different plant. This process, called pollination, is mainly achieved using wind, insects, birds or bats.

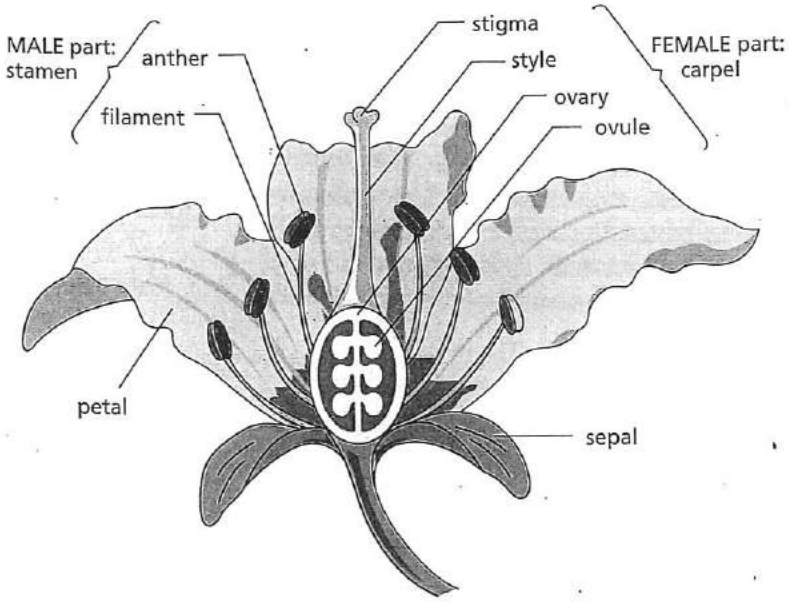


FIGURE 1.1.9b: Male and female parts of a flower

1. Identify the following parts in the photos in Figure 1.1.9a: anther, filament, stamen, stigma, style, ovary.
2. What differences can you see between the two flowers in Figure 1.1.9a?
3. Why do you think the flowers have the differences you have written in your answer to question 2?

Attracting insects

Most insect-pollinated plants produce brightly coloured flowers with sweet smells to attract insects. Many also produce nectar deep inside the flower. This is a sugary fluid that draws insects inside the flower to encourage pollination. Pollinators such as bees collect the pollen as a food source. Plants produce a lot of pollen to increase the chances of successful pollination. Some orchids produce flowers that look like the female of particular wasps.

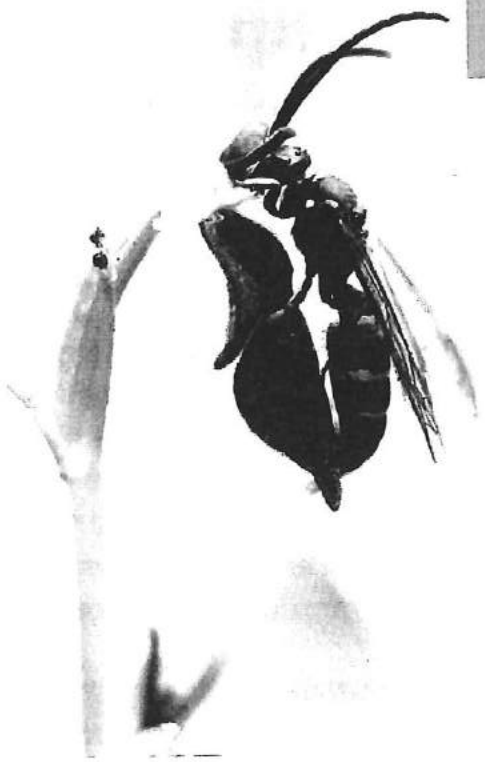


FIGURE 1.1.9c: This orchid mimics the appearance of a female wasp. The male wasp visits the flower and becomes covered in pollen.

4. Describe different ways plants encourage insects to visit them.
5. Why do plants use such a diverse range of methods of attracting pollinators?

Wind or insect pollination?

There is no guarantee that the wind will successfully transfer the pollen from one plant to the stigma of another plant, so wind-pollinated plants produce millions of pollen cells to improve their chance of success, even though most cells are wasted. Stigmas evolved to become large and feathery so as to capture pollen floating on the wind. Even so, there is no guarantee that the pollen from the same species will land on the plants.

Insect-pollinated plants produce far less pollen, but use other mechanisms to attract insects. However, some insects eat parts of the flower and plant, so flowers have developed mechanisms to avoid this, such as producing toxins and growing spikes.

6. Discuss the advantages and disadvantages of wind pollination and insect pollination.

Did you know...?

The oldest-known pollen grains were found on the bodies of tiny insects encased in amber. The pollen was thought to be over a million years old. Fossilised pollen has provided evidence of how plant life on Earth has evolved.

Key vocabulary

anther
filament
pollen
ovary
style
stigma

SEARCH: wind-pollinated flowers, insect-pollinated flowers

Knowing how pollination leads to fertilisation

We are learning how to:

- Describe the processes of pollination and fertilisation.
- Analyse and present data on the growth of pollen tubes.
- Explain factors that affect the growth of pollen tubes.

The world's chocolate supply depends on midges. These tiny flies are the only insects that can pollinate the cacao plant. Once fertilised, the plant produces seeds, which are used to make coffee and chocolate.

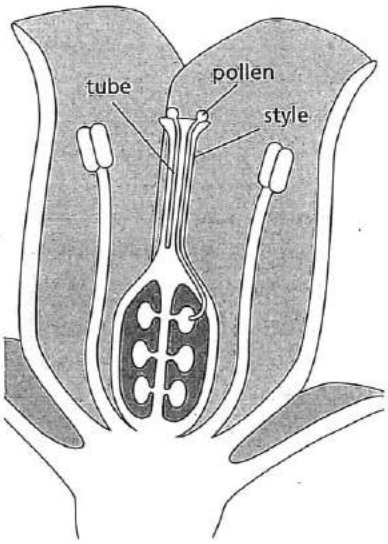


FIGURE 1.1.10a: How do you think a pollen tube is formed, from one cell or many?

Fertilising plants

Pollen contains the male sex cell. The female sex cell, the egg cell, is found in the ovule. The pollen travels down the style to reach the ovule by growing a long tube. Once it has reached the ovule, the nucleus of the male sex cell joins with the nucleus of the egg cell – this is **fertilisation**. The result is a new seed, which will eventually become a new plant.

1. Describe how pollination and fertilisation differ.

Pollen tubes

Look at Figure 1.1.10b. When a pollen grain lands on the stigma of another plant, the tube cell uses stored nutrients and sugars to grow a **pollen tube** down to the ovule. The concentration of sugar affects the ability of the pollen grains to grow tubes.

2. Plot a graph of the data in Table 1.1.10a.
3. Describe the pattern shown by the data.

TABLE 1.1.10a: The effect of sugar on the growth of pollen tubes

Sugar concentration (%)	5	10	15	20
growth of pollen tubes (micrometres)	250	350	450	200

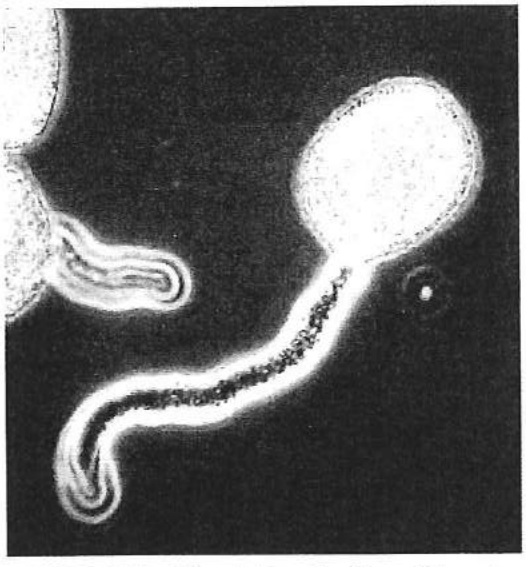


FIGURE 1.1.10b: Why might pollen from different species grow best in different concentrations of sugar solution?

Factors affecting the growth of pollen tubes

Many factors affect the growth of pollen tubes. The pollen grain is dry when it lands on the stigma. Chemicals in the stigma enable water to enter the pollen grain so it can grow. These include sugar. In some plants, if pollen lands on the stigma of the same plant, chemicals prevent it from growing pollen tubes so it cannot fertilise itself. If the temperature is hotter, pollen tubes grow faster. Once the tube has formed, chemicals in the stigma direct the pollen tube to the ovule. Only one pollen cell fertilises the egg.

4. Look at the data in Table 1.1.10b and highlight any anomalous results.

TABLE 1.1.10b: The growth of pollen tubes in different sugar concentrations

Sugar concentration (%)	5	10	15	20
Growth of pollen tubes (micrometres) – experiment 1	225	345	200	213
Growth of pollen tubes (micrometres) – experiment 2	250	350	450	207
Growth of pollen tubes (micrometres) – experiment 3	275	355	450	250

5. Ignoring the anomalous values, calculate the average values in Table 1.1.10b.

TABLE 1.1.10c: The effect of temperature on pollen tube growth

Temperature (°C)	15	20	25	30	35	40
Growth of pollen tubes (micrometres)	0	200	420	700	800	100

6. From the data in Tables 1.1.10b and 1.1.10c, draw two graphs – one showing the effect of sugar concentration and the other showing the effect of temperature on pollen tube growth.

7. Which has the bigger effect on pollen tube growth, from these data? Why do you think this?

8. Which data would you trust more – explain why.

Did you know...?

Pollen that does not land on a stigma remains in the environment. It is the primary cause of hay fever and allergies. Pollen counts are made by counting how much pollen lands on a greasy spinning rod over a 24-hour period.

Key vocabulary

fertilisation

pollen tube

Understanding the challenges facing pollinators

We are learning how to:

- Describe the role of insects in crop production, using suitable data.
- Explain why bee populations are declining.
- Make suggestions for increasing insect populations, and hence crop production.

Honey bees used to pollinate 70 per cent of the UK's insect-pollinated crops. Today, it is less than 30 per cent. However, the growth of some crops has risen, suggesting that other insects have been taking the place of honey bees. Pollinators must be protected to make sure we don't lose crops.

Important pollinators

Most cereal crops are wind-pollinated. However, insect, bird and bat pollinators are responsible for 35 per cent of global crop pollination, including pollination of fruits, nuts, seeds, beans, coffee, oilseed rape, onions, almonds and tomatoes. Butterflies and bees are among the most important pollinators. Bees collect pollen from plants to make honey. They are usually specially **adapted**, with a furry body, so they can collect the maximum amount of pollen. Some of this lands on other plants as they move from plant to plant.

FIGURE 1.1.11a: The world's most important pollinator

1. Name three other crops we rely on insects to pollinate.
2. Why are bees so useful as pollinators?
3. If a plant relies on one species of pollinator, what will happen if the pollinator dies out?

Confused bees

Since 2005, more than ten million bee colonies have been wiped out by **colony collapse disorder (CCD)**, possibly caused by **pesticides**. Bees become weak and confused, and can't find their way back to the hive. This results in a reduction in the size of the colony, a shortage of food for the remaining bees and the inability to reproduce successfully. Many bees have also shown signs of increased viral disease.

4. Draw a flow chart to show how CCD occurs and its effect on a bee colony.

Developing explanations for CCD

Theories about the causes of CCD include:

- Pesticides such as **insecticides** are sprayed on crops to prevent insects and fungi from attacking them. Unfortunately it is not possible to target specific insects, and others may be affected. Some contain nicotine, which is thought to cause confusion in the brain of the bee.
- The number of wild flowering plants has reduced as more land is used for development and agriculture, leading to less variety of pollen and a narrower range of nutrients for bees.
- Farmers rent out hives to pollinate crops. This can disorientate bees, which find their way around by locating routes back to their hives. Also, disease can be spread more widely because hives from different locations come into close contact, which would not occur naturally.
- Climate change means that some plants are flowering earlier, before bees can fly.
- Bees are more susceptible to virus attacks because other factors have made them weaker.

FIGURE 1.1.11b: What are the problems with industrial pollination?

5. What do you think is the most likely cause of CCD?
6. Describe three steps that could be taken that would increase bee **populations**.

Did you know...?

In the USA, bees are the only pollinators of almond trees. Farmers are completely dependent on an active bee population for a good crop.

FIGURE 1.1.11c

Key vocabulary

adapted

colony collapse disorder (CCD)

pesticide

insecticide

population

Understanding how seeds are dispersed by the wind

We are learning how to:

- Recognise the variety of different structures shown by different seeds.
- Describe the need for plants to disperse their seed.
- Plan an investigation into seed dispersal by wind.

The largest seed in the world is 50 cm in diameter. It comes from the palm tree called Coco de Mer, found only in the Seychelles islands in the Indian Ocean. Another large seed is the coconut – it can be carried by the sea and germinate in a new place. Plants have developed many ingenious ways to be dispersed and to colonise new areas.

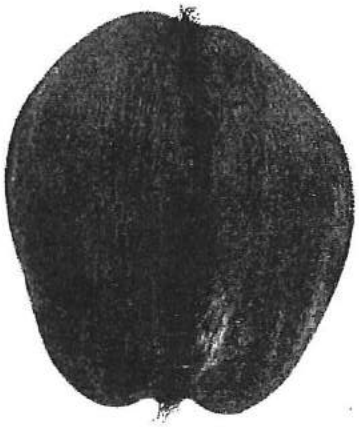


FIGURE 1.1.12a: Coco de Mer seed – the largest on the planet

Plants on the move?

Plants cannot move. They colonise new areas by moving their **seeds** in a process called **dispersal**. Seeds can be dispersed by:

- wind
- water
- exploding pods that release seeds on touch or with moisture
- being carried inside animals that eat the fruit
- hooking onto the fur or skin of passing animals.

1. Look at Figure 1.1.12b, and identify how each of these seeds is dispersed.
2. Give reasons for all of your answers to question 1.

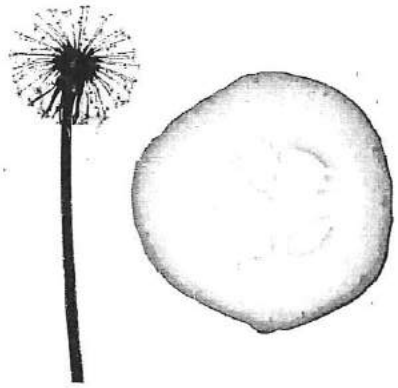
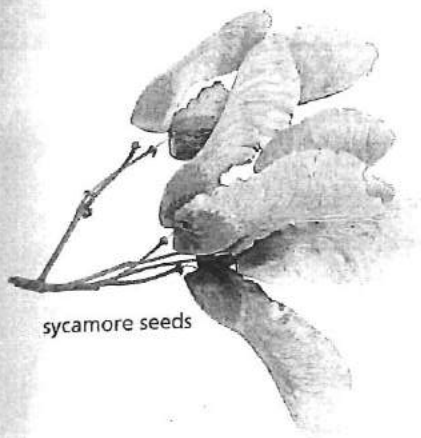


FIGURE 1.1.12b: Why have plants developed such variety in types of seed?

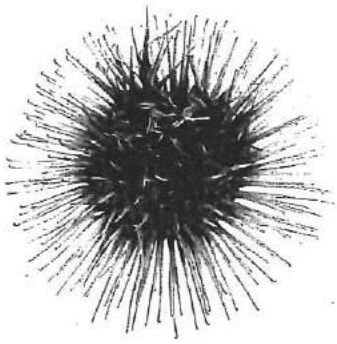
Ways of travelling

Seeds dispersed by wind have many shapes and sizes. The dandelion has parachute-like seeds, and the sycamore has seeds like helicopters. Peas and pansies have pods that explode when they have dried out or are touched by an animal, causing the seeds to fly out. Some plants produce fruits that animals eat but cannot digest. These pass through the animals, allowing the seed to **germinate** in another place using nutrients from the animals' dung. Burdock seeds have tiny hooks that catch on the fur of passing animals.

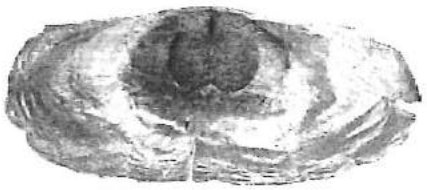
Seeds need to be dispersed as far away from the parent plant as possible, where there could be more light, nutrients and water – thereby increasing the chance of successful growth. Seeds are packed with nutrients to help the germinating plant to grow. Smaller seeds have fewer nutrients but may travel further. Larger seeds have bigger stores of food and can last much longer.



sycamore seeds



burdock seed



Alsomitra vine seed

FIGURE 1.1.12c: How are these seeds dispersed?

3. Why are the seeds from trees in forests most likely to be dispersed by the wind?
4. What are the advantages and disadvantages of a seed growing near the parent plant?

Surveying and sampling seeds

Botanists carry out surveys to try to find out how seeds are dispersed and how successful different plants are at germinating the seeds they make. They might do this by sampling many plants of the same species in a particular habitat. First they count the number of seeds made. Then, after the seeds have dispersed, they sample the habitat again to make an estimate of the number of seedlings that have germinated. By estimating the percentage of seedlings germinated compared to seeds made originally, they can judge how successful the seed dispersal mechanism is.

5. What is the **independent variable** in this survey?
6. What factors need to be controlled in such a survey?
7. How would you ensure the evidence collected was **reliable**?
8. Why might it be important to find out how successful plants are at dispersing and germinating seeds?

Did you know...?

The seeds of the *Alsomitra* vine tree were the inspiration in the development of the first gliders and airplanes. With a wing span of up to 13 cm, they are the largest wind-pollinated seeds in the world.

Key vocabulary

seed dispersal

germinate

independent variable

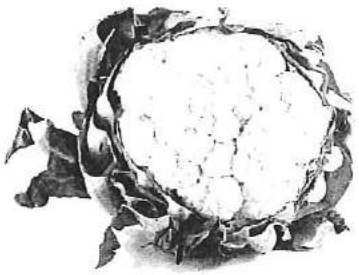
reliable

Understanding how fruits disperse seeds

We are learning how to:

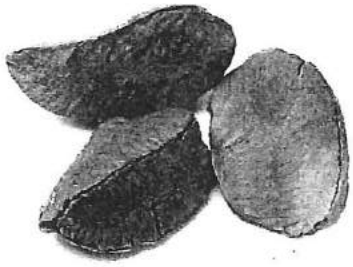
- Describe how fruits are used in seed dispersal.
- Compare evidence about seed dispersal by wind and by fruit formation.
- Use data to evaluate different seed dispersal mechanisms.

Without animals to disperse their seeds, some plants would become extinct. The seeds of the *Astrocaryum* palm used to be dispersed by dinosaurs. Now, small rodents called agoutis disperse the seeds. Agoutis steal each other's seeds, increasing the distance of dispersal.



Plants exploiting animals

Plants use **fruits** to disperse seeds. A fruit is the **ovary** of a plant after fertilisation. The fruit is a nutritious treat surrounding the seed, mainly made of sugars and tasty nutrients to attract animals. Examples include nuts, tomatoes and cucumbers. The seed cannot be digested, so passes through the intestines and out with the faeces. Some seeds, such as mango seeds, are too large to be eaten. When they land in soil, they can germinate to make new plants.



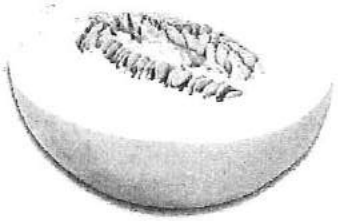


FIGURE 1.1.13a: Where are the seeds in these plant products?

1. What is a 'fruit'?
2. Which of the objects in Figure 1.1.13a is not a fruit?
3. What is the main advantage of fruits dispersing seeds?

Why seeds are dispersed

In producing fruit a plant uses energy, which is transferred to the animals that eat the fruit. The advantage for the plant is that it does not need to produce as many seeds, and most are carried away from the parent plant and land in nutritious soil.

Plants that use wind to disperse seeds usually produce thousands of much smaller seeds, to increase the chance of successful germination. Their small size and aerodynamic features allow them to be dispersed over much larger areas, but with no guarantee of landing in nutritious soil.

The rubber plant and witch hazel have exploding pods that burst open when the seeds are ripe. This mechanism guarantees dispersal, though rarely very far from the parent plant, increasing **competition** and reducing the chance of successful germination. Coconuts are large and buoyant and so can be tranported by seas. They are packed with nutrition so the seed can survive a long time.

4. Which type of dispersal mechanism requires more seeds? Why is this?

FIGURE 1.1.13b: How are these seeds adapted for their dispersal method?

Methods of seed dispersal

TABLE 1.1.13: Different methods of seed dispersal

Name of plant	Type of dispersal mechanism	Approximate number of seeds made per plant	Average dispersal distance
ragwort	parachute	10 000	over 100 m
ash tree	helicopter	1000	over 100 m
Alsomitra vine tree	glider	40 000	1–2 km
witch hazel	exploding pod	100	10 m
pea	exploding pod	100	a few metres
blackcurrant	fruit	300	variable
melon	fruit	500	variable
coconut	water	50	hundreds of miles

Table 1.1.13 summarises the types of seed dispersal mechanisms used by a variety of plants.

5. If you were a plant, which dispersal mechanism would you choose and why?
6. What can you say about the different dispersal mechanisms from the data?
7. Show the data from the table in a graphical form. Choose a good way to represent the data so that mechanisms can be evaluated.

Did you know...?

Avocados are thought to be the most nutritious fruit with over 25 essential nutrients, including vitamin C, iron, magnesium and potassium. Eating plenty of different fruit can reduce the risk of cancer, heart disease, strokes and Alzheimer's disease.

Key vocabulary

fruit

ovary

competition

Understanding the male reproductive system

We are learning how to:

- Describe the structure and function of different parts of the male reproductive system.
- Compare plant and human male reproductive structures.
- Summarise the strengths and weaknesses of the human and plant male reproductive systems.

The human reproductive system is controlled by chemicals. In the male, one chemical is testosterone, which controls the growth and development of the organs and sperm cells. Sperm cells take four to six weeks to mature, and live for about 36 hours once released inside the female.

Male and female

The purpose of a **reproductive system** is to produce offspring and so keep the species alive. In some species, such as plants, the male and female organs are on the same organism. Most vertebrates have separate male and female organisms, with specially adapted reproductive systems. The purpose of the human male reproductive system is to make millions of male sex cells (sperm) and to transport them inside the female to fertilise an egg cell and so produce a baby.

1. Name the male sex cells and female sex cells in humans.
2. What is the purpose of the male reproductive system?

Naming the parts

The **testes** are two organs where human sperm cells are made. They are protected inside the **scrotal sac.** A tube called the **sperm duct** carries the sperm to a large organ called the prostate gland. Here, a liquid called **semen** is produced and mixed with the sperm cells, to supply them with nutrients for their long journey. They leave the male through a tube called the **urethra,** inside the organ known as the **penis.** This occurs during the act of sexual intercourse.

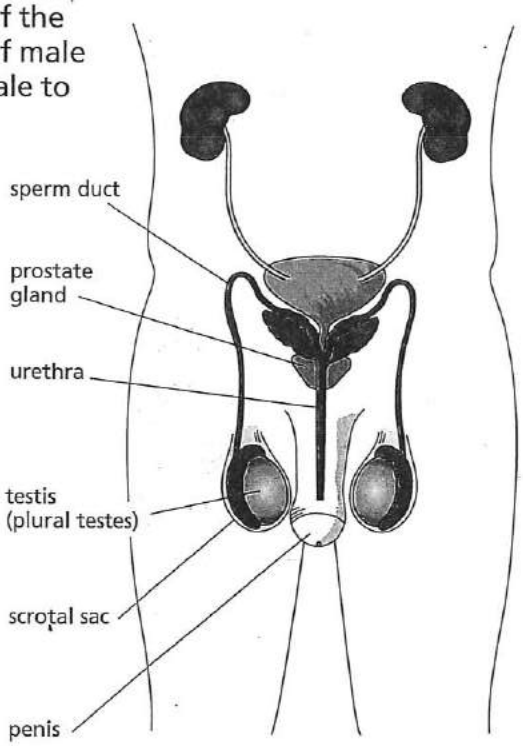


FIGURE 1.1.14a: The male reproductive system

3. List one cell and two organs in the male reproductive system.
4. Draw the journey of a sperm cell, labelling the parts of the male reproductive system that it passes through.

Transfer of the male sex cell

The human male reproductive system has the same purpose as the stamen in a flower. The anther makes pollen (the male sex cells of the plant), just as the testes make sperm cells. The anther releases the pollen to be transported to the stigmas of other plants using external influences such as insects or the wind.

Humans carry out internal fertilisation. In sexual intercourse, the penis is inserted inside the vagina – its movement stimulates the release of sperm from the testes. In this way, sperm are guaranteed to be placed directly inside the female. Both the anther and the testes produce millions of male sex cells to maximise the likelihood of successful fertilisation. However, plants produce pollen only when the stigmas are likely to be ready for fertilisation.

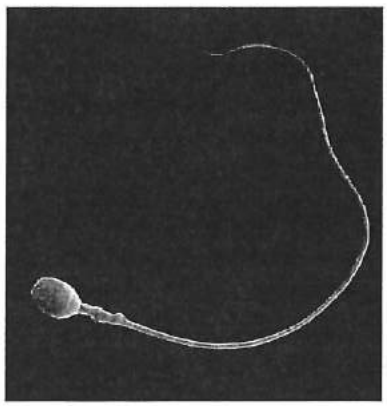


FIGURE 1.1.14b: The human male sex cell is adapted to carry out its job. How is it different from a pollen cell?

5. Which parts make the male sex cells in plants and in humans?
6. What additional features does a plant reproductive system have that a human reproductive system does not have? Why does it need them?
7. What advantage(s) does the plant male reproductive system have over the human male reproductive system?
8. Which system do you think is more effective – the stamen or the human male reproductive system? Give reasons for your answer.

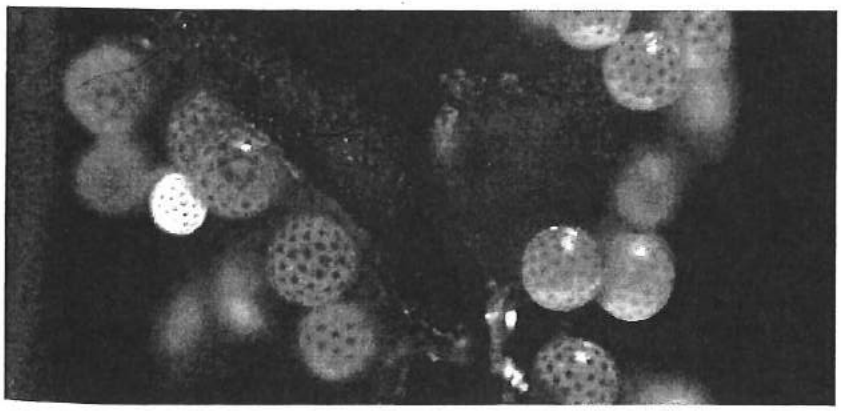


FIGURE 1.1.14c: Pollen on the stamen of a flower. Compare this with the human male reproductive system.

Did you know...?

A human sperm is the smallest cell in the body. 5000 sperm cells would fit into one millimetre. The egg cell is the largest – about the size of a full stop.

Key vocabulary

reproductive system
testes
scrotal sac
sperm duct
semen
urethra
penis

Understanding the female reproductive system and fertility

We are learning how to:

- Describe the structures and functions of different parts of the female reproductive system.
- Explain the process of fertilisation.
- Explain problems of infertility and how they might be treated.

The human female reproductive system receives sperm and enables the fertilised egg to develop until it is ready to be born. The uterus, or womb, is where the foetus grows and develops. The uterus increases to up to 20 times its original size during pregnancy.

The functions of female organs

The human female reproductive system has two main purposes – to produce egg cells that may be fertilised by the male sperm, and to provide an environment for the growing foetus.

The main female organs are the **vagina, cervix, uterus, oviduct** and **ovary**. Table 1.1.15 summarises the structure and function of each of these.

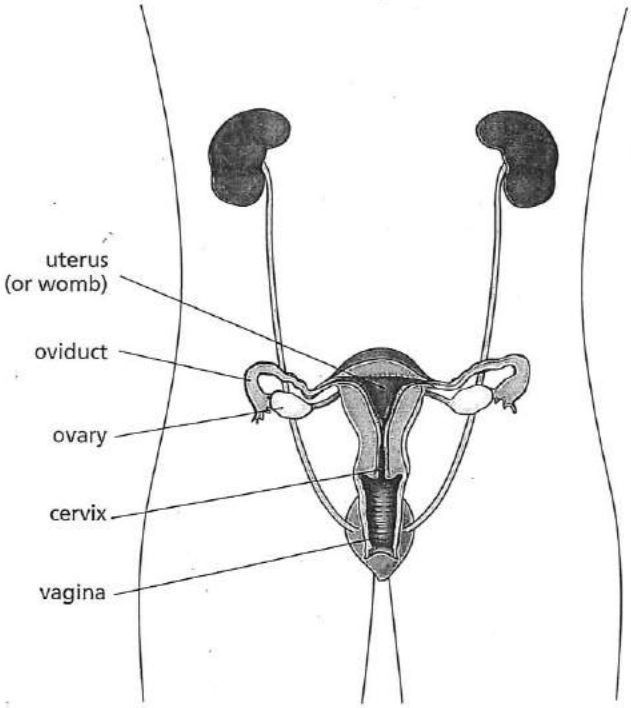


FIGURE 1.1.15a: The female reproductive system

TABLE 1.1.15: Female reproductive organs

Vagina	Muscular tube, 8 to 12 cm long, that extends up to the uterus and can stretch to allow a baby to pass
Cervix	Narrow opening from the vagina to the uterus with thick walls – can extend wide enough to allow a baby to pass
Uterus or womb	Pear-shaped cavity with thick muscular walls – where fertilisation occurs and the developing baby grows
Oviduct (Fallopian tube)	The tube that carries the egg from the ovary to the uterus
Ovary	Where eggs cells are made and then released into the oviduct

1. Where are female sex cells made?
2. Why do you think the uterus has muscular walls?

Fertilisation

One egg matures each month in the ovary and is released into the oviduct – this process is called **ovulation**. The lining of the oviduct contains specialised cells with tiny hairs that beat causing the egg to move down to the uterus, where for up to 24 hours it may be fertilised by a sperm cell. Only one sperm penetrates the egg cell, losing its tail as it does so. The nucleus of the sperm fuses with the nucleus of the egg, combining the genetic material of both. The fertilised egg is the start of a new life.

3. Why does the egg need to move from the ovary to the uterus?
4. Why do you think the egg cell is so much bigger than the sperm cell?
5. Explain the difference between ovulation and fertilisation.

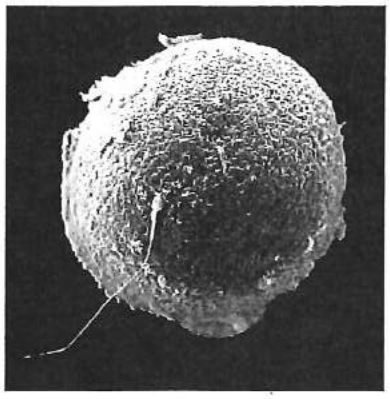


FIGURE 1.1.15b: Fertilisation occurs when one sperm cell penetrates the egg cell and their nuclei fuse.

Infertility

Most women below the age of 36 have little trouble in having babies. However, **infertility** affects about 3.5 million women in the UK. There are a number of causes:

- External factors – such as excessive alcohol, drugs, long-term smoking, stress and sexually transmitted diseases.
- Problems with ovulation – the release of eggs is controlled by chemicals called hormones; an imbalance may result in eggs not being made or released.
- Endometriosis – cells from the lining of the oviduct may start to grow around the ovary and cause cysts to appear, making it hard for the eggs to be released.
- Blockages in the oviduct – these can prevent an egg from reaching the uterus and becoming fertilised.

In men, infertility may be caused by a low number of healthy sperm or sperm that can't swim well because of disease.

6. For each of the female infertility problems, suggest a possible solution.

Did you know...?

The ovaries of new-born girls have about 600 000 immature eggs. However, an adult woman is capable of giving birth to a maximum of 35 babies.

Key vocabulary

vagina
cervix
uterus
oviduct
ovary
ovulation
infertility

Learning about changes in puberty

We are learning how to:

- Recognise changes in male and female bodies during puberty.
- Describe the process of menstruation
- Explain how some problems with menstruation occur.

Puberty refers to the period when physical changes occur that enable a person to reproduce. It can start from any age between 8 and 16 years. All the changes are controlled by chemicals called hormones, which work together.

Changes during puberty

During **puberty** in girls:

- the hips widen, preparing for childbirth
- there is a height spurt
- breasts become bigger to prepare for breastfeeding
- **menstruation (periods)** start
- hair develops in the armpits and around the reproductive organs.

During puberty in boys:

- the shoulders broaden to give a strong appearance
- the voice deepens to attract females
- there is a height spurt
- the penis and testes grow
- sperm is produced and released during 'wet dreams' to prepare for intercourse
- hair develops in the armpits and around the reproductive organs.

1. What changes in puberty occur in *both* boys and girls?

When the changes happen

The changes that occur during puberty, and the ages between which they usually occur, are shown in Table 1.1.16.

Event in puberty	Age range for start of event (years)
height spurt in girls	8.5 – 14.0
development of breasts	8.0 – 13.0
first menstruation period	10.5 – 15.5
height spurt in boys	10.5 – 16.5
growth of penis	10.5 – 14.5
growth of testes	9.5 – 13.5
growth of voice box (larynx)	10.5 – 14.0

TABLE 1.1.16: Age ranges for the start and end of changes in puberty

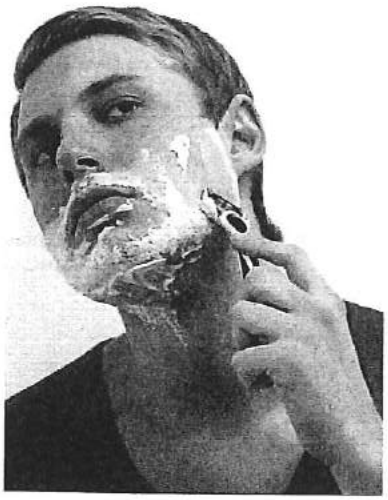


FIGURE 1.1.16a: Individuals experience changes at different ages.

2. Look at the data in Table 1.1.16. What are the youngest ages at which a girl and a boy can start puberty?
3. Is there any order in which particular events occur in puberty? Give evidence for your answer.

Menstruation

Menstruation occurs in a cycle lasting about 28 days and is controlled by hormones. Some women experience problems:

- Amenorrhea (absence of periods) is caused by hormonal problems, defects in the ovary, stress or anorexia.
- Menorrhagia (excessively heavy bleeding) is caused by hormonal imbalances or infection in the uterus.
- Dysmenorrhea (period pain) is also caused by hormone imbalances.

Did you know...?

Apart from humans, only primates, elephant shrews and some bats undergo menstruation. In other mammals, the lining is reabsorbed by the body so that nutrients are not lost.

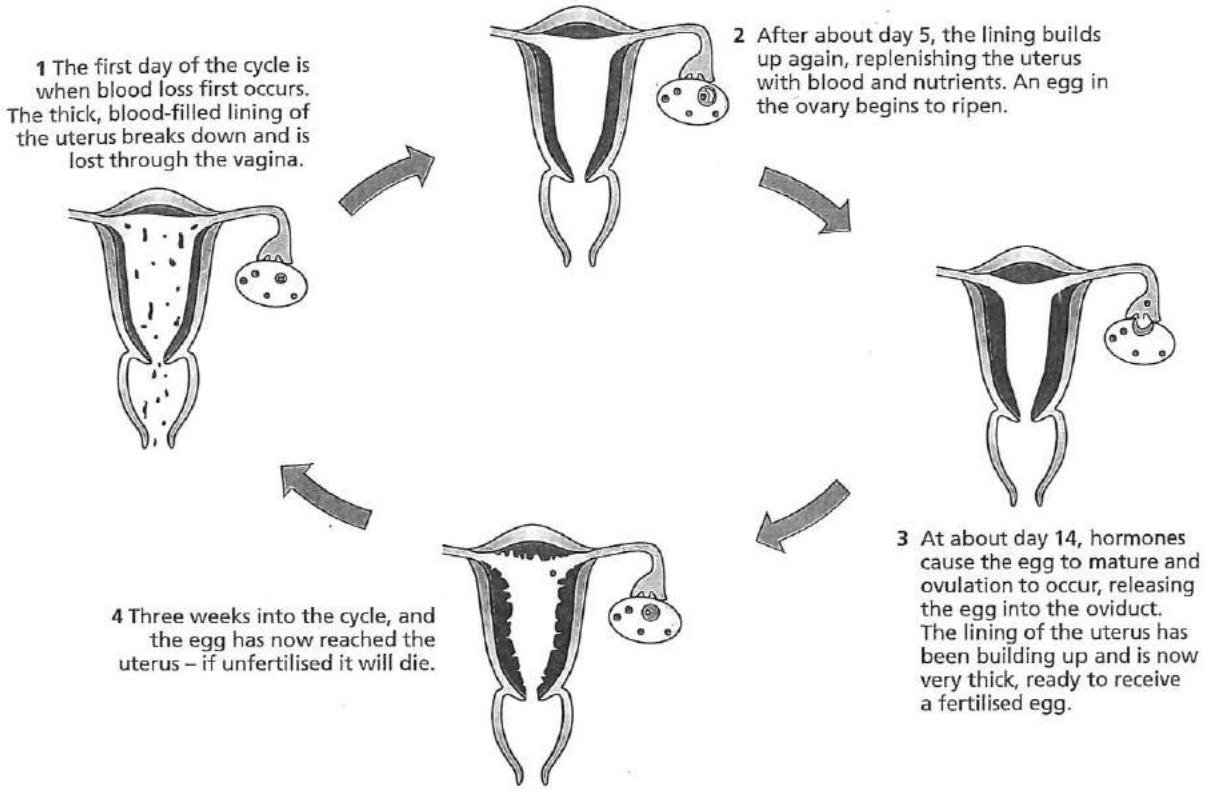


FIGURE 1.1.16b: The menstrual cycle

4. What part do hormones play in normal and abnormal periods?
5. Look at Figure 1.1.16b. Explain the problems that may occur at different stages of the cycle.

Key vocabulary

puberty
menstruation
period

Learning how a foetus develops

We are learning how to:

- Recognise the process of growth.
- Use data to show how the embryo grows during gestation.
- Compare and contrast the pregnant uterus with the non-pregnant uterus.

A human foetus takes 38 weeks to grow from one fertilised cell into a complete baby ready to be born. Dogs take just two months, whereas elephants take up to two years. The mother provides the developing foetus with all the nutrients and oxygen it needs, as well as removing all waste products.

Cell division

When an egg cell has been fertilised, it divides into two cells. These cells further divide to make four cells, which divide again to make eight cells. This **cell division** continues until there are several thousand cells. This is the process of growth, where cells divide to make new cells and the overall size of the organism increases. Within the first two to three weeks the cells are all the same – they are called **stem cells**. Stem cells have the ability to become any specialised cell in the body.

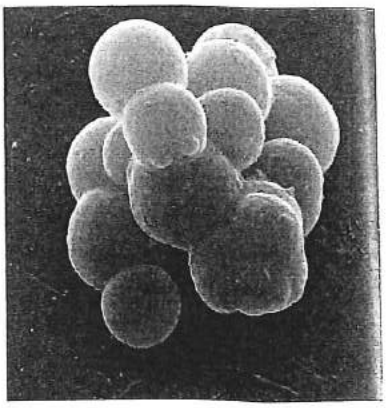


FIGURE 1.1.17a: Stem cells

1. What is 'growth'?
2. What is special about stem cells?

Development of the foetus

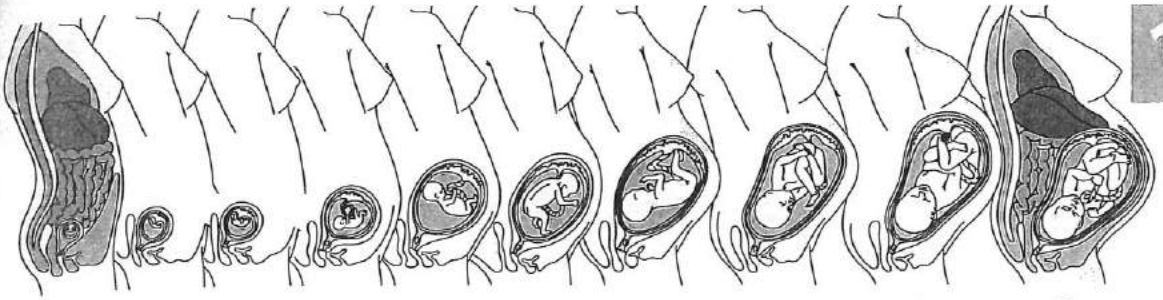
Once the ball of stem cells reaches a certain size, the cells begin to differentiate and become specialised cells. Some cells will develop into the organs and tissues of the developing baby. At this stage when the cells begin to differentiate, the ball of cells is called an **embryo**. Once it reaches about 8 weeks old, when most of the main organs are formed, including the heart which is now beating, it is called a **foetus**.

Figure 1.1.17b shows the different stages of development of a human foetus. Ultrasound is used to make images of the foetus at different stages to monitor its development and identify any problems. The height of the foetus can be measured using these images.

3. When is the fastest period of growth of the developing foetus? Explain your answer.

Did you know...?

The taste buds of a foetus develop at 14 weeks; it can hear at 24 weeks and track objects with its eyes at 31 weeks. At 28 weeks, a foetus is likely to survive if born.



weeks of gestation	9	12	16	20	24	28	32	36	40
size (length) of foetus	50mm	90mm	140mm	190mm	230mm	270mm	300mm	340mm	380mm

FIGURE 1.1.17b: Foetuses at different stages of development

Supporting structures

During pregnancy, other cells from the original ball of cells will become structures that connect with the mother – the **placenta**, amnion, amniotic fluid and **umbilical cord**. These structures are shown in Figure 1.1.17c.

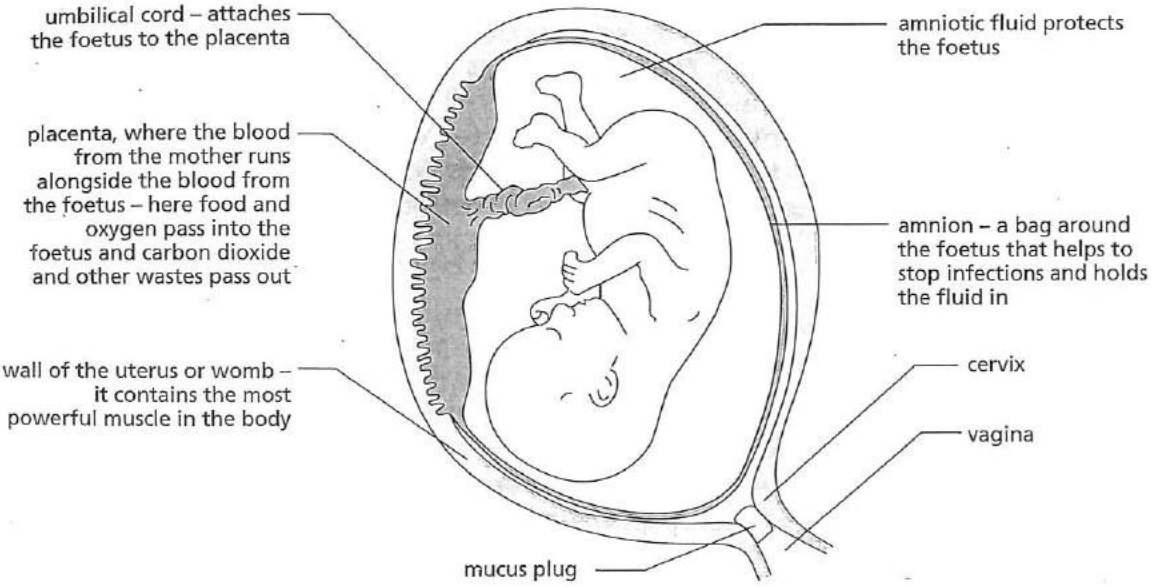


FIGURE 1.1.17c: The developing foetus in the uterus

4. Why does a foetus need the placenta?
5. Why is it important for the baby to be surrounded by fluid?
6. Summarise the different ways in which a pregnant uterus is different from a normal uterus.

Key vocabulary

cell division
stem cells
embryo
foetus
placenta
umbilical cord

Understanding factors affecting a developing foetus

We are learning how to:

- Describe the effects of different factors on a developing foetus.
- Evaluate the strength of data.

A foetus can't take in its own food or oxygen and relies on the mother to supply it with essential chemicals and nutrients. The placenta allows substances to pass from mother to baby.

The role of the placenta

The placenta allows oxygen, glucose, digested proteins and fats, vitamins and minerals to enter the foetus – it also removes carbon dioxide and waste products, such as urea. Harmful substances can also cross the placenta including alcohol, nicotine, carbon monoxide, cocaine, insecticides, lead and mercury.

1. How might the harmful substances come to be at the placenta?
2. What would happen to a foetus without the placenta? Explain your answer.

FIGURE 1.1.18a: An ultrasound scan of a foetus enables its development to be checked.

Effects of substances on the foetus

Scientific studies have established how different substances affect a developing foetus. Foetal size and movements can be tracked and the heartbeat measured. Tests have found out that some substances affect the foetus – see Table 1.1.18.

TABLE 1.1.18: Substances that affect a developing foetus

Alcohol	Higher rate of stillbirth, lower birth weight, lower IQ; baby slower to move and think, more likely to be dependent on alcohol in adulthood.
Smoking – nicotine and carbon monoxide	Much higher risk of stillbirth, **premature** delivery and low birth weight resulting in poor development; greater likelihood of developing asthma.
Drugs – marijuana, cocaine	Higher rate of stillbirth, premature birth, low birth weight, learning difficulties and likely addiction to the drug.
Nutrition – folic acid	Good for the development of the brain and spinal cord; supplements should be taken as soon as pregnancy is recognised.

3. What are the common factors that badly affect the development of a foetus?
4. What advice can you give to pregnant mothers to help them have a healthy baby?
5. How confident can you be about the evidence produced by ultrasound scans? Explain your answer.

Validity and reliability in research

Researchers need to ensure that their investigations produce **valid** and **reliable** evidence. 'Valid' means that the evidence collected answers the question being investigated. It must take account of all possible variables. The evidence should also be reliable. This can be done through repeat readings or, in the case of a survey, using a large **sample size**.

6. Comment on the validity and reliability of the following studies:
   - **a)** The first research on the effects of alcohol was conducted on 127 babies born to alcoholic mothers in France in 1968. The babies were found to have lower birth weights and lower intelligence.
   - **b)** In a study on the effect of smoking, the ultrasound scans of 65 mothers who smoked were compared with the scans of 36 mothers who were non-smokers.
   - **c)** In a study on the use of folic acid, the mothers of 85 per cent of Norwegian children born between 2002 and 2008 completed a questionnaire. Researchers found that 0.1 per cent of mothers who took folic acid had autistic children, compared to 0.21 per cent who did not take folic acid.

Did you know...?

A woman may not realise she is pregnant until about 8 weeks after conception. The embryo's brain starts to develop after just 2 to 3 weeks and is highly influenced by chemicals coming through the placenta.

FIGURE 1.1.18b: Possible consequence of smoking during pregnancy

Key vocabulary

premature
valid
reliable
sample size

Checking your progress

To make good progress in understanding science you need to focus on these ideas and skills.

Recognise and label basic and specialised animal cells and plant cells; use a microscope to make observations.

Describe the functions of the nucleus, cell membrane, mitochondria, cytoplasm, cell wall, vacuole and chloroplast.

☐ Compare and contrast the similarities and differences between specialised animal cells and plant cells.

Describe unicellular organisms – including yeast, bacteria, euglena, paramecium and amoeba – as being either prokaryotes or eukaryotes.

Describe the function of specialised parts of different unicellular organisms.

☐ Explain how different structures help organisms to survive.

Recognise the role of diffusion in living organisms.

Describe the process of diffusion, and name the materials needed by the cell and those removed from the cell.

☐ Explain the factors that affect diffusion.

Put the terms cell, tissue, organ and organ system in order of hierarchy, naming some common tissues, organs and organ systems in humans.

Explain the terms cell, tissue, organ and organ system and the function of all the main organ systems in the body.

☐ Describe some benefits and disadvantages of multicellular organisms compared to single-celled organisms.

Describe the role of different parts of a flowering plant in reproduction.

Explain the differences in wind-pollinated and insect-pollinated plants.

☐ Discuss the strengths and weaknesses of wind-pollinated and insect-pollinated plants.

Recognise different seed-dispersal methods and relate these to the structures of the seeds.	Identify key variables that need to be controlled when investigating the effect of seed design on seed dispersal.	Explain the advantages and disadvantages of different seed-dispersal mechanisms.
Name the main parts of the male and female human reproductive systems.	Describe the structures and functions of the main parts of the male and female human reproductive systems; describe how fertility problems may arise.	Explain how the male and female reproductive structures are designed for fertilisation; describe methods to combat infertility.
Recognise changes that occur during adolescence.	Describe how the menstruation cycle works.	Explain how and why some problems occur with menstruation.
Identify substances passed on from a mother that will either help or harm her developing foetus.	Describe the structures and functions of different parts of a pregnant uterus, describing how substances pass into and from a developing foetus.	Explain how a pregnant uterus is different from a normal uterus, including the impact of different substances on the health and development of a foetus.

Questions

Questions 1–7

See how well you have understood the ideas in the chapter.

1. Which of the following is a unicellular organism? [1]

a) nerve cell **b)** cytoplasm **c)** amoeba **d)** flowering plant

2. Where in the cell would the most diffusion take place? [1]

a) nucleus **b)** cell membrane **c)** chloroplast **d)** cell wall

3. Which structure is not directly linked to fertilisation? [1]

a) egg cell **b)** ovary **c)** stigma **d)** pollen grain

4. Which of the following will not pass from a mother to her developing foetus across the placenta? [1]

a) carbon dioxide **b)** carbon monoxide **c)** alcohol **d)** glucose

5. Using an example, describe the theory of 'spontaneous generation'. [2]

6. Describe the events after pollination that lead to fertilisation. [2]

7. Outline what happens in the menstruation cycle. [4]

Questions 8–14

See how well you can apply the ideas in this chapter to new situations.

8. Some plants live in conditions of low light on the floor of thick forest. Which of the following features are likely to help them to survive? [1]

a) They will have brightly coloured petals.

b) Their leaves will be dark green, packed with more chloroplasts than ordinary leaves.

c) They will have fewer root hair cells.

d) Their seeds will have parachutes so they can be blown by the wind.

9. Cells in the lining of the human lung need to transfer oxygen quickly from the lungs to the blood. How are the cells likely to be adapted to carry out their job? [1]

a) They will contain chloroplasts to collect sunlight.

b) They will contain cilia to remove bacteria.

c) They will have a thin cell membrane and lots of mitochondria.

d) They will have a large surface area and a thin cell membrane.

10. Insect populations in towns are declining. What can be done to increase these populations? [1]

a) Grow a greater variety of wild flowers. **b)** Use more pesticides.

c) Grow more crops for food. **d)** Build more roads and buildings.

11. Seeds are dispersed by a variety of mechanisms. Some are shown in Figure 1.1.20a. Which type of seed is likely to disperse the furthest if the plant was growing on an island? [1]

	Type of seed
a)	Avocado stone
b)	Coconut
c)	Dandelion head
d)	Burdock seed

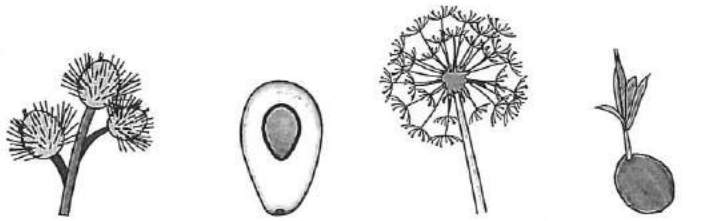


FIGURE 1.1.20a

12. Some scientists discover a new unicellular organism. What features would enable them to classify it as algae? [2]

13. A sixteen-year-old girl has not yet begun to menstruate. What two reasons could there be? [2]

14. Bees in Australia are not affected by colony collapse disorder. Explain why this might be so. [4]

Questions 15–16

See how well you can understand and explain new ideas and evidence.

15. Figure 1.1.20b shows the percentage of motile (moving) sperm in men according to whether they are smokers and/or fertile. What information would you want to know about this study before you could trust the data? [2]

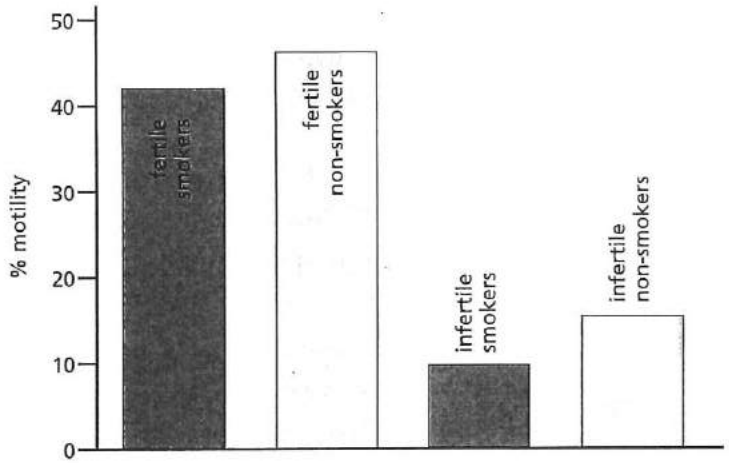


FIGURE 1.1.20b: How smoking affects motility of sperm
(Source: Bethany R. Brookshire, Ph.D scientopia.org/blogs/scicurious/)

16. Sketch a graph to show how the weights of foetuses from smoking mothers compare to those from non-smoking mothers. Give reasons for the differences. [4]

Maths

KS3

Adding and Subtracting Decimals

1. Workout:

a) 0.4 + 0.1 =
b) 0.8 + 0.4 =
c) 0.6 + 0.2 =
d) 0.8 + 0.5 =
e) 0.6 + 0.9 =

2. Workout:

a) 0.48 + 0.99 =
b) 0.54 + 0.74 =
c) 0.96 + 0.7 =
d) 0.77 + 0.2 =
e) 0.89 + 0.79 =

3. Workout:

a) 5.14 + 26.3 =
b) 6.91 + 63.9 =
c) 1.76 + 37.7 =
d) 3.25 + 30.9 =
e) 6.58 + 43.7 =

4. Workout:

a) 0.59 - 0.14 =
b) 0.88 - 0.34 =
c) 0.82 - 0.33 =
d) 0.96 - 0.25 =
e) 0.86 - 0.16 =

5. Workout:

a) 4.2 - 1.26 =
b) 41.8 - 2.78 =
c) 72.2 - 4.95 =
d) 86.7 - 9.67 =
e) 62.9 - 8.79 =

Factors and HCF

1) Find all the factors of the following numbers:
    1) 20
    2) 24
    3) 27
    4) 32
    5) 40
    6) 50
    7) 56
    8) 120
    9) 200
2) 2 only has 2 factors (1 and 2), how many numbers can you find between 1 and 30 which have exactly 2 factors? (these are called prime numbers)
3) Find the highest common factors of the following pairs of numbers:
    1) 18 and 54
    2) 25 and 45
    3) 12 and 18
    4) 27 and 108
    5) 30 and 75
4) Find the HCF of these pairs of numbers:
    1) 90 and 450
    2) 96 and 480
    3) 39 and 195

Factor Trees

1. **Draw factor trees for the following numbers:**
    a) **20**
    b) **24**
    c) **48**
    d) **90**
    e) **81**
    f) **50**
    g) **75**
    h) **120**
    i) **200**
    j) **1800**

2. Using your factor trees from question 1, write the numbers as products of their prime factors .

Directed Numbers

1)	-20	+	7	=
2)	-4	+	16	=
3)	-5	+	0	=
4)	-6	+	16	=
5)	-5	+	19	=
6)	-19	+	18	=
7)	-19	+	8	=
8)	-16	+	15	=
9)	-5	+	12	=
10)	-17	+	10	=

1)	-10	+	-7	=
2)	-4	+	-20	=
3)	-7	+	-16	=
4)	-6	+	-18	=
5)	-3	+	-6	=
6)	-14	-	-6	=
7)	-1	-	-9	=
8)	-17	-	-5	=
9)	-18	-	-4	=
10)	-15	-	-6	=

1)	20	+	-3	=
2)	14	+	-19	=
3)	9	+	-8	=
4)	11	+	-3	=
5)	6	+	-16	=
6)	12	-	-11	=
7)	11	-	-15	=
8)	19	-	-17	=
9)	8	-	-9	=
10)	7	-	-9	=

Directed Numbers 2

1) I am £250 into my overdraft (☹) but then I get paid £535, how much will I have in my bank account?
2) The temperature at the North Pole is -17°C; luckily the temperature in my living room is 40°C warmer than that, what is the temperature in my living room?
3) I have £32 and each month for 4 months I have to pay £15 to my mobile phone, if I don't put any money into my account, how far will I be into my overdraft?
4) I jump out of a plane 125m above the ocean, I travelled 191m before I stop, how far am I from the surface of the water?
5) I am playing air hockey with my friend, because I am amazing I agree start on -9 points, we play first to 14, how many points do I need to score?

Equivalent Fractions

1. **Write 5 fractions equivalent to:**
   a. $\frac{1}{2}$
   b. $\frac{1}{4}$
   c. $\frac{2}{3}$
   d. $\frac{3}{4}$
   e. $\frac{2}{5}$
2. **Fill in the blanks:**
   a. $\frac{1}{10}=\frac{\square}{40}$ b. $\frac{3}{4}=\frac{\square}{20}$ c. $\frac{2}{5}=\frac{\square}{30}$ d. $\frac{4}{7}=\frac{\square}{35}$ e. $\frac{5}{6}=\frac{\square}{72}$ f. $\frac{4}{9}=\frac{\square}{18}$
   g. $\frac{13}{24}=\frac{\square}{48}$ h. $\frac{8}{13}=\frac{\square}{53}$ i. $\frac{10}{11}=\frac{\square}{132}$ j. $\frac{4}{5}=\frac{12}{\square}$ k. $\frac{7}{8}=\frac{56}{\square}$ l. $\frac{8}{14}=\frac{88}{\square}$
   m. $\frac{22}{25}=\frac{110}{\square}$ n. $\frac{20}{30}=\frac{\square}{600}$ o. $\frac{5}{15}=\frac{205}{\square}$ p. $\frac{2}{54}=\frac{360}{\square}$

Ratio

1. There are 10 girls and 15 boys in a class, what is the ratio of girls to boys in its simplest form?
2. There are 14 cats and 16 dogs in an animal shelter, what is the ratio of cats to dogs in its simplest form?
3. There 22 caramels and 55 fudges in a bag of sweets, what is the ratio of caramels to fudges in its simplest form?
4. Simplify these ratio to their simplest forms:
   a) 48:60
   b) 45:75
   c) 63:108
   d) 25:40:80
   e) 24:56:96
   f) 120:180:600
   g) 320:400:440
5. Archie and Charlie share their Thomas the tank engine toys in the ratio 1:4, how many do they each get if they have:
   a. 10 toys b.30 toys c.45 toys
6. Tom and Jerry share sweets in the ratio 2:3, how many do they each get if they share:
   a. 20 sweets b.30 sweets c.55 sweets
7. Sue and Linda share some money in the ratio 3:7, how many do they each get if they share:
   a. £30 b.£60 c.£90
8. Mike, Dave and Henry share some little bits of blue tack in the ratio 1:2:3, how many do they each get if they share:
   a. 60 pieces b.72 pieces c.300 pieces

Finding Percentages

1) **Some percentages I can find easily by doing a single sum, what single sums can I do to find:**
   a. **10%** b. **50%** c.**25%**
2) **If I know 10% how can I find:**
   a. **5%** b. **1%** c. **20 %** d. **90%**
3) **If I know 50% how can I find:**
   a. **5%** b. **25%**
4) **Find:**
   a. **30% of 250** b. **40% of 500** c. **15% of 220** d. **75% of 84**
5) **Find:**
   a. **35% of 440** b. **65% of 450** c. **16% of 220** d. **82% of 96**
6) **Find:**
   a. **94% of 640** b. **8% of 520** c. **27% of 220** d. **53% of 96**
7) **Compare you methods for the questions above with a partner, where they the same ?**

Equivalent Fractions

1. **Write 5 fractions equivalent to:**
   a. $\frac{1}{2}$
   b. $\frac{1}{4}$
   c. $\frac{2}{3}$
   d. $\frac{3}{4}$
   e. $\frac{2}{5}$
2. **Fill in the blanks:**
   a. $\frac{1}{10}=\frac{\square}{40}$ b. $\frac{3}{4}=\frac{\square}{20}$ c. $\frac{2}{5}=\frac{\square}{30}$ d. $\frac{4}{7}=\frac{\square}{35}$ e. $\frac{5}{6}=\frac{\square}{72}$ f. $\frac{4}{9}=\frac{\square}{18}$
   g. $\frac{13}{24}=\frac{\square}{48}$ h. $\frac{8}{13}=\frac{\square}{53}$ i. $\frac{10}{11}=\frac{\square}{132}$ j. $\frac{4}{5}=\frac{12}{\square}$ k. $\frac{7}{8}=\frac{56}{\square}$ l. $\frac{8}{14}=\frac{88}{\square}$
   m. $\frac{22}{25}=\frac{110}{\square}$ n. $\frac{20}{30}=\frac{\square}{600}$ o. $\frac{5}{15}=\frac{205}{\square}$ p. $\frac{2}{54}=\frac{360}{\square}$

HCF and LCM

Find the Highest Common Factor of these numbers:

- **18 and 30**
- **15 and 20**
- **16 and 24**
- **12 and 36**
- **20 and 30**
- **28 and 70**
- **39 and 65**
- **38 and 57**

Find the Lowest Common Multiple of these numbers

- **6 and 7**
- **4 and 6**
- **5 and 8**
- **10 and 4**
- **16 and 5**
- **14 and 21**
- **2.2 and 5**
- **0.4 and 7**

Fractions, Decimals and Percentages

Copy down these statements, when you have finished see if you can tick off any of the statements

- I can convert between decimals and percentages
- I can convert between simple fractions and percentages
- I can convert between simple fractions and decimals

1. Convert these decimals to percentages

   a. 0.75 b. 0.1 c.0.2 d.0.35 e.0.42

2. Convert these percentages to decimals:

   a. 70% b.25% c. 30% d. 15% e. 5%

3. Convert these fractions to percentages

   a. $\frac{3}{5}$ b. $\frac{7}{10}$ c. $\frac{8}{100}$ d. $\frac{27}{100}$ e. $\frac{4}{5}$

4. Convert these percentages to fractions

   a. 25% b. 33% c. 51% d.80% e. 20%

5. Convert these fractions to decimals

   a. $\frac{4}{10}$ b. $\frac{9}{10}$ c. $\frac{74}{100}$ d. $\frac{3}{100}$ e. $\frac{5}{100}$

6. Convert these decimals to fractions

   a. 0.7 b. 0.6 c.0.22 d.0.35 e.0.42

Multiples

A. List the first 5 multiples of:

1. 5
2. 7
3. 12
4. 14
5. 19

B. What is the:

1. 9th multiple of 8
2. 7th multiple of 6
3. 12th multiple of 12
4. 11th multiple of 10
5. 13th multiple of 5
6. 5th multiple of 13

C. List 3 numbers v

1. 3 and 4 times tal
2. 3 and 5 times tal
3. 10 and 4 times t
4. 9 and 2 times tal
5. 12 and 10 times

D. What is the lowe

1. 5 and 6
2. 7 and 8
3. 4 and 8
4. 9 and 6
5. 10 and 6

E. What is the lowes

1. 13 and 5
2. 15 and 12
3. 16 and 10
4. 14 and 21
5. 21 and 70

a) 5,10,15,20,25
b) 7.14.21.28.35
c) 12,24, 36, 48, 60
d) 14,28,42,56,70
e) 19,38,57,76,95

a) 72
b) 42
c) 144
d) 110
e) 65
f) 65

a) 12,24,36
b) 15,30,45
c) 20,40,60
d) 18,36,54
e) 60,120,180

a) 30
b) 56
c) 8
d) 18
e) 30

a) 65
b) 60
c) 80
d) 42
e) 210

Multiplying and dividing fractions

1. **Work out:**

   a. $\frac{1}{8} \times \frac{3}{4} =$

   b. $\frac{5}{12} \times \frac{1}{4} =$

   c. $\frac{3}{9} \times \frac{1}{3} =$

   d. $\frac{2}{5} \times \frac{4}{10} =$

   e. $\frac{3}{6} \times \frac{7}{8} =$

2. **Work out:**

   a. $\frac{13}{6} \times \frac{5}{3} =$

   b. $\frac{11}{3} \times \frac{6}{2} =$

   c. $\frac{8}{3} \times \frac{12}{4} =$

   d. $\frac{21}{14} \times \frac{2}{3} =$

   e. $\frac{10}{8} \times \frac{2}{5} =$

3. **Work out:**

   a. $\frac{1}{8} \div \frac{3}{4} =$

   b. $\frac{5}{12} \div \frac{1}{4} =$

   c. $\frac{3}{9} \div \frac{1}{3} =$

   d. $\frac{2}{5} \div \frac{4}{10} =$

   e. $\frac{3}{6} \div \frac{7}{8} =$

4. **Work out:**

   a. $\frac{13}{6} \div \frac{5}{3} =$

   b. $\frac{11}{3} \div \frac{6}{2} =$

   c. $\frac{8}{3} \div \frac{12}{4} =$

   d. $\frac{21}{14} \div \frac{2}{3} =$

   e. $\frac{10}{8} \div \frac{2}{5} =$

Multiplying and dividing decimals

Multiplying

1	a)	0.8 x	7	=
	b)	0.5 x	7	=
	c)	0.1 x	6	=
	d)	0.6 x	4	=
	e)	0.3 x	3	=
2	a)	0.2 x	0.5	=
	b)	0.4 x	0.7	=
	c)	0.8 x	0.1	=
	d)	0.9 x	0.9	=
	e)	0.6 x	0.1	=
3	a)	1.9 x	0.3	=
	b)	1.6 x	0.5	=
	c)	1.6 x	0.5	=
	d)	1.7 x	0.2	=
	e)	1.3 x	0.7	=
4	a)	5.4 x	0.11	=
	b)	5.2 x	0.97	=
	c)	8.3 x	0.73	=
	d)	4.6 x	0.11	=
	e)	8.2 x	0.75	=

Dividing

1

a) 3.2 ÷ 4
b) 4.8 ÷ 8
c) 7.2 ÷ 9
d) 2.4 ÷ 6
e) 1.8 ÷ 3

2

a)5.6 ÷ 0.7
b)6.3 ÷ 0.7
c)2.7 ÷ 0.3
d)4.9 ÷ 0.7
e)2.8 ÷ 0.7

3

a) 1.65 ÷ 0.15
b) 24 ÷ 0.12
c) 27.3 ÷ 1.3
d) 0.03 ÷ 0.005
e) 0.99 ÷ 0.0009

Ordering Fractions

Order these fractions:

1. $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{4}{8}$
2. $\frac{2}{5}$, $\frac{6}{10}$, $\frac{1}{2}$, $\frac{2}{2}$, $\frac{3}{5}$
3. $\frac{3}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{4}{6}$, $\frac{5}{12}$
4. $\frac{2}{3}$, $\frac{1}{4}$, $\frac{5}{6}$, $\frac{7}{8}$, $\frac{1}{2}$
5. $\frac{3}{4}$, $\frac{6}{10}$, $\frac{2}{5}$, $\frac{1}{2}$, $\frac{1}{4}$
6. $\frac{4}{9}$, $\frac{2}{3}$, $\frac{1}{2}$, $\frac{5}{6}$, $\frac{1}{3}$
7. $\frac{2}{6}$, $\frac{2}{3}$, $\frac{5}{12}$, $\frac{1}{4}$, $\frac{7}{9}$
8. $\frac{2}{7}$, $\frac{2}{4}$, $\frac{11}{14}$, $\frac{3}{2}$, $\frac{5}{8}$

Ordering Decimals

1. For each pair of numbers say which is bigger by adding > or <.
   a) 0.2 0.7
   b)0.3 0.1
   c)0.7 0.9
   d)0.3 0.4
   e)0.6 0.3
   f)0.24 0.2
   g)0.3 0.39
   h)0.4 0.35
   i)0.9 0.85
   j)0.22 0.3
2. Try these:
   a) 0.04 0.05
   b)0.02 0.09
   c)0.12 0.02
   d)0.04 0.23
   e)0.4 0.04
3. These are trickier:
   a) 2.34 0.09
   b)4.49 4.0003
   c)5.01 5.1
   d)6.32 6.325
   e)7.436 7.43
   f)8.35 8.345

4. Put these decimals in ascending order (smallest to biggest):
   a. 0.2 0.3 0.15
   b. 0.7 0.64 0.072
   c. 0.85 0.9 0.425
   d. 0.734 0.7345 0.7335
   e. 6.234 6.009 6.4

Percentage Increase/Decrease

1. Explain how you would use a calculator to increase an amount by a given percent.
2. Increase the following amounts by 42%
   a)£225
   b) £306
   c)£125
   d)£448
   e)£512
3. A TV costs £120, how much will it cost if its price is increased by:
   a) 12%
   b)31%
   c)55%
   d)62.5%
   e)99.9%
4. Simon puts £70 in a bank, each year the money in his bank increase by 5.5%, how much does he have in:
   a) 1 year
   b)2 years
   c)5 years?
5. Explain how you would use a calculator to decrease an amount by a given percent.
6. Decrease the following amounts by 28%
   a) £225
   b) £306
   c) £125
   d) £448
   e) £512
7. A TV costs £120, how much will it cost if its price is decreased by:
   a) 19%
   b) 32%
   c) 79%
   d) 73.5%
   e) 42%
8. A car bought for £6, 500 depreciates in value by 12.5% each year, how much will it be worth after:
   a) 1 year
   b) 2 years
   c) 5 years?

Rounding to Significant Figures

1. What is the difference between rounding to significant figures and rounding to decimal places?
2. Round the following numbers to a) 1 sig fig b) 2 sig fig c) 3 sig fig

i. 1463.8

ii. 157.26

iii. 37.096

iv. 6.0936

v. 0.006403

3. Work out the following on a calculator and give the answer to 2 significant figures;

a. $\sqrt{22}$

b. $\frac{3.2 \times 0.2^2}{2.3}$

c. $\sqrt{\frac{4.44 \times 0.3^2}{11}}$

d. $\frac{\pi \times 17}{0.1} + \sqrt{14}$

Rounding to Decimal Places

- **Round the following numbers to a) 1 decimal place b) 2 decimals places c) 3 decimal places**

a) 1.463884266

b) 1.572660902

c) 3.783345228

d) 6.3931313

e) 0.640368898

f) 0.326119942

g) 4.249504359

h) 4.44692939

i) 1.447852851

j) 0.069143754

Work out the following on a calculator and give the answer to 2 decimal places;

a) 3.104×5.938

b) 2.99×8.82

c) $7.1537 \div 3.111$

d) 14.77^2

Reverse Percentages

1. What would you multiply an amount by to increase it by:
   a) 15%
   b)25%
   c)4%
   d)0.5%
   e)13.5%
2. Find the original prices of these prices that have been increased by the given percentage:
   a) Cost= £49.5 after 10% increase
   b)Cost= £74.75 after 15% increase
   c)Cost= £61 after 22% increase
   d)Cost= £104 after 30% increase
   e)Cost= £120 after 50% increase
3. I have £252 in my bank account; this is due to me earning 5% interest on what I originally had put in. How much money did I have originally in my bank account?

4. What would you multiply an amount by to decrease it by:
   a) 15%
   b)25%
   c)4%
   d)0.5%
   e)13.5%

5. Find the original prices of these items that have been decreased by the given percentage:
   a) Cost= £72 after 10% decrease
   b) Cost= £93.5 after 15% decrease
   c) Cost= £39 after 35% decrease
   d) Cost= £4 9fter 40% decrease
   e) Cost= £67.50 after 55% decrease

6. A Cars value has dropped by 11.5% it is now worth £3053.25, what was it worth when it was new?

Two Brackets

1. **Multiply out these brackets and simplify the result:**

a) $(x + 5)(x + 7)$
b) $(x + 7)(x + 3)$
c) $(x + 2)(x + 3)$
d) $(x + 4)(x + 2)$
e) $(x + 1)(x + 8)$

2. **Multiply out these brackets and simplify the result:**

a) $(x + 7)(x - 7)$
b) $(x + 4)(x - 3)$
c) $(x - 2)(x + 10)$
d) $(x - 9)(x - 8)$
e) $(x - 4)(x - 6)$

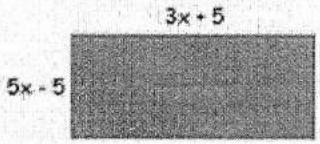
3. **Multiply out these brackets and simplify the results:**

a) $(x + 3)(6x - 3)$
b) $(x + 10)(8x - 4)$
c) $(x - 8)(9x + 1)$
d) $(x - 7)(6x - 6)$
e) $(x - 4)(9x - 1)$

4. **Multiply out these brackets and simplify the results:**

a) $(2x + 8)(3x - 6)$
b) $(4x + 7)(7x - 7)$
c) $(2x - 8)(6x + 6)$

5. **Write and simplify an expression for the area of this rectangle:**



Brackets

1. Remove the brackets from these expression by multiplying them out:
   a) $2(x+5)$
   b) $6(2x+7)$
   c) $8(4x-2)$
   d) $5(3x-9)$
   e) $2(4-2x)$
   f) $8(3-4x)$
   g) $x(x+3)$
   h) $x(2x+9)$
   i) $x(4x-7)$
   j) $2x(9-5x)$
2. Multiply out the brackets:
   a) $x(3x^2+5)$
   b) $2x(5x^2+6)$
   c) $5x(3x^3-7)$
3. Multiply out the brackets and simplify:
   a) $3(x+4)+4(x-6)$
   b) $7(x+7)+5(2x-8)$
   c) $3(4x+1)+2(6x-9)$
   d) $5(5x-4)-4(3x-6)$
   e) $2(13-4x)-9(x+6)$

Collecting like terms

1. Simplify

a) $10a + 4a$

b) $2b + 7b$

c) $3a + a + 4a$

d) $11b - 4b$

e) $14b - 5b + 4b$

f) $3a - 6a + a$

2. Simplify

a) $10a + 4b - a + 5b$

b) $8a + 5a + 5b - 3b$

c) $12b - 7a + 3b + a$

d) $2b - 8b - a + 9a$

e) $-13b + 4a - 5b - 4a$

f) $11a + 8b + 2c + 6a + 3b - 2c$

g) $6b + 4b - a + 6c + 5a - 4c$

h) $7c + 4b - 3b + a + 10c - 5a$

i) $10a + 4b + 7a + 10b - 17a - 14b$

j) $5b + 4c + 18c - 22a + z$

Sequences

1. Copy down the following sequences and add the next three terms:
   a) 36 9 12 15
   b) 27 12 17 22
   c) 410 16 22 28
   d) 13 24 35 46 57
   e) 50 48 46 44 42
2. For each of the questions in question what is rule to find the next term in the sequence. (This is called the term to term rule)
3. Copy the following sequences, write the term to term rule and find the next 3 terms.
   a) 0.3 0.7 1.1 1.5 1.9
   b) 1.4 1.7 2 2.3 2.6
   c) 40 39.5 39 38.5 38
   d) 5.9 5.3 4.7 4.1 3.5
   e) 11.4 12.5 13.6 14.7 15.8
4. Copy the following sequences, write the term to term rule and find the next 3 terms.
   a) 50 -5 -10 -15
   b) 3 -1 -5 -9 -13
   c) -20 -16 -12 -8 -4
   d) -30 -27.5 -25 -22.5 -20
5. Copy the following sequences, write the term to term rule and find the next 3 terms.
   a) 1 2 4 8 16
   b) 1 3 6 10 15
   c) 1 3 7 13 21

The Nth term

·1) Find the nth term of the following sequences:

a)	4	7	10	13	16
b)	2	7	12	17	22
c)	4	10	16	22	28
d)	13	24	35	46	57
e)	1	9	17	25	33

·2) Take the following nth terms and find the first 5 terms

a) $3n + 1$
b) $4n + 2$
c) $5n + 5$
d) $4n - 1$
e) $6n + 3$
f) $10n - 3$

·3) If the nth term is $7n + 4$ what is

a. The 4^{th} term b. The 12^{th} term c. The 100^{th} term

·4) If the nth term is $8n - 2$ what is

a. The 4^{th} term b. The 12^{th} term c. The 100^{th} term

·5) If the nth term is $11n + 3$ what is

a. The 4^{th} term b. The 12^{th} term c. The 100^{th} term

·6) If the nth term is $n + 9$ what is

a. The 4^{th} term b. The 12^{th} term c. The 100^{th} term

Solving Equations

1. Find x if:
   a) 7x= 42
   b) 12x=36
   c) 5x = 40
   d) 10x = 110
   e) How did you answer these questions?
2. Find x if:
   a) X + 10 = 17
   b) X + 15 = 27
   c) X + 25 = 30
   d) X- 9 = 15
   e) X – 13 = 40
   f) How did you answer these questions?
3. Find x if
   a) 3x + 6 =21
   b) 7x + 11 = 67
   c) 5x + 4 = 24
   d) 9x – 2 =25
   e) 11x – 14= 30
   f) 10x - 7= 53
   g) 12x + 11= 155
   h) 15x - 14= 61
   i) 13x + 25 = 90
   j) How did you answer these questions?

Substituting

1. If A is 5 what is:
   a) 5A
   b) 11A
   c) 6A – 10
   d) 9A + 15
   e) 100-5A
2. If B is 7 what is
   a) 2(B+8)
   b) 3(B-5)
   c) B(B+5)
   d) 9(10-B)
   e) (3+B)X(B-5)
3. If A= 6 and B=7 what is:
   a) A+B
   b) B-A
   c) 6A+2B
   d) AB
   e) A(B+1)
   f) A^2B

4. If C is 12, what is:
   a. $\frac{C}{3} + 4.$
   b. $\frac{C}{4} - 5$
   c. $\frac{5C}{2}$
   d. $\frac{3C}{3}$
   e. $\frac{8C}{C}$

5. If D=-11, what is:
   a. 3D
   b. D+11
   c. D+20
   d. D-5
   e. 2D+4
   f. 4D-6
   g. 20-D

Adding and Subtracting Fractions

1. Work out:

a. $\frac{1}{8} + \frac{3}{4} =$

b. $\frac{5}{12} + \frac{1}{4} =$

c. $\frac{4}{9} + \frac{1}{3} =$

d. $\frac{2}{5} + \frac{3}{10} =$

e. $\frac{3}{7} + \frac{5}{21} =$

2. Work out:

a. $\frac{1}{4} + \frac{2}{3} =$

b. $\frac{1}{5} + \frac{1}{2} =$

c. $\frac{1}{3} + \frac{1}{5} =$

d. $\frac{5}{6} + \frac{2}{4} =$

e. $\frac{1}{8} + \frac{1}{3} =$

3. Work out:

a. $\frac{3}{4} + \frac{5}{6} =$

b. $\frac{5}{7} + \frac{3}{8} =$

c. $\frac{2}{12} + \frac{4}{5} =$

d. $\frac{4}{13} + \frac{1}{4} =$

e. $\frac{6}{15} + \frac{7}{10} =$

1. Work out:

a. $\frac{7}{8} - \frac{1}{4} =$

b. $\frac{9}{12} - \frac{1}{3} =$

c. $\frac{11}{15} - \frac{1}{3} =$

d. $\frac{20}{25} - \frac{2}{5} =$

e. $\frac{21}{24} - \frac{3}{8} =$

2. Work out:

a. $\frac{3}{4} - \frac{2}{5} =$

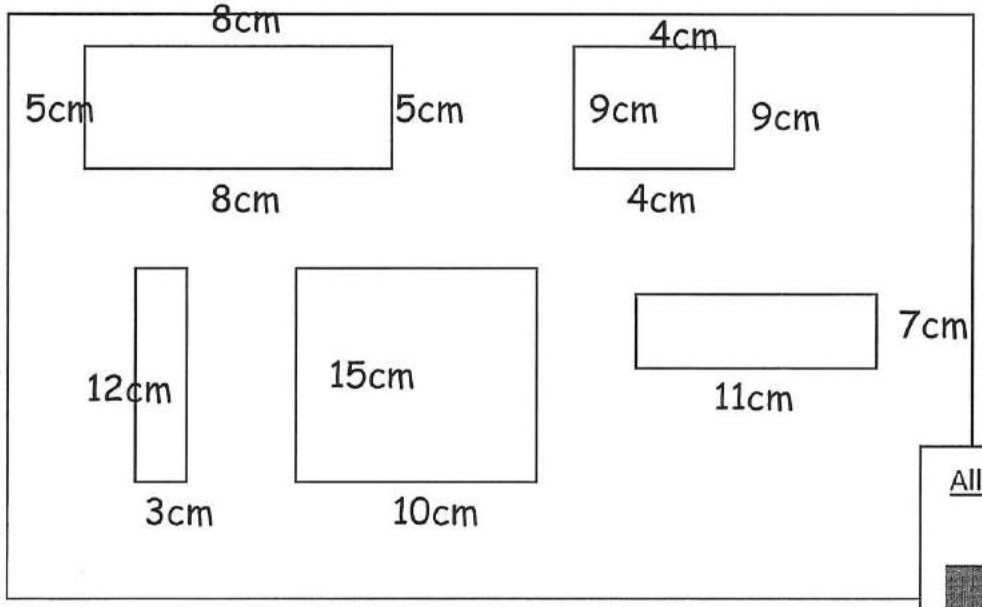
b. $\frac{4}{6} - \frac{2}{7} =$

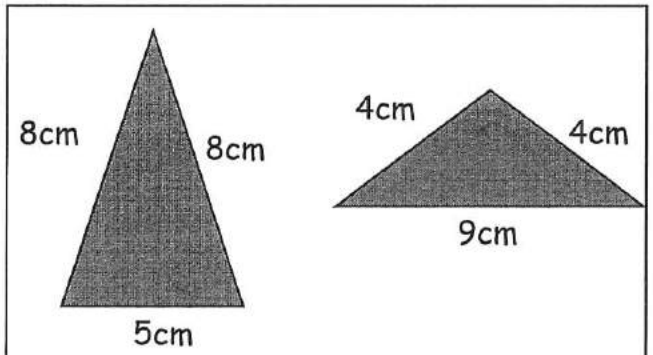
c. $\frac{6}{8} - \frac{1}{9} =$

d. $\frac{10}{11} - \frac{2}{4} =$

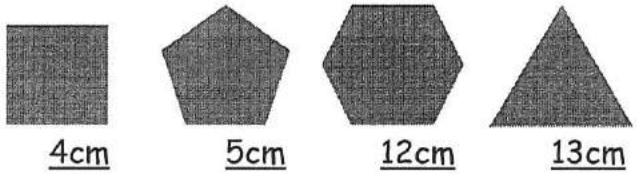
e. $\frac{7}{9} - \frac{3}{14} =$

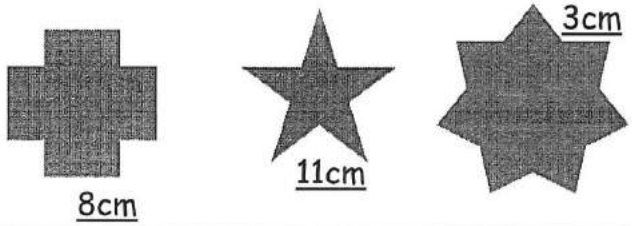
Find the Perimeter of these shapes



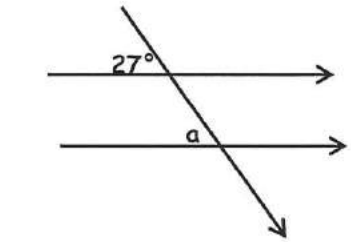


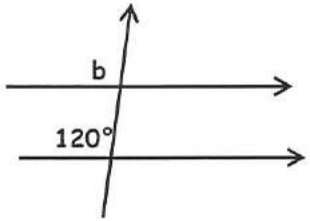
All of these shapes are **regular**

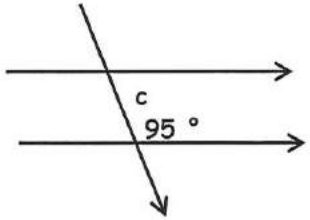


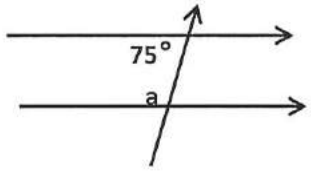


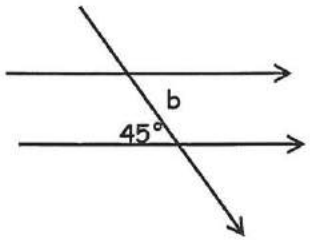
Find a, b and c giving reasons for each answer.

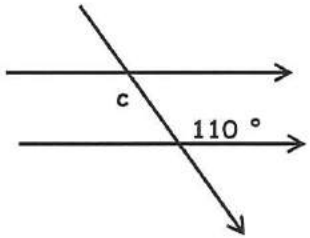


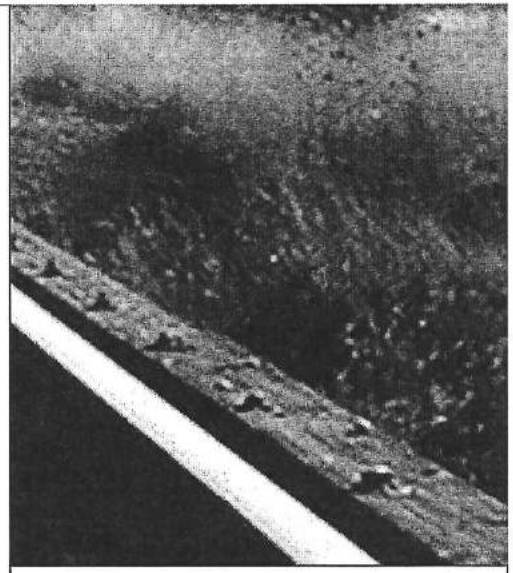


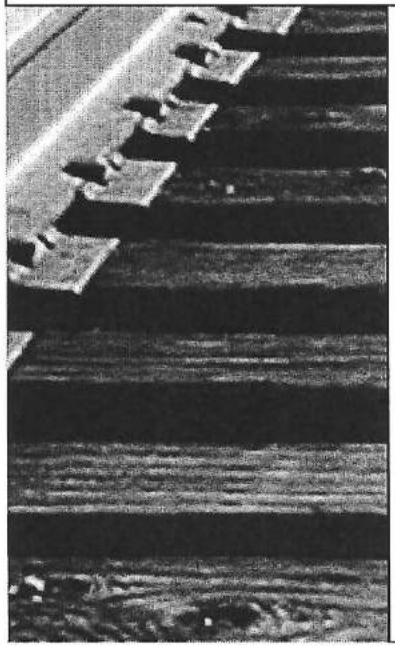




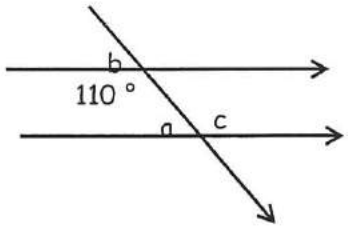


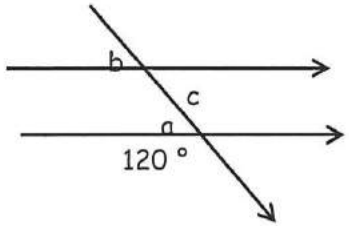


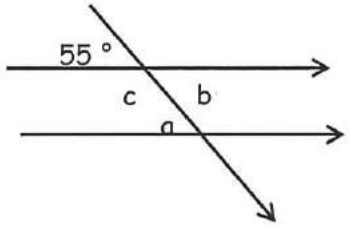


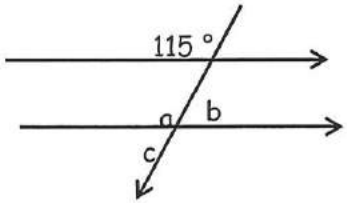


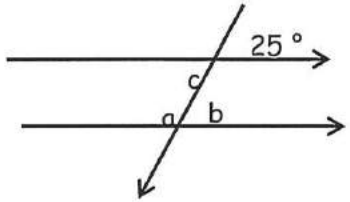
Find a, b and c giving reasons for each answer.

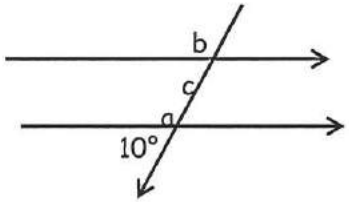




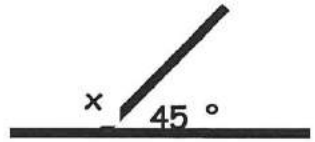


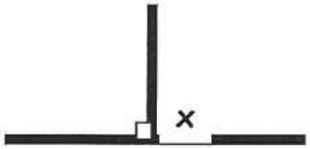


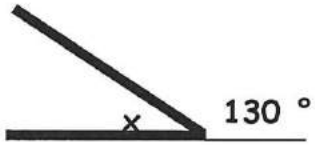




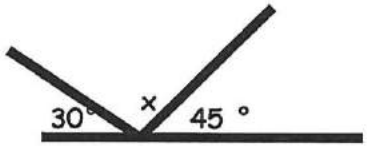
Find the values of x

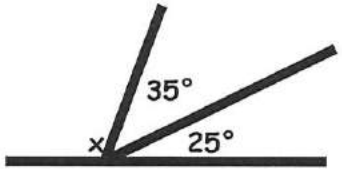


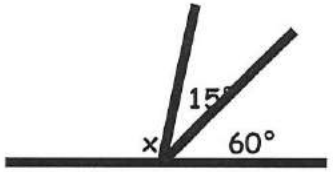


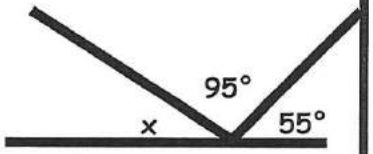


Find the values of x

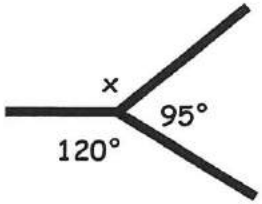


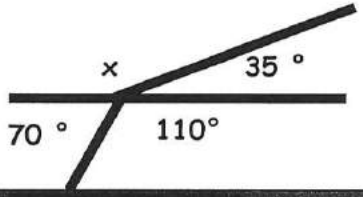


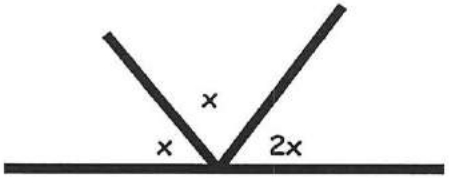


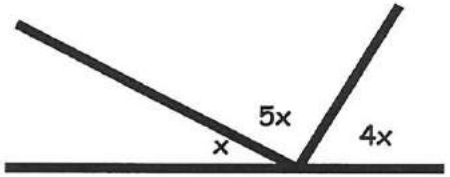


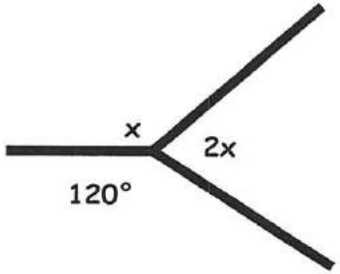
Find the values of x

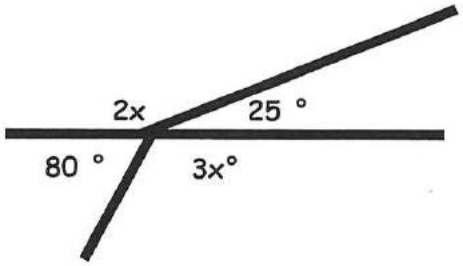






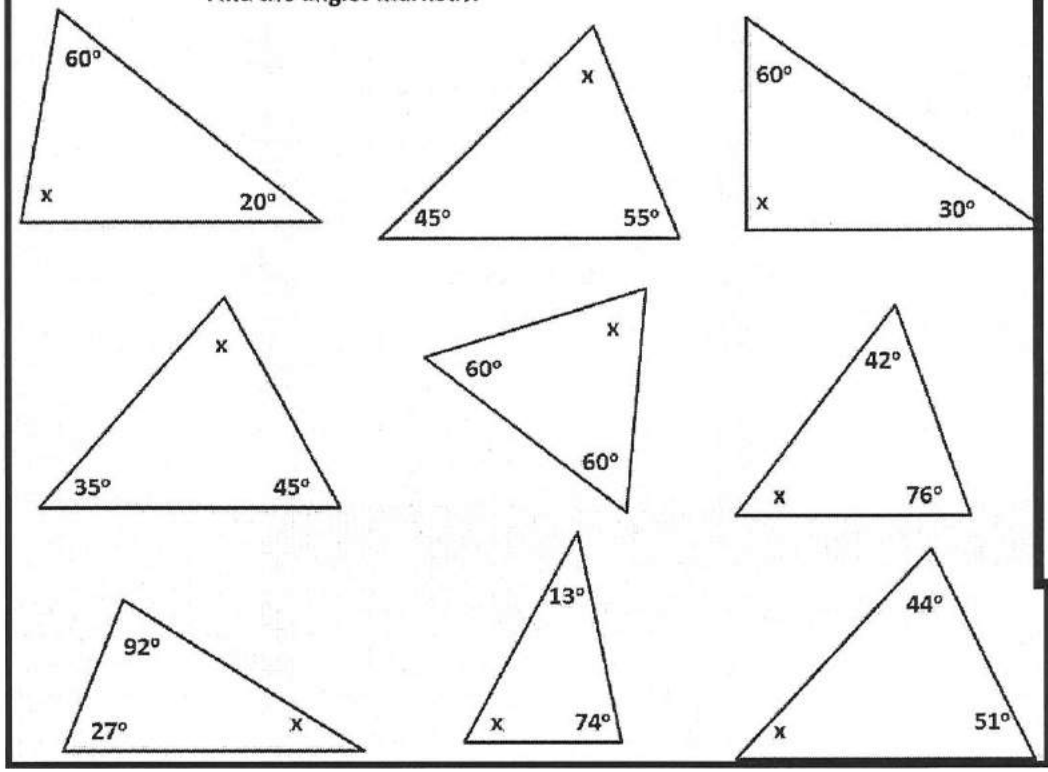




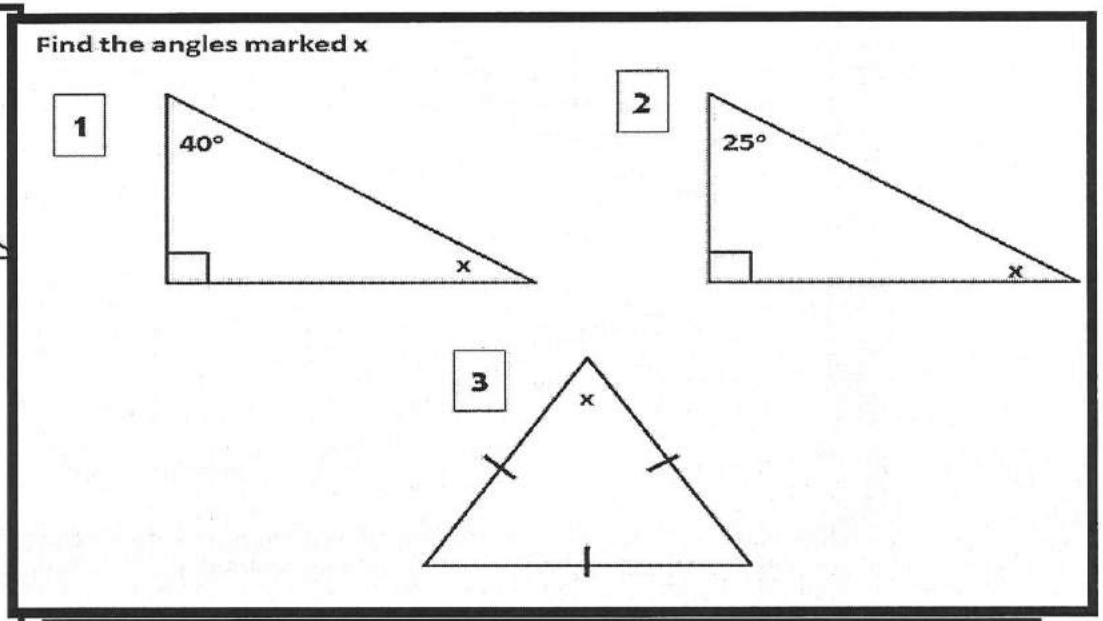


Angles in a triangle

Find the angles marked x



Find the angles marked x



Find x