

The Building Blocks of Sentences

Nouns

We use **nouns** to give names to people, places and things.

Proper nouns start with capital letters and they can be:

- names of particular people ([Joe](#), [Amy](#))
- place names ([Spain](#), [London](#))
- days and months ([Monday](#), [July](#))

Common nouns such as [child](#), [town](#) and [mouse](#) are not names of any particular person, place or thing.

Nouns can also be **countable** ([book](#), [toy](#)) or **non-countable** ([water](#), [imagination](#)).

Noun Phrases

Noun phrases are groups of words doing the job of a noun.

Example: [The old yak](#) walked slowly to the field.

Pronouns

Pronouns are used in place of nouns in sentences.

Example: [Jane](#) went to school → [She](#) went to school

Pronouns like [mine](#) and [yours](#) are called **possessive pronouns**. They show who something belongs to. **Example:** [Yours](#) is the best.

Determiners

Determiners give important information about nouns.

Examples: [the, a, an](#) - [the](#) picture was amazing
[this, that](#) - [that](#) book is fantastic
[some, every](#) - [some](#) noisy people arrived
[my, your](#) - [my](#) name is Sam

Determiners have to go before adjectives in sentences.

Adjectives

Adjectives describe things. They can tell us about 'colour', 'size', 'how many' and lots more.

Examples: The [blue](#) pencil. An [enormous](#) bar of chocolate.

Verbs

Verbs often tell us what someone or something is doing or feeling. Verbs have different tenses.

Examples: I [feel](#) full. (Present tense) They [walked](#) back home. (Past tense)

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Modal Verbs

Modal verbs are words like: [will](#), [would](#), [can](#), [could](#), [should](#), [might](#) and [must](#). They change the meaning of other verbs.

Examples: You [should](#) help your mother. We [must](#) follow the directions.

Conjunctions

Conjunctions usually connect words or ideas together inside a sentence.

Examples: [and](#), [but](#), [or](#), [when](#), [because](#), [although](#)

Dave [and](#) his friend went outside.

They couldn't get to school [because](#) the snow was too deep.

Adverbs

Adverbs usually tell us information about 'how', 'when', 'where' or 'how much'. They can be used with verbs, adjectives or other adverbs.

Examples: He shouted [loudly](#). The game was [really](#) exciting. She ran [very](#) quickly.

Connecting Adverbs

Connecting adverbs can be used to link ideas in one sentence to ideas in another.

Examples: [however](#), [furthermore](#), [consequently](#), [secondly](#), [meanwhile](#)

I enjoyed my dinner. [However](#), I'd like something different tomorrow.

Connecting adverbs and conjunctions are sometimes called **connectives**.

Adverbials

Adverbials are groups of words used like an adverb.

Example: The ship sails [in ten minutes](#).

They are called **fronted adverbials** if they are at the front of a sentence.

Example: [In ten minutes](#) the ship sails.

Prepositions

Prepositions often tell us where something or someone is.

Examples: The message is [in](#) the bottle. They are back [from](#) France.

Interjections

Interjections are used to show feeling and emotion. They often have exclamation marks after them.

Example: [Ouch!](#) I've hit my finger!

Conjunctions Explained

Conjunctions connect words, phrases and clauses together.

Coordinating Conjunctions

The conjunctions [and](#), [but](#), [or](#), [nor](#) and [yet](#) are called coordinating conjunctions.

We use coordinating conjunctions to connect things that are equally important.

Here are some examples:

Words: Jack [and](#) Jill

Phrases: The green coat [or](#) the blue jacket

Main clauses: I wanted popcorn, [but](#) my sister wanted crisps.

Subordinating Conjunctions

We use subordinating conjunctions such as [because](#), [although](#) and [until](#) to introduce **adverbial** clauses which often tell us how, when or why something happened. Adverbial clauses are **subordinate** clauses because they only make sense when they are with a main clause.

Here are some examples:

They went to the café [because](#) they were hungry.

We ate the food [although](#) we didn't like it.

I'll stay with you [until](#) your mother gets home.

There are lots of subordinating conjunctions:

[After](#), [before](#), [if](#), [except](#), [since](#), [though](#), [whereas](#), [unless](#), [until](#), [when](#), [where](#), [wherever](#), [whether](#), [while](#)

Some phrases also act as conjunctions such as '[in case](#)' and '[as long as](#)'.

Punctuation



- **Full stop (.)** Used to end a sentence.
- **Question mark (?)** Ends a sentence that asks a question.
- **Comma (,)** Used to separate parts of a sentence. It is also used to split up items in a list.
- **Exclamation mark (!)** Used at the end of a sentence to show a strong feeling or emotion like surprise, shock, pain, joy or anger.
- **Ellipsis (...)** Used to show that something has been left out or is not finished.
- **Apostrophe (')** Used to show ownership (The girl's coat). It is also used to show that a word has been shortened by missing out letters (I am = I'm).
- **Inverted commas (" ")** Used to show that someone is speaking. They wrap around the words that are being spoken.
- **Colon (:)** Used to introduce a list or a following example.
- **Semi-colon (;)** Used to separate main clauses. (I liked the book; it was great to read.) Also used to split up phrases or clauses in a list. For example: I need a large bar of chocolate; a box of breakfast cereal; a mixing bowl and a wooden spoon.
- **Brackets ()** Used to add extra detail (elaborate).
- **Dash (—)** Dashes have several uses:
 - For emphasis, e.g. you need one thing—imagination.
 - To add extra information, e.g. his foot—the size of a football—was painful.
 - To add extra comments, e.g. "I've finished—at least I think I have."
- **Hyphen (-)** Used to join two or more words or to divide a word that runs over two lines.

Apostrophes

Apostrophes to Show Omission

Use an apostrophe ' to show where a letter has been omitted from (left out of) a word or phrase.

I'm - I am
I've - I have
I'll - I will

I'd - I had
- I should
- I would

she's - she is
- she has

he'll - he will

we'd - we had
we've - we have
we'll - we will

you're - you are
you've - you have
you'll - you will
you'd - you had

they're - they are
they'll - they will
they'd - they had
they've - they have

can't - cannot
couldn't - could not
could've - could have

didn't - did not
don't - do not
doesn't - does not

how've - how have
how's - how is

isn't - is not
it's - it is
- it has

mightn't - might not
mustn't - must not

shouldn't - should not
should've - should have

'til - until
'tis - it is

wouldn't - would not
would've - would have

Apostrophes to Show Possession (who things belong to)

Types of Noun	Examples
With singular nouns , add 's	Our cat's teeth The boss's chair
With plural nouns ending in s , just add the apostrophe	My parents' car (the car belonging to my parents)
With plural nouns not ending in s , add 's	The children's playing field

Note: names from ancient times ending with **s** are often treated differently.

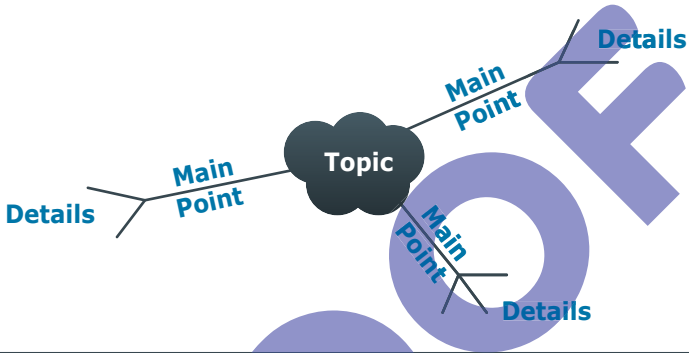
For example: Socrates' death, not Socrates's death.

Ways to Improve Your Written Work

1. Plan your work in rough before you produce it

A plan is really useful as it helps you structure your writing and capture any ideas or points you want to include. With a good plan you can concentrate on how to express yourself without having to think about content.

You can plan your work in a variety of ways. One effective way is to use a Mind Map. This is a diagram to show information in picture form. A mind map is often created around a single word as shown.



2. Vocabulary

Always try to use the most expressive words you can. Use a thesaurus to find better words. Try not to use the same words too often in the same piece of work.

To improve your vocabulary write down a list of words you don't know when you read or hear them and then look them up using a dictionary later and write down their meanings.

3. Using different ways to begin sentences

Try to start your sentences in different ways. Here are some examples:

An **adverb**: **Sadly**, he was no longer the leader.

A **verb**: **Jumping** up suddenly, Jane bumped her head on the cupboard.

An **adjective**: **Terrible** things had happened in that evil place.

A **preposition**: **Under** the table, the cat was fast asleep.

A **noun**: **Aisha** loved chocolate.

A **pronoun**: **She** had never liked olives before.

An **interjection**: **'Ouch!'** said Georgia as she hit her knee.

Ways to Improve Your Written Work

4. Using different types of sentences

Your writing will be more interesting if it includes sentences of different lengths and types.

A **fragment sentence** (one word): *Bang!*

A **simple sentence** (only one clause): *Tilly locked the door.*

A **compound sentence** (with two independent clauses):
I really want to go out, but I am too ill to get up.

A **complex sentence** (with an independent clause and at least one dependent clause): *Taking his coat off, Henry thought about the day.*

5. Writing effective paragraphs

Remember **TiP ToP** when you start a new paragraph.

Start a new paragraph when you change: **T**ime, **P**lace, **T**opic, **P**erson.



6. Writing in a formal style

Sometimes we need to write in a formal style, e.g. a letter to someone in authority.

Do not use slang words.

Do not use 'text speak'.

Do not use abbreviations (shortened words, e.g. Wellies for Wellington Boots) and **contractions** (where you miss letters out, e.g. can't).

7. Check your work when you have finished

For example:

- Read your work aloud to yourself to see if it 'sounds right'.
- Make sure you have not repeated the same word too often.
- Check you have not missed out words or written them twice by mistake.
- Check for spelling, punctuation and grammar mistakes.
- Is your handwriting and presentation neat?

Figures of Speech and Poetic Devices

Simile

When an object is compared to something similar in behaviour or appearance. A simile is often introduced by 'like' or 'as'.

e.g. Skin like **ice**. As sure footed as a **mountain goat**.

Metaphor

We use a metaphor when we describe something with a word or phrase that means something in our imagination but doesn't really apply.

e.g. It was a **dirty** trick. David is a **cheeky monkey**.

Personification

When something that is not human is given thoughts, feelings and emotions that only a human can have, or when something is called **he** or **she**.

e.g. The snowman **stared at us** from across the garden.
That's my car - **she's** great!

Alliteration

This is the repetition of the same letter or sound.

e.g. She created **rapidly repeating random rows of real rubbish**.
They were **furry-faced female foxes**.

Onomatopoeia

The use of words that have been formed from the sound associated with the word.

e.g. cuckoo / sizzle / plop / hiss / buzz
The chicken curry **sizzled** with the heat from the iron dish.

Hyperbole

Exaggeration that is used for effect and cannot be taken literally.

e.g. I've had a **million** phone calls today.
I walked **half way around Europe** to get here.

Euphemism

Using mild or vague expressions to refer to something unpleasant or embarrassing.

e.g. 'We had to put the cat **to sleep**' instead of 'We had the cat killed'
'She **passed away** peacefully' instead of 'She died'

Pun

A humorous play on words to suggest different meanings.

e.g. 'I've been to the dentist several times so I know the **drill**'
A pun on the double meaning of the word drill.

Spelling Strategies

To learn your spellings

Think about the origin of the word

e.g. Bi - cycle
two + wheels

Take a mental photograph of the word

e.g. "busy"

Look for families of words

e.g. muscle / muscular

Compare to similar words

e.g. elephant
relevant

Use spelling rules
(i before e except after c e.g. receive)

Practise
look - say - cover -
write - check

Make up rhymes or mnemonics to help you remember

e.g. necessary
→ one collar, two sleeves

Say (or sing!) the word out loud, letter by letter, as you write it down

e.g. D - I - S - C - O

Remember similar words

e.g. sight, bright, might
tight, right

Look for a shorter word within the word which will help you remember it

e.g. 'rat' in temperature

Say the word in your head, or out loud, as it is written

e.g. Wed - nes - day

Say the word clearly, syllable by syllable

e.g. RE - MEM - BER

General Spelling List

The following list of spellings was compiled by a number of secondary schools who all identified the following words as commonly misspelled words among your age group.

- ✓ accommodation
- ✓ actually
- ✓ although
- ✓ analyse/analysis
- ✓ argument
- ✓ assessment
- ✓ atmosphere
- ✓ audience
- ✓ autumn
- ✓ beautiful
- ✓ beginning
- ✓ believe
- ✓ beneath
- ✓ buried
- ✓ business
- ✓ caught
- ✓ chocolate
- ✓ climb
- ✓ column
- ✓ concentration
- ✓ conclusion
- ✓ conscience
- ✓ conscious
- ✓ consequence
- ✓ continuous
- ✓ creation
- ✓ daughter
- ✓ decide/decision
- ✓ definite
- ✓ design
- ✓ development
- ✓ diamond
- ✓ diary
- ✓ disappear
- ✓ disappoint
- ✓ embarrass
- ✓ energy
- ✓ fierce
- ✓ fulfil
- ✓ February
- ✓ furthermore
- ✓ guard
- ✓ happened
- ✓ health
- ✓ height
- ✓ imaginary
- ✓ improvise
- ✓ industrial
- ✓ interesting
- ✓ interrupt
- ✓ issue
- ✓ jealous
- ✓ knowledge
- ✓ listening
- ✓ lonely
- ✓ lovely
- ✓ marriage
- ✓ material
- ✓ meanwhile
- ✓ miscellaneous
- ✓ mischief
- ✓ modern
- ✓ moreover
- ✓ murmur
- ✓ necessary
- ✓ nervous
- ✓ original
- ✓ outrageous
- ✓ parallel
- ✓ participation
- ✓ pattern
- ✓ peaceful
- ✓ people
- ✓ prioritise
- ✓ process
- ✓ proportion
- ✓ proposition
- ✓ queue
- ✓ reaction
- ✓ receive
- ✓ reference
- ✓ relief
- ✓ remember
- ✓ research
- ✓ resources
- ✓ safety
- ✓ Saturday
- ✓ secondary
- ✓ separate
- ✓ sequence
- ✓ shoulder
- ✓ sincerely
- ✓ skilful
- ✓ soldier
- ✓ stomach
- ✓ straight
- ✓ strategy
- ✓ strength
- ✓ success
- ✓ surely
- ✓ surprise
- ✓ survey
- ✓ technique
- ✓ technology
- ✓ texture
- ✓ tomorrow
- ✓ unfortunately
- ✓ Wednesday
- ✓ weight

Homophones and Near-homophones

Homophones are words that sound the same but have different spellings. Near-homophones almost sound the same, and some words are just easy to get mixed up! Here are some to look out for.

there Look over [there!](#)
their They have [their](#) own drinks.
they're [They're](#) (they are) having fun.

to We are going [to](#) the cinema.
two I have [two](#) pet cats and a dog.
too My toy plane is [too](#) heavy to fly.

quiet We must be [quiet](#) in the library.
quite The jar is not [quite](#) full.

accept Will you [accept](#) this gift?
except Everyone went home [except](#) me.

here Please bring it [here](#) to me.
hear Can you [hear](#) the music?

affect The bad weather won't [affect](#) me.
effect Sweets have a bad [effect](#) on teeth.

see When I close my eyes I can't [see](#).
sea Let's go swimming in the [sea](#).

berry A juicy [berry](#) is very tasty.
bury A pirate likes to [bury](#) treasure.

bare It's easier to climb with [bare](#) feet.
bear A [bear](#) is a wild animal.

break If you drop the glass it will [break](#).
brake Use your [brake](#) to slow you down.

be I want to [be](#) a vet when I'm older.
bee A [bee](#) looks similar to a wasp.

grown The puppy is almost fully [grown](#).
groan He hit his toe and let out a [groan](#).

blue [Blue](#) is the best colour.
blew The wind [blew](#) my hat off.

mail [Mail](#) comes through the letterbox.
male A boy is [male](#), a girl is female.

night We can see the stars at [night](#).
knight The brave [knight](#) rode a white horse.

meet It's great to [meet](#) you.
meat Vegetarians don't eat [meat](#).

new My shoes are old, I need [new](#) ones.
knew He already [knew](#) his times tables.

missed A snowball just [missed](#) Mum.
mist The [mist](#) felt wet on my face.

for This present is [for](#) you.
four Five, [four](#), three, two, one, GO!

piece Can I have a [piece](#) of cake please?
peace He needs [peace](#) and quiet.

are These [are](#) my favourite fruits.
our Miss Jackson is [our](#) teacher.

plane The [plane](#) landed on the runway.
plain She likes [plain](#) not spicy food.

where [Where](#) have I put my pencil?
wear Today, I need to [wear](#) a coat.

weather It is sunny [weather](#).
whether I don't know [whether](#) to go or not.

one [One](#), two, three, four..
won Great! I have [won](#) a prize.

whose [Whose](#) coat is this?
who's [Who's](#) (who is) in the kitchen?

Homophones and Near-homophones

Homophones are words that sound the same but have different spellings.
Near-homophones almost sound the same, and some words are just easy to get mixed up! Here are some to look out for.

advice Ask for some good [advice](#).
advise Your teacher can [advise](#) you.

practice Hockey [practice](#) is cancelled.
practise I need to [practise](#) more.

device It is a measuring [device](#).
devise She needs to [devise](#) a good plan.

licence He needs a driving [licence](#).
license We must [license](#) the TV.

(In these pairs of words, nouns end **-ce** and verbs end **-se**)

aisle You can walk along an [aisle](#).
isle An [isle](#) is an island.

guest You are a [guest](#) in my house.
guessed I [guessed](#) the answer would be 44.

past You were born in the [past](#).
passed I [passed](#) the ball to you.

herd A [herd](#) of cows.
heard We [heard](#) a loud bang.

steel Stainless [steel](#) knives and forks.
steal She tried to [steal](#) my money.

led A guide [led](#) the way.
lead The rock was as heavy as [lead](#).

stationary If it's not moving it is [stationary](#).
stationery [Stationery](#) includes pens and paper.

aloud Do you have to sing [aloud](#)?
allowed Eating in class is not [allowed](#).

profit I sold my bike and made a [profit](#).
prophet A [prophet](#) speaks about the future.

morning Wake up! It's [morning](#).
mourning I'm [mourning](#) a friend who died.

wary If you are [wary](#), you are cautious.
weary If you are [weary](#), you are tired.

medal The athlete won a gold [medal](#).
meddle Please don't [meddle](#) with my things.

father My [father](#) is in the army.
farther How much [farther](#) do I need to go?

not That's [not](#) fair!
knot You can tie a [knot](#) in your string.

great He made a [great](#) effort.
grate I need to [grate](#) the cheese.

fair It's not [fair](#), I have less than you.
fare She forgot her bus [fare](#).

seen Rare birds are not often [seen](#).
scene It was the final [scene](#) of the play.

bridal She got married in a [bridal](#) dress.
bridle The horse's [bridle](#) was too loose.

Multiplication

Multiplication Table

Square Number	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

Fraction	Decimal	Percentage
$\frac{1}{1}$	1	100%
$\frac{4}{5}$	0.8	80%
$\frac{3}{4}$	0.75	75%
$\frac{2}{3}$	0.6666... or $0.\dot{6}$	$66.\dot{6}\%$
$\frac{3}{5}$	0.6	60%
$\frac{1}{2}$	0.5	50%
$\frac{2}{5}$	0.4	40%
$\frac{1}{3}$	0.3333... or $0.\dot{3}$	$33.\dot{3}\%$

Example

$\frac{4}{5}$	=	$(4 \div 5)$	=	0.8	=	$(0.8 \times 100\%)$	=	80%
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Steps in Long Multiplication

E.g. 45×23

Step 1 - Partitioning

Recognise that $45 \times 23 = (3 \times 5) + (3 \times 40) + (20 \times 5) + (20 \times 40)$

Step 2 - Grid Method

Show your working on a grid

x	20	3
40	800	120
5	100	15

$$\begin{aligned} 45 \times 23 &= (3 \times 5) + (3 \times 40) + (20 \times 5) + (20 \times 40) \\ &= 15 + 120 + 100 + 800 = 1035 \end{aligned}$$

Step 3 - Expanded Long Multiplication

$$\begin{array}{r} 45 \\ \times 23 \\ \hline 15 \quad (3 \times 5) \\ 120 \quad (3 \times 40) \\ 100 \quad (20 \times 5) \\ 800 \quad (20 \times 40) \\ \hline 1035 \end{array}$$

Step 4 - Long Multiplication

$$\begin{array}{r} 45 \\ \times 23 \\ \hline 135 \quad (3 \times 45) \\ 900 \quad (20 \times 45) \\ \hline 1035 \end{array}$$

Steps in Division

Step 1 - Know how multiplication and division are related

$$5 \times 8 = 40$$

$$\text{so } 40 \div 8 = 5$$

$$\text{and } 40 \div 5 = 8$$

Step 2 - Use the expanded method to divide a 2-digit number by a 1-digit number

$$\begin{array}{r} 27 \\ 3 \overline{) 82} \\ \underline{60} \quad (20 \times 3) \\ 22 \\ \underline{21} \quad (7 \times 3) \\ r1 \end{array}$$

Answer : $27r1$ or $27\frac{1}{3}$

Step 3 - Use short division

$$\begin{array}{r} 27r1 \\ 3 \overline{) 82} \end{array} \quad \text{or } 27\frac{1}{3}$$

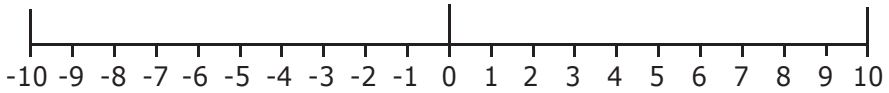
Step 4 - Use long division

$$\begin{array}{r} 25.5 \\ 22 \overline{) 561.0} \\ \underline{44} \\ 121 \\ \underline{110} \\ 11.0 \end{array}$$

This is 110 tenths and $110 \text{ tenths} \div 22 = 5 \text{ tenths} = 0.5$

Positive and Negative Numbers

Positive and negative numbers can be shown on a number line

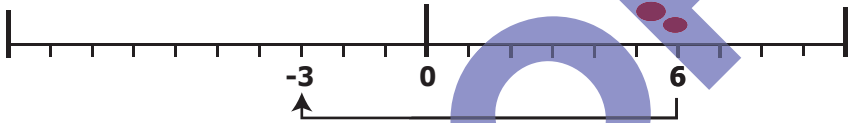


To add, move to the **right** → To subtract, move to the **left** ←

Examples

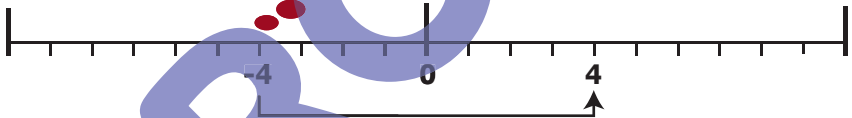
1 $6 - 9 = -3$

Start at **6** and
move **left 9**
spaces



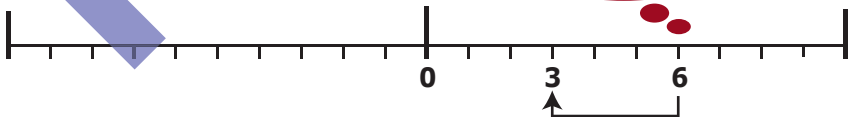
2 $-4 + 8 = 4$

Start at **-4** and
move **8** spaces
right



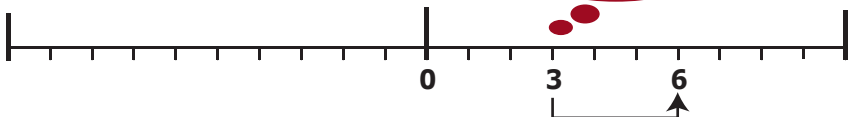
3 $6 + (-3) = 6 - 3 = 3$
(Adding **-3** is the same
as **subtracting 3**)

Start at **6** and
move **3** spaces
left



4 $3 - (-3) = 3 + 3 = 6$
(Subtracting **-3** is the
same as **adding 3**)

Start at **3** and
move **3** spaces
right



Conversions

Length

1 centimetre (cm)	=	10 millimetres (mm)	=	0.394 inches (in)
1 metre (m)	=	100 cm	=	1.094 yards (yd)
1 kilometre (km)	=	1000 m	=	0.621 miles
1 inch (in)	=		=	2.54 cm
1 foot (ft)	=	12 in	=	30.48 cm
1 yard (yd)	=	36 in	=	0.914 m
1 mile	=	1760 yd	=	1.609 km

Area

1 sq cm (cm ²)	=	100 mm ²	=	0.1550 in ²
1 sq metre (m ²)	=	10 000 cm ²	=	1.1960 yd ²
1 sq km (km ²)	=	100 hectares	=	0.3861 mile ²
1 sq in (in ²)	=		=	6.4516 cm ²
1 sq ft (ft ²)	=	144 sq in	=	929.03 cm ²
1 sq yard (yd ²)	=	9 ft ²	=	0.8361 m ²
1 sq mile (mile ²)	=	640 acres	=	2.5900 km ²

Volume

1 litre (l)	=	1000 ml	=	1.76 pints
1 cubic metre (m ³)	=	1,000,000 cm ³	=	1000 l
1 pint (pt)	=	20 fl oz	=	0.5683 l
1 gallon (gal)	=	8 pt	=	4.5460 l

Mass

1 gram (g)	=	1000 mg	=	0.0353 oz
1 kilogram (kg)	=	1000 g	=	2.2046 lb
1 tonne (t)	=	1000 kg	=	0.9842 ton
1 ounce (oz)	=	437.5 grains	=	28.3500 g
1 pound (lb)	=	16 oz	=	0.4536 kg
1 ton	=	20 cwt	=	1.0160 t

Velocity

miles per hour	x	1.609	=	km per hour
km per hour	x	0.6214	=	miles per hour
km per hour	x	0.278	=	metres per sec
metres per sec	x	3.6	=	km per hour

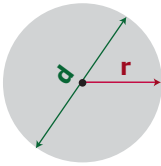
Temperature

°F to °C: $\boxed{-32} \rightarrow \boxed{\times 5} \rightarrow \boxed{\div 9}$
 e.g. 86°F: 54 → 270 → 30°C

°C to °F: $\boxed{\times 9} \rightarrow \boxed{\div 5} \rightarrow \boxed{+32}$
 e.g. 15°C: 135 → 27 → 59°F

Circles, Triangles and Quadrilaterals

Circles

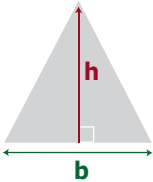


radius = r
diameter = d

$$\begin{aligned} \text{Circumference} &= \pi \times d \\ &= 2 \times \pi \times r \end{aligned}$$

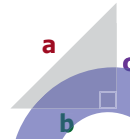
$$\text{Area} = \pi \times r^2$$

Triangles



height = h
base = b
Area = $\frac{1}{2} \times b \times h$

In a right-angled triangle:



$$a^2 = b^2 + c^2$$

Side a is the longest side - it is called the **hypotenuse**

Quadrilaterals



Square

- all sides equal
- opposite sides parallel
- all angles 90°

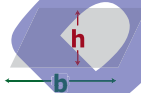
$$\text{Area} = a^2$$



Rectangle

- opposite sides equal and parallel
- all angles 90°

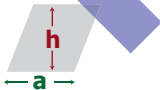
$$\text{Area} = a \times b$$



Parallelogram

- opposite sides equal and parallel
- opposite angles equal

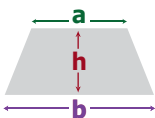
$$\text{Area} = b \times h$$



Rhombus

- all sides equal
- opposite sides parallel

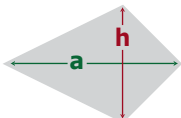
$$\text{Area} = a \times h$$



Trapezium

- one pair of sides parallel

$$\text{Area} = \frac{1}{2} (a + b) \times h$$



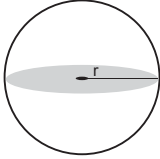
Kite

- two pairs of sides equal

$$\text{Area} = \frac{1}{2} (a \times h)$$

Volumes (V) & Surface Areas (A)

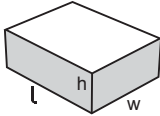
Sphere



$$V = \frac{4}{3} \pi r^3$$

$$A = 4 \pi r^2$$

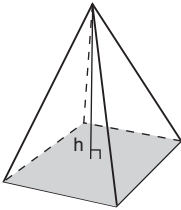
Cuboid



$$V = l \times w \times h$$

A = found from adding together the surface areas of all six sides

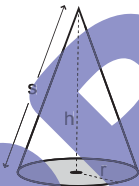
Pyramid



$$V = \frac{1}{3} \times \text{base area} \times \text{perpendicular height (h)}$$

A = found from adding together the surface areas of the base and sides

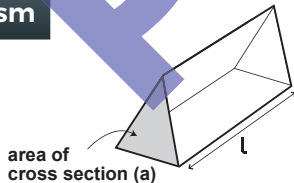
Cone



$$V = \frac{1}{3} \times \text{base area} \times \text{perpendicular height (h)}$$
$$= \frac{1}{3} \pi r^2 h$$

$$A = \text{area of base} + \text{curved surface area}$$
$$= \pi r^2 + \pi r s$$

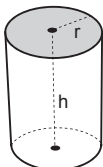
Prism



$$V = \text{area of cross-section} \times \text{length}$$
$$= a \times l$$

A = found from adding together the areas of all the sides

Cylinder

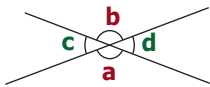


$$V = \pi r^2 h$$

$$A = \text{area of ends} + \text{curved side}$$
$$= 2 \pi r^2 + 2 \pi r h$$

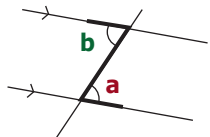
Angles

Equal angles



The vertically opposite angles are **equal** when two lines cross

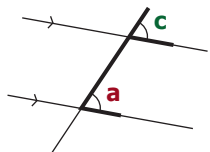
angle **a** = angle **b** and angle **c** = angle **d**



When a line crosses two parallel lines:

- **alternate angles** are equal

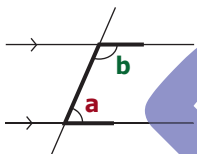
angle **a** = angle **b**



- **corresponding angles** are equal

angle **a** = angle **c**

180° angles



When a line crosses two parallel lines the sum of the **interior angles** is **180°**

angle **a** + angle **b** = 180°



The sum of the angles on a straight line is **180°**

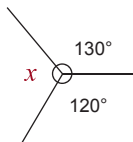
angle **c** + angle **d** + angle **e** = 180°



The sum of the angles inside a triangle is **180°**

angle **f** + angle **g** + angle **h** = 180°

360° angles



The sum of all angles that meet at a point is **360°**

Use subtraction to find the missing angle

$$360^\circ - 120^\circ - 130^\circ = x$$

Percentages, Fractions and Decimals

A percentage is a fraction with a denominator of 100

$$\text{e.g. } 13\% = \frac{13}{100}$$

Changing percentages to fractions

Write the percentage as a fraction and cancel any common factors

$$\text{e.g. } 25\% = \frac{25}{100} = \frac{1}{4} \quad 50\% = \frac{50}{100} = \frac{1}{2} \quad 55\% = \frac{55}{100} = \frac{11}{20}$$

Changing fractions to percentages

Multiply the fraction by 100%

$$\text{e.g. } \frac{1}{2} = \frac{1}{2} \times 100\% = \frac{1 \times 100}{2} \% = 50\%$$

$$\frac{3}{5} = \frac{3}{5} \times 100\% = \frac{3 \times 100}{5} \% = 3 \times 20\% = 60\%$$

Changing percentages to decimals

Write the percentage as a fraction and divide the numerator by the denominator

$$\text{e.g. } 60\% = \frac{60}{100} = 60 \div 100 = 0.6$$

$$14\% = \frac{14}{100} = 14 \div 100 = 0.14$$

Changing decimals to percentages

Multiply the decimal by 100%

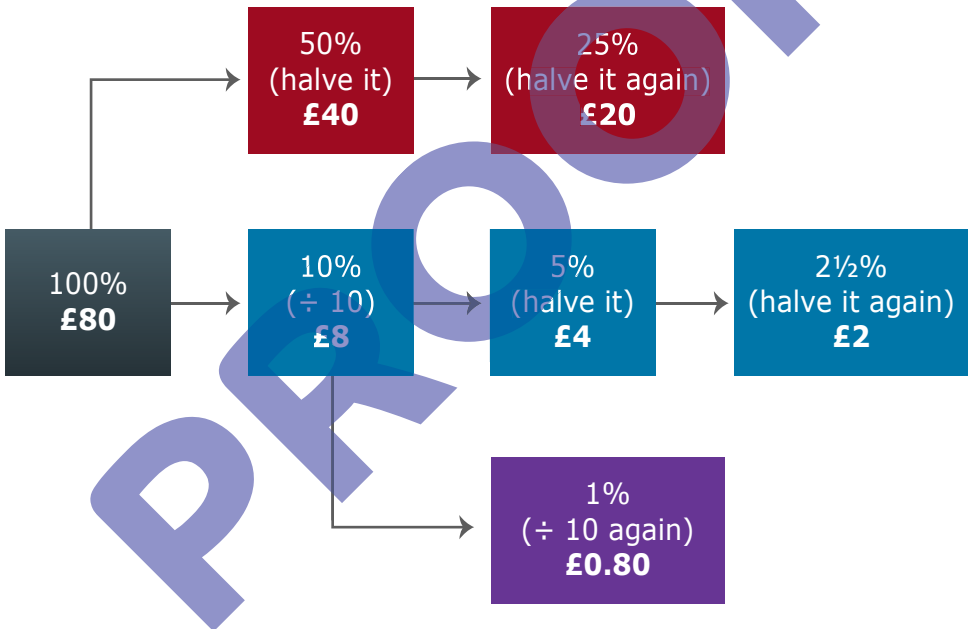
$$\text{e.g. } 0.15 = 0.15 \times 100\% = 15\%$$

Percentages

A simple 'Splitting' method to help you work out percentages.

e.g. to find 37% of £80

$$\begin{array}{r} 25\% = \text{£}20 \\ 10\% = \text{£}8 \\ 1\% = \text{£}0.80 \\ 1\% = \text{£}0.80 \\ \hline 37\% = \text{£}29.60 \\ \hline 1 \end{array}$$



Finding VAT

$$\text{VAT} = 20\% \quad (10\% + 10\%)$$

$$\text{VAT on £80} = \text{£}8 + \text{£}8 = \text{£}16$$

Number Patterns

Square Numbers

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144 ..

$$1^2 = 1 \times 1 = 1$$

one squared

$$2^2 = 2 \times 2 = 4$$

two squared

$$3^2 = 3 \times 3 = 9$$

three squared

$$4^2 = 4 \times 4 = 16$$

four squared

Square Roots

$$\sqrt{1} = 1 \quad \sqrt{4} = 2 \quad \sqrt{9} = 3$$

example: $\sqrt{25} + \sqrt{36} = 5 + 6 = 11$

Prime Numbers

(these are numbers with exactly two factors):

2, 3, 5, 7, 11, 13, 17, 19, 23,
29, 31, 37, 41, 43, 47 ...

Cube Numbers

1, 8, 27, 64, 125, 216, 343, 512, 729, 1000 ...

$$1^3 = 1 \times 1 \times 1 = 1$$

$$2^3 = 2 \times 2 \times 2 = 8$$

$$3^3 = 3 \times 3 \times 3 = 27$$

Algebra - Rules

$$a + a = 2a$$

$$a \times b = ab$$

$$b + b + b = 3b$$

$$2a \times 3b = 6ab$$

$$a \times a = a^2$$

$$2a \times 3a = 6a^2$$

$$b \times b \times b = b^3$$

$$a \times b \times c = abc$$

Brackets: $2(a + b) = 2a + 2b$

$$3(2a + 3b) = 6a + 9b$$

Averages

Mean = total \div how many

Range = highest value - smallest value

Mode = most popular value

Median = middle value when numbers in order

Example: 4, 4, 5, 1, 4, 6

$$\text{Mean} = (4 + 4 + 5 + 1 + 4 + 6) \div 6 \\ = 4$$

$$\text{Range} = 6 - 1 \\ = 5$$

Mode = 4 (occurs 3 times)

$$\text{Median} = 1 \ 4 \ \underline{4} \ \underline{4} \ 5 \ 6 \\ = 4$$