Geometry and Measures

Guidance for Teachers

Highfield Schools

The following guidance aims to provide a consistent approach to Geometry and Measures branch of Mathematics, and includes guidance on properties of 2D and 3D shapes, time, money and measures

The main aims of this guidance is to:

- Create love and enthusiasm for Maths
- Develop a deeper understanding of the properties of shapes
- Improve pupils' ability to work with time and money
- Ensure a consistent approach within schools
- Support Medium Term planning at Highfield Schools

2D shape

Definition: shapes that have only 2 dimensions, generally width and height, but no thickness

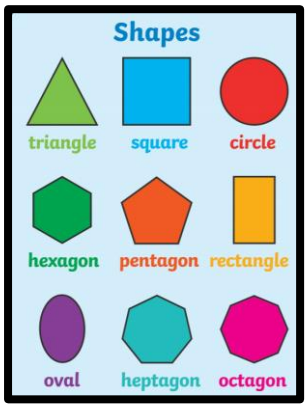
Core skills

To progress and use 2D shapes effectively, pupils will need:

- Basic number skills, counting

Progression

Recognise and name common 2D shapes

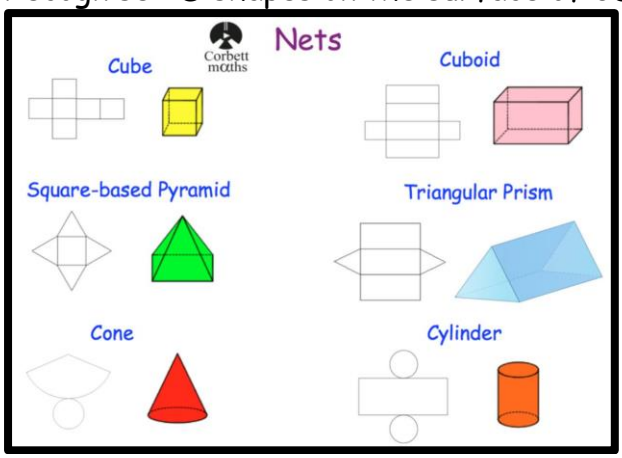


Identify and describe properties of 2D shapes

2D Shapes

Name	Sides	Vertices
triangle	3	3
circle	1	0
square	4	4
rectangle	4	4
pentagon	5	5
hexagon	6	6

Recognise 2D shapes on the surface of 3D shapes

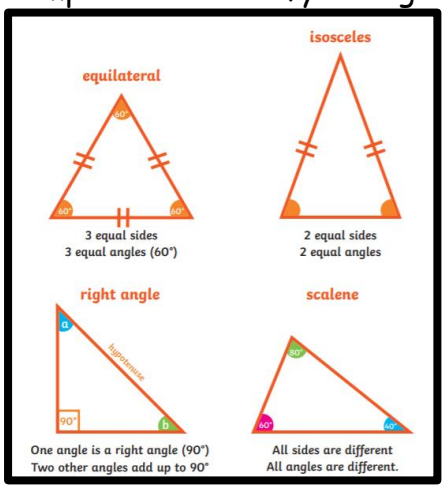


Compare and sort 2D shapes

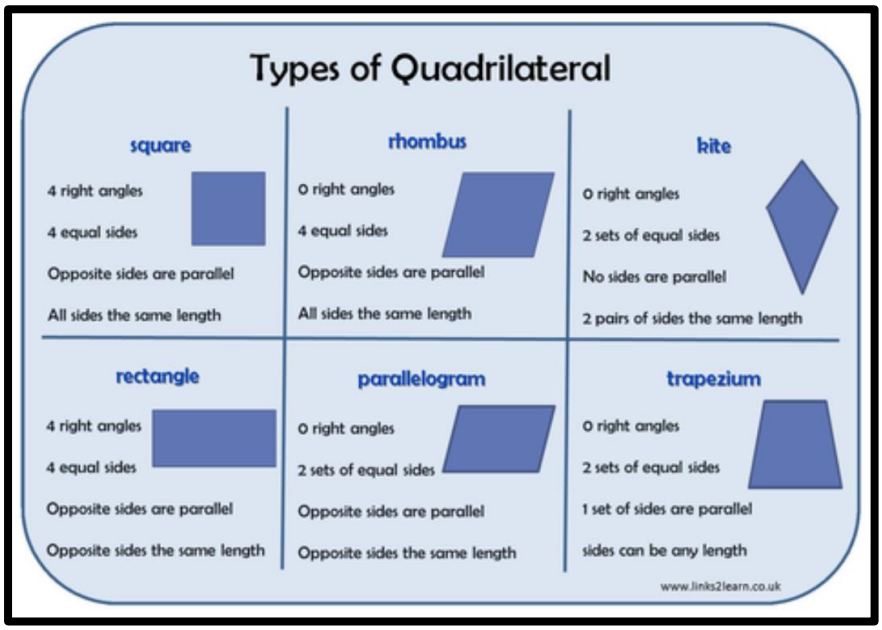
Example

Sort by number of sides, number of vertices, straight or curved edges

Compare and classify triangles based upon properties

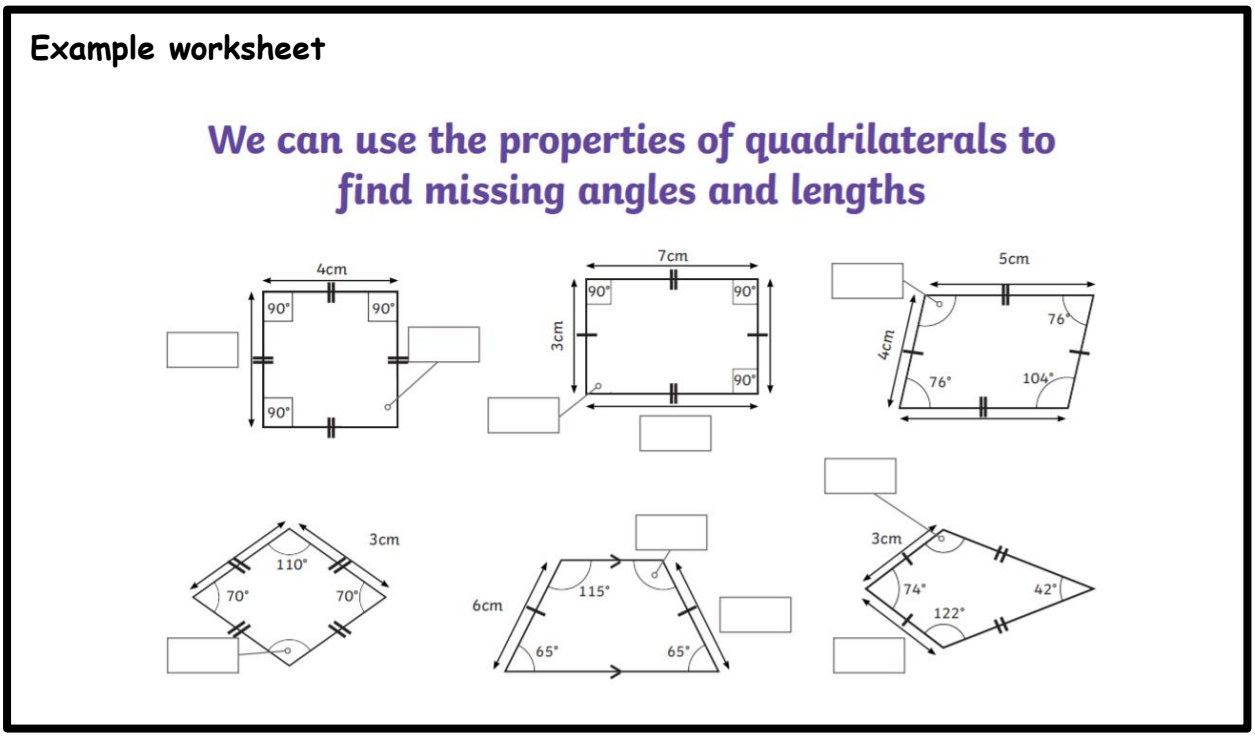


Compare and classify quadrilaterals based upon properties

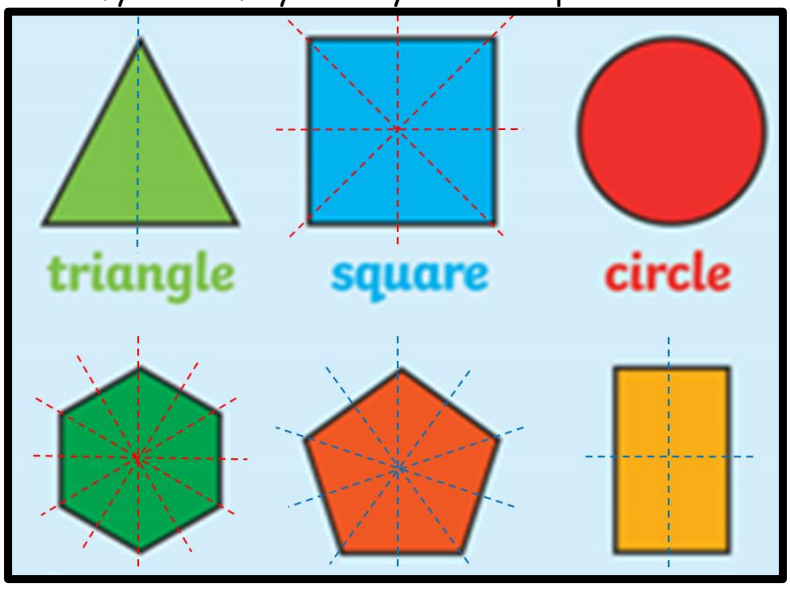


Use properties of quadrilaterals to work out missing lengths and angles

Example worksheet



Identify lines of symmetry in 2D shape

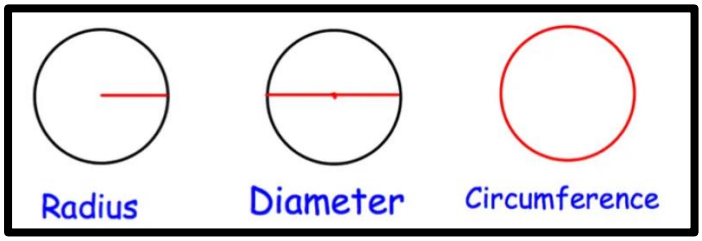


Recognise regular and irregular polygons

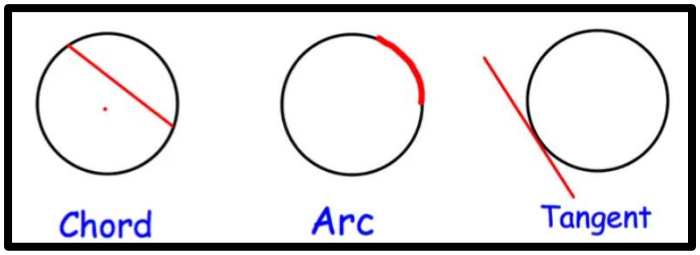
Note: A polygon is regular when all angles are equal and all sides are equal, otherwise it is irregular

Illustrate and name parts of circles

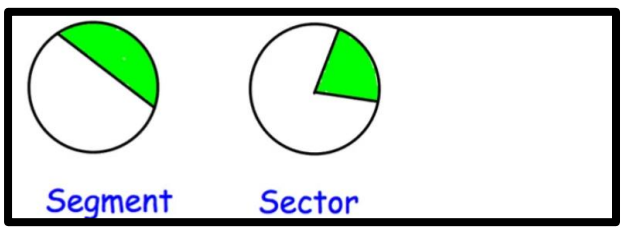
- Basic



- Intermediate



- Advanced



3D Shape

Definition: shapes with three dimensions (such as height, width and depth), like any object in the real world.

Core skills

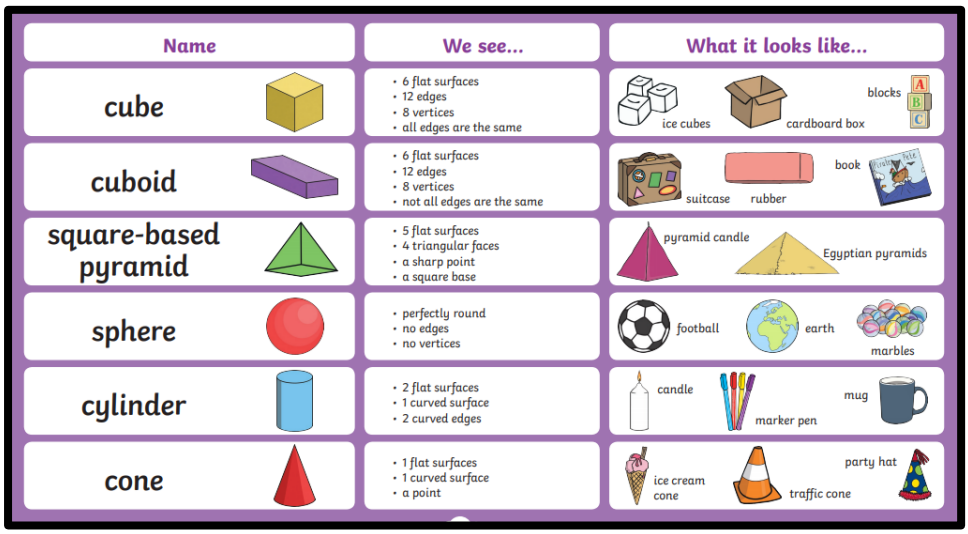
To progress and use 3D shapes effectively, pupils will need:

- Basic number skills, counting
- A knowledge of basic 2D shapes

Progression

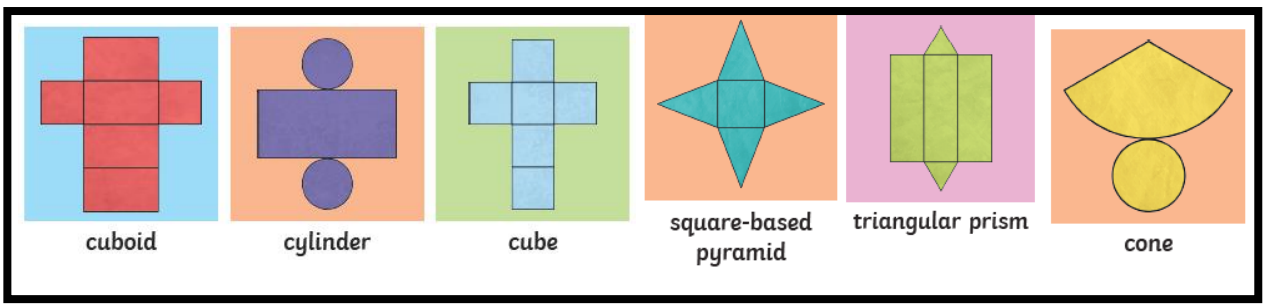
Recognise and name common 3D shapes

- Compare and sort common 3D shapes and everyday objects
- Describe properties of 3D shapes (faces, vertices (corners), edges)
- Recognise 3D shapes in different orientations



Nets of 3D shapes

- Construct 3D shapes from nets
- Recognise and draw nets of 3D shapes



Angles and Lines

Definition: a **line** is a straight one- dimensional figure that has no thickness and extends endlessly in both directions

An **angle** is the amount of turn between two lines around their common point

Core skills

To progress and use angles and lines effectively, pupils will need:

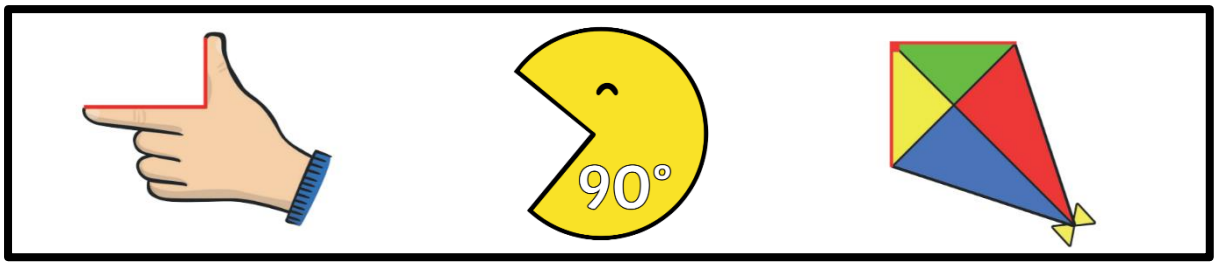
- Basic numeracy skills
- Knowledge of 2D shapes
- Understanding of symmetry

Progression

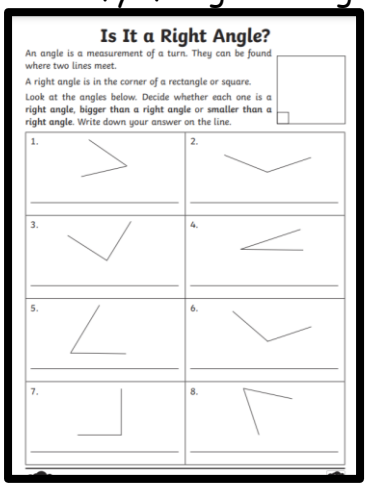
Recognise angles as a property of a shape or description of a turn

> Note: Start with quarter, half and three-quarter turns.
>
> Use clockwise and anticlockwise if appropriate – how else can I turn three-quarters clockwise?

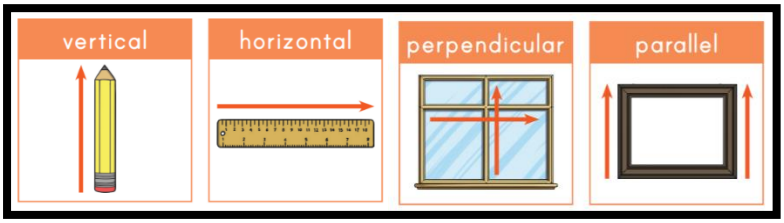
Identify right angles



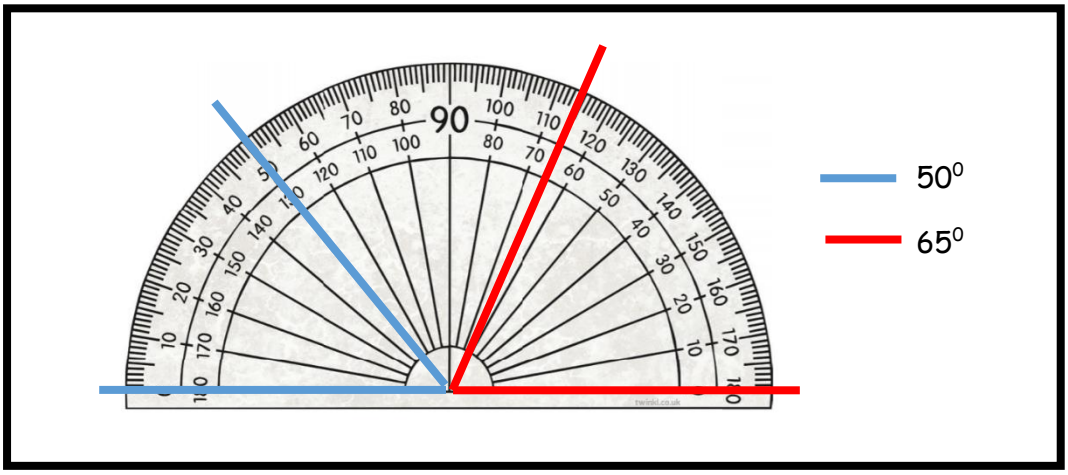
Identify if angles are greater than or less than a right angle



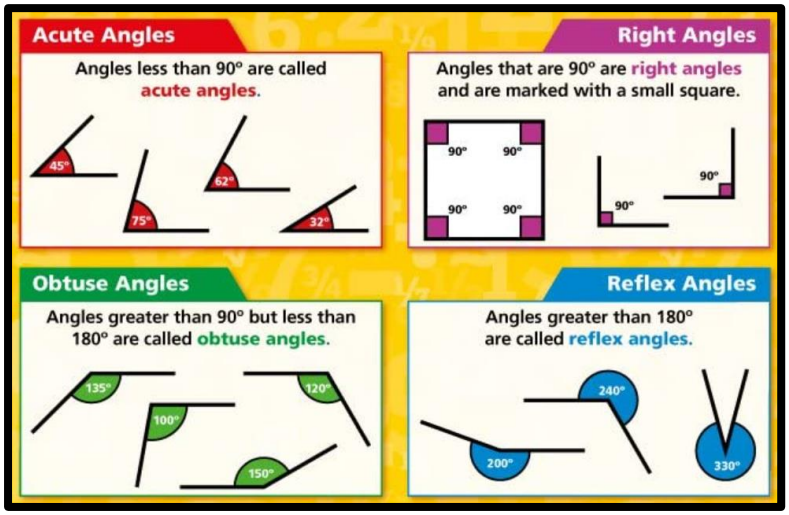
Identify horizontal & vertical lines, perpendicular & parallel lines



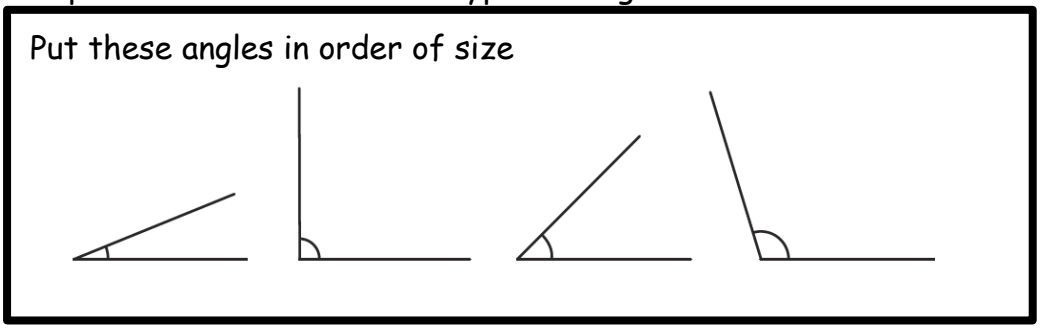
Know angles are measured in degrees, and protractors are used to measure angles



Identify acute, obtuse and reflex angles



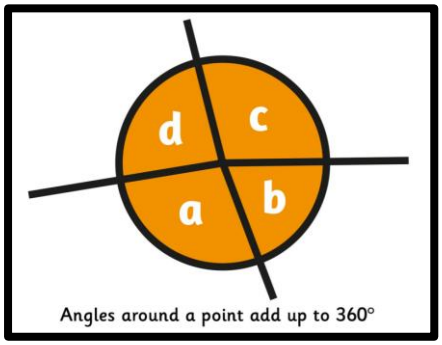
Compare and order different types of angles



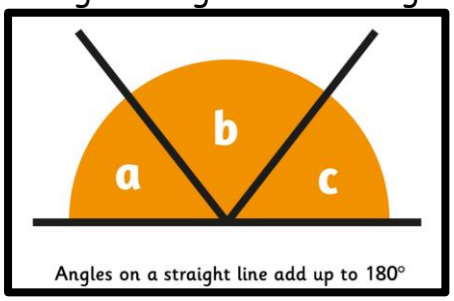
Draw given angles and measure in degrees

Note: This requires confidence in protractor use – pupil must be familiar with the two scales on the protractor to become proficient at this

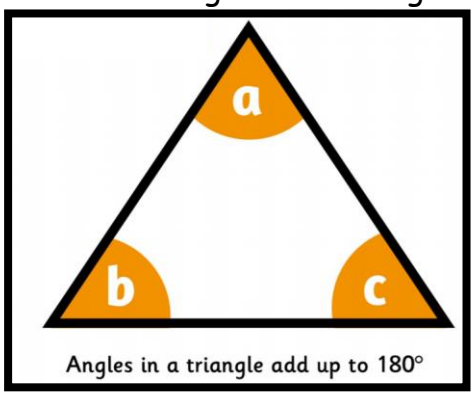
Recognise angles at a point equal one whole turn (360 degrees)



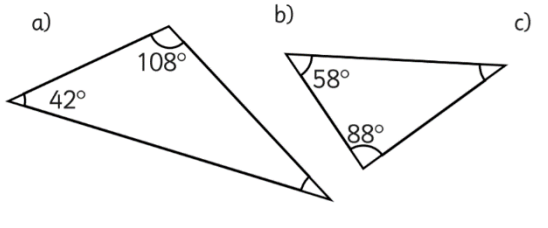
Recognise angles on a straight line equal half a turn (180 degrees)



Know that angles in a triangle add to 180^0.



Calculate unknown angles in triangles



a) $180 - (108 + 42) = 30^0$

b) $180 - (58 + 88) = 34^0$

c) $180 - (69 + 72) = 39^0$

Perimeter, Area and Volume

Definitions:

Perimeter - the continuous line forming the boundary of a two-dimensional shape

Area - the space occupied by a flat shape or the surface of an object

Volume - the quantity of three-dimensional space enclosed within a container

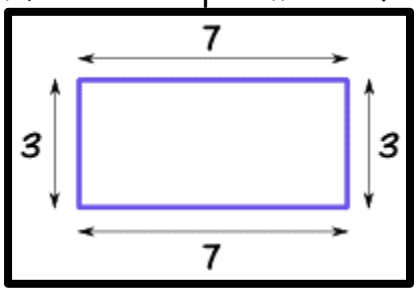
Core skills

To progress and use perimeter, area and volume effectively, pupils will need:

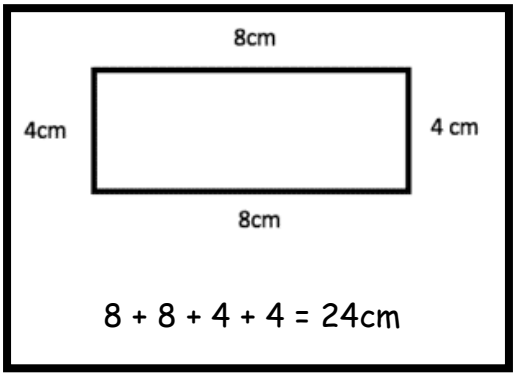
- Basic numeracy skills
- To be able to read and use a ruler
- Understanding of 2D shapes
- Understanding 3D shapes

Progression

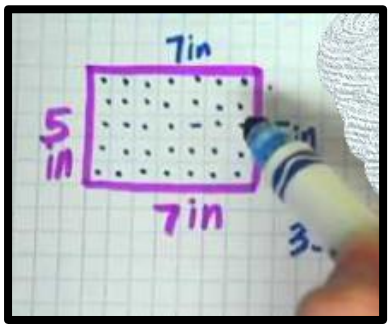
Measure the perimeter of simple 2D shapes



Calculate the perimeter in cm and m



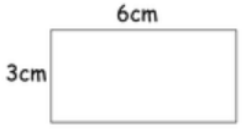
Find the area of shapes by counting squares



Calculate the area of rectangles

Area of rectangle = length x height

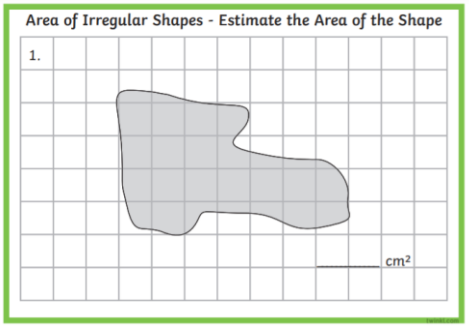
Example

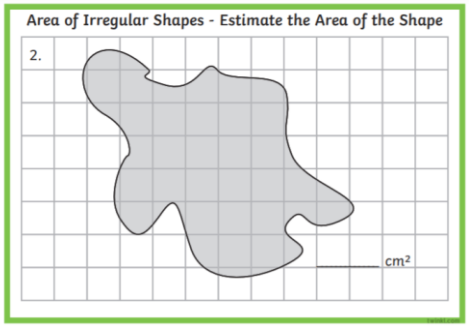


Area of rectangle = 6 x 3 = 18cm^2

Estimate the area of irregular shapes

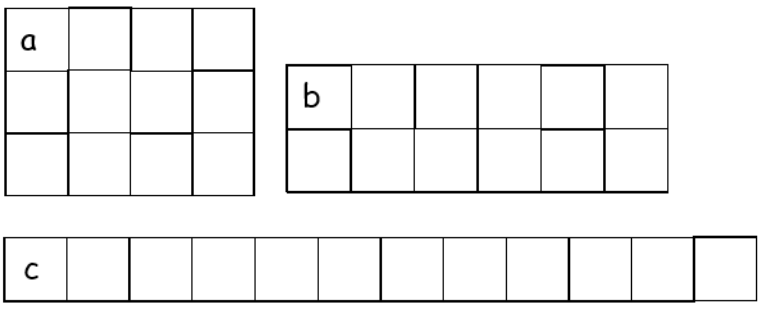
Count squares to estimate area





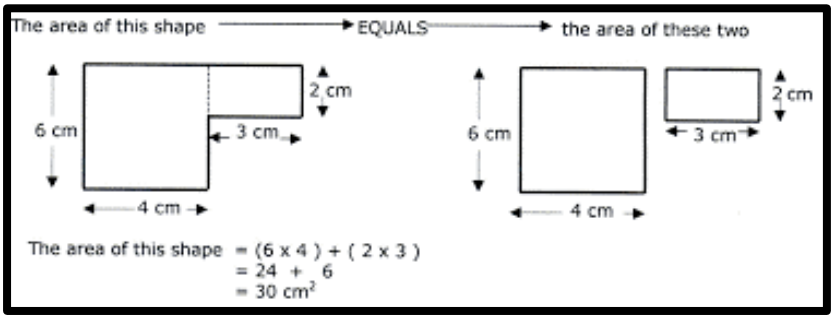
Recognise shapes with the same area can have different perimeters

Shapes a, b and c all have area 12cm^2



Perimeter a = 14cm, Perimeter b = 16cm, Perimeter c = 26cm

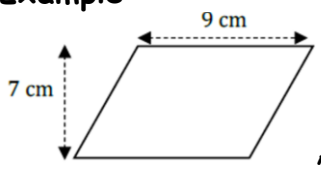
Calculate the area of compound shapes



Calculate the area of parallelograms

Area of parallelogram = length x height

Example

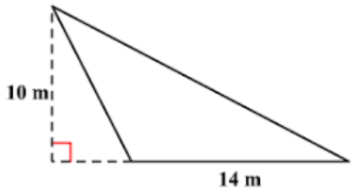


Area of parallelogram = 9 x 7 = 63cm^2

Calculate the area of triangles

Area of triangle = $\frac{1}{2}$ x base x height

Example

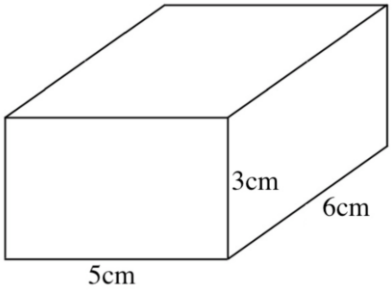


Area of triangle = $\frac{1}{2}$ x 14 x 10 = 70cm^2

Calculate volume of cubes and cuboids

Volume of cube or cuboid = base x height x width

Example



Volume of cuboid = 5 x 3 x 6 = 90cm^3

Time

Definition: the ongoing sequence of events taking place

Core skills

To progress and use fractions effectively, pupils will need:

- Basic numeracy skills
- Understanding of equal portions/sizes
- Understanding of symmetry
- Knowledge of multiples and factors

Progression

Sequence events in chronological order

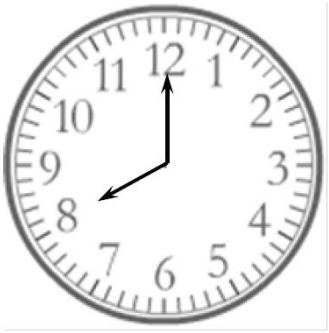
Use words such as yesterday, tomorrow, first, next, before, after

Recognise language related to dates

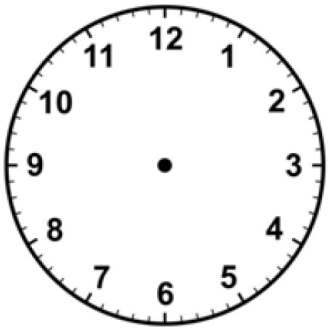
Days of the week, months, years, seasons

Tell the time to the hour

What time does this clock show?

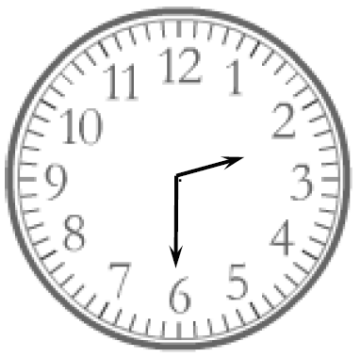


Draw hands on this clock to show 4 o'clock

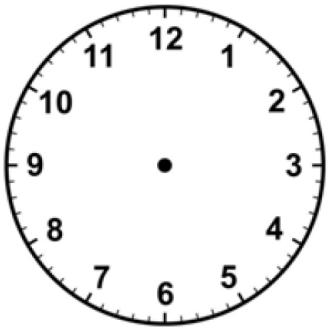


Tell the time to the half hour

What time does this clock show?



Draw hands on this clock to show half past 7



Compare and sequence intervals of time

Example questions

A. Choose one of these phrases to fill each gap with:

- takes longer than
- takes less time than
- takes about the same time as

1. Brushing your teeth		reading a book.
2. Watching a film		watching a TV programme.
3. Knitting a jumper		making a paper aeroplane.
4. Making a cup of tea		eating an apple.

B. Can you put these events in order from the one that would take the least time up to the one that would take the most time?

Travelling to the Moon by car	Flying to America	Walking to the local shop	Watching a film	Sailing to America by boat

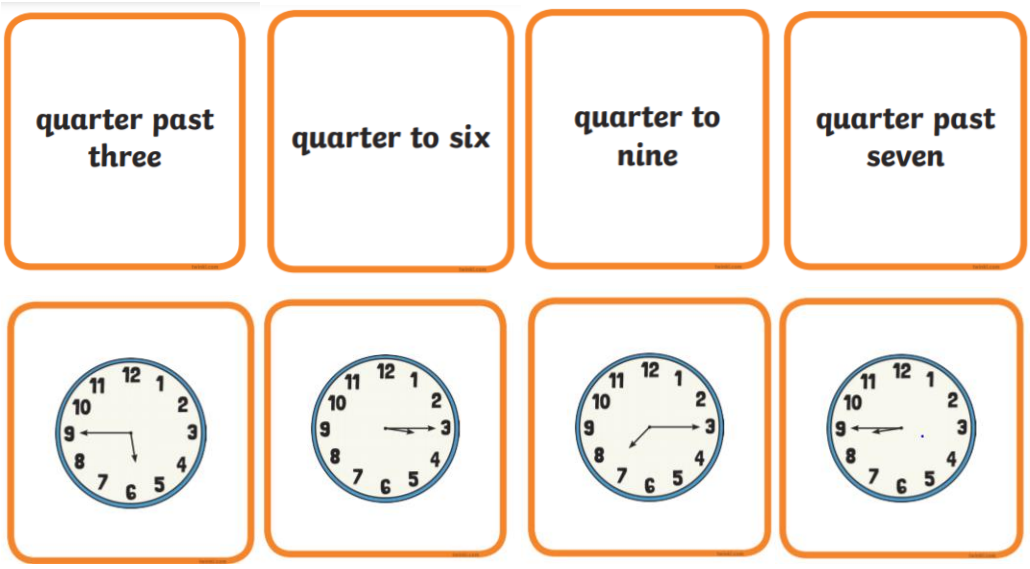
less time → more time

C. Can you use the signs <, > and = to make these statements correct?

1 hour		1 minute
100 minutes		1 hour
1 minute		1 second
1 week		24 hours

Tell the time to quarter to and quarter past

Example activity – matching cards



Know the number of seconds in a minute, minutes in an hour, hours in a day

Example activity

True or false?

- there are 60 minutes in 1 hour
- 1 minute is made up of 24 seconds
- there are 30 minutes in half an hour
- a quarter of an hour = 45 minutes
- a quarter of an hour is 10 minutes
- 24 hours = 1 day

Tell the time in 5 minute intervals

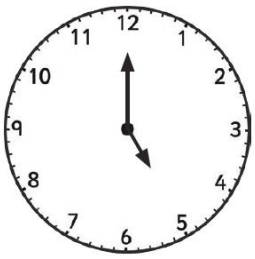
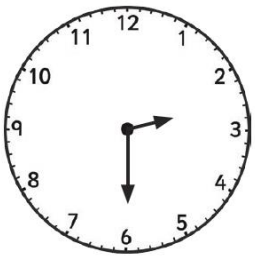
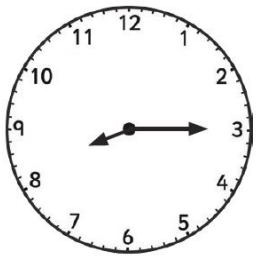
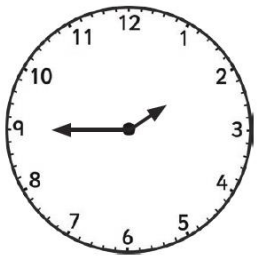
Example activity – dominoes

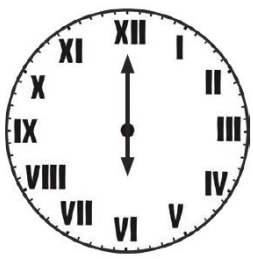
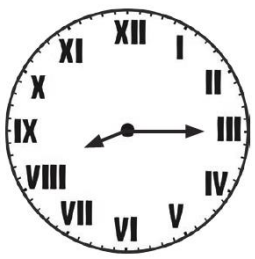
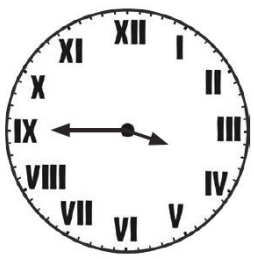
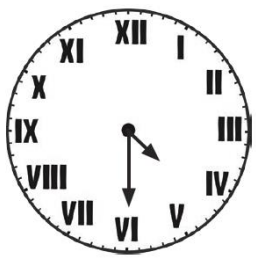
one o'clock		twenty past ten		twenty to four	
five past nine		twenty-five past three		quarter to two	
ten past two		half past eleven		ten to eight	
quarter past six		twenty-five to eight		five to five	

Tell and write the time on an analogue clock, roman numerals

Example worksheet

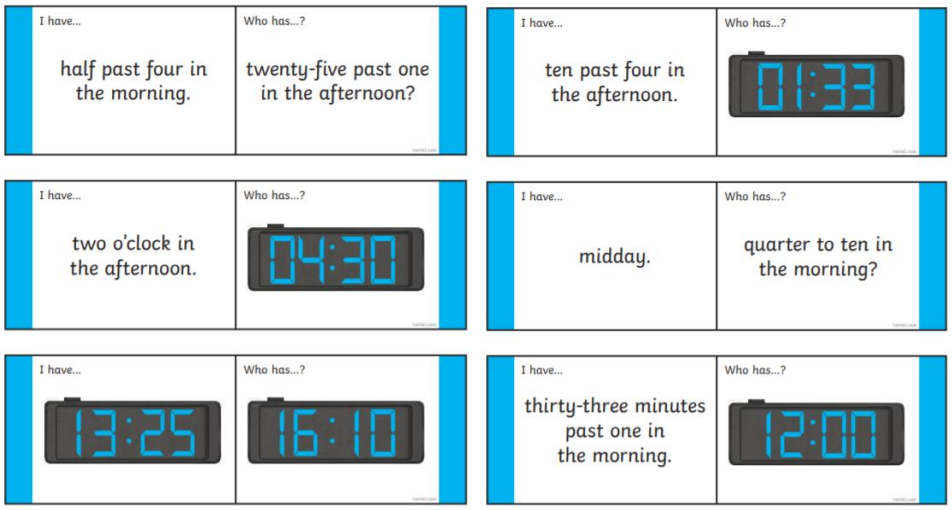
Write the time shown on each clock.

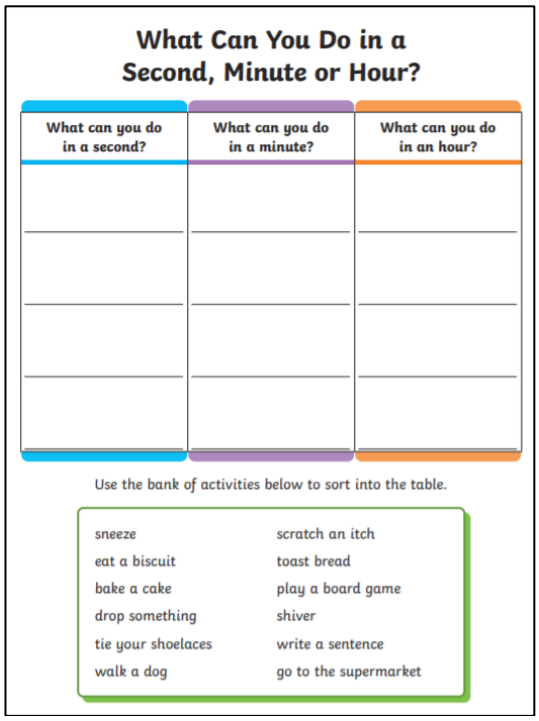
Tell the time on 12 and 24 hour clocks

Example activity – loop cards



Estimate and read time to the nearest second, minutes and hours

Example worksheet



What Can You Do in a Second, Minute or Hour?

What can you do in a second?	What can you do in a minute?	What can you do in an hour?

Use the bank of activities below to sort into the table.

sneeze	scratch an itch
eat a biscuit	toast bread
bake a cake	play a board game
drop something	shiver
tie your shoelaces	write a sentence
walk a dog	go to the supermarket

Use AM PM morning noon night vocabulary

Example worksheet

In each pair, tick the time which comes earliest in the day. The first one is done for you.

3:15 p.m.	○	11:30	✓
04:15	○	4:30 a.m.	○
13:15	○	1:00 p.m.	○
8:30 p.m.	○	09:15	○
11:30 a.m.	○	23:30	○
14:30	○	2:15 p.m.	○

Know the order of the months and the number of days in each month

Examples

a. Which is the second month of the year? _____

b. Which month is between August and October? _____

c. Which month is likely to be hot? _____

d. Which month might be very cold? _____

e. Which is the third month of the year? _____

f. When do leaves fall from the trees? _____

g. When do we celebrate Christmas? _____

30 Days Has September

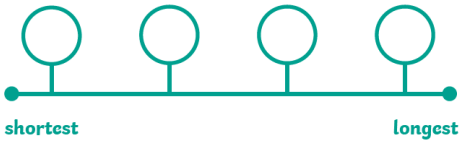
30 days has September,
April, June and November.
All the rest have 31,
Excepting February alone,
Which only has 28 days clear,
And 29 in each leap year.

Compare durations of events

Example worksheet

1) Order the durations of the TV shows from shortest to longest.

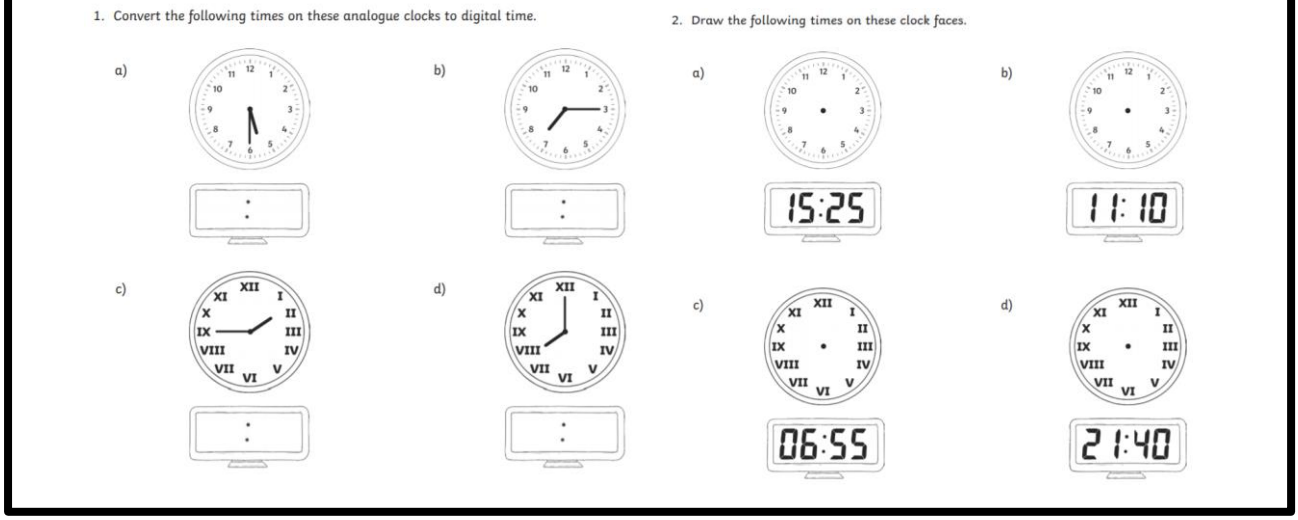
1. Twinkl News 10:55 - 11:00
2. Twinkl Toons 09:00 - 11:20
3. Twinkl Sports Show 10:20 - 11:35
4. Twinkl Tots 09:00 - 10:05



shortest longest

Convert between analogue and digital 12 and 24 hour clocks

Example worksheet



Solve problems involving converting hours to minutes, years to months

Example questions

1) Rob and Josie had a race.
Rob took 165 seconds.
Josie took 2 minutes 35 seconds.
Who won?
Show how you decide.

2) It takes Jade 35 minutes to walk from her home to the station.
She then waits 15 minutes for the train.
The train journey to Derby takes 1 hour 5 minutes.
a) What is her total journey time from home to Derby?
b) Jade leaves home at 7.00 am. What time should she get to Derby?

Money

Definition: coins and banknotes collectively; generally accepted as payment for goods and services

Core skills

To progress and use money effectively, pupils will need:

- Basic numeracy skills, counting
- Addition and subtraction

Progression

Recognise and know the value of different British coins

Recognise and use symbols for pounds (£) and pence (p)

Recognise British bank notes

Combine amounts to make a particular value

Example question
Look at the coins

Use the coins to make a total of 7p

Find different combinations of coins that equal the same amount

Example question
Look at the coins

Find two different ways to make a total of 8p

Convert between pounds and pence, and vice versa

Example questions
How many pence is £1.50?

Write 352 pence in pounds

Solve simple money problems involving giving change

Example question
Large cakes cost 50p each Small cakes cost 35p each

Dita buys a large cake and a small cake. What is the total cost?
She pays with a £1 coin.
How much change should she get?

Add and subtract money to give change in practical contexts

Example question
David has £60
He buys three CDs for £9.99 each and a computer game for £24.99
How much money does he spend?
How much money does he have left?

Using Measures

Definition: a fraction is a numerical quantity that is not a whole number, consists of numerator (top) and denominator (bottom)

Core skills

To progress and use fractions effectively, pupils will need:

- Basic numeracy skills
- Understanding of equal portions/sizes
- Understanding of symmetry
- Knowledge of multiples and factors

Progression

Compare lengths and heights (long short double half taller shorter)

Example questions

Look at the pencils.

- Which is the longest pencil?
- Which two pencils are the same length?

Compare mass (heavy light)

Example question

Which is lighter?

Tick your answer.

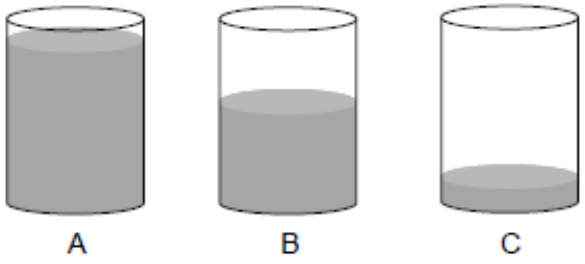
☐

☐

Compare capacity and volume (full empty half full nearly full nearly empty)

Example question

Look at the containers.



Which container is half full?

Which container is more than half full?

Measure and record length, height, mass, weight, capacity and volume

Example question – estimate the length of each object then measure them

Object	Estimate	Measurement
scissors		
glue stick		
desk		
whiteboard		
book		
paper		

Choose appropriate standard measures to estimate and measure

Example question

Match the measurements with the most suitable units.

Choose *one unit only* for each measurement.

Weight of a mouse	Centimetres	Grams
Height of a house	Litres	Metres
Volume of liquid in a can of drink	Kilograms	Millilitres

Compare and order measures and record using < > and =

Example worksheet

1) Compare these measurements using <, > or =.

12cm		15cm
9cm		4cm
1cm		10mm
35mm		4cm
8m		4m
6m		12m
3m		350cm
4m		400cm

2) Order these measurements from shortest to longest.

a) 10cm 25mm 3m

b) 45mm 1m 20cm

Convert metric and imperial measures

Notes

Approximate conversions for mental (approximate) values

1 pint = 0.5 litres	1 litre = 2 pints
1lb = 0.5kg	1 kg = 2lbs
1ft = 30cm	1 metre = 3ft

Exact conversions for calculator values

1 pint = 0.57 litres	1 litre = 1.76 litres
1lb = 0.45kg	1kg = 2.2lbs
1ft = 30.38cm	1 metre = 3.28ft
1 inch = 2.5cm	1cm = 0.39 inches
1 mile = 1.6km	1km = 0.625 miles

Use all four operations to solve measures problems

Example questions

1) Dad drives a truck. Last week, he drove 267 kilometres on Monday, 186 on Tuesday, and 198 on Wednesday. This week, Dad drove 282 kilometres in total. What is the difference in kilometres between this week and last week?

2) I walk 3000m every day. How many days would it take me to walk 273 kilometres?

3) Billy drew a chalk like on the playground. He drew a blue line 88cm long and then continued the line in red chalk. The total length of the line was 1.3m. How long was the red section of the line?

Use read write and convert between standard units smaller to larger/decimals

Example worksheet

Convert.

1 a. 2,000 m = _____ km

1 b. 9 km = _____ m

2 a. 9,000 ml = _____ L

2 b. 3 kg = _____ g

3 a. 6 L = _____ ml

3 b. 90 mm = _____ cm

4 a. 6 cm = _____ mm

4 b. 4 km = _____ m

Useful Websites

Activities for all year groups: www.ixl.com

Go Gordons Interactive Maths: http://www.wldps.com/gordons/

Top Marks Games: http://www.topmarks.co.uk/maths-games/5-7-years/counting

Algebra tiles: http://technology.cpm.org/general/tiles/

Interactive Cuisenaire rods: https://nrich.maths.org/4348

Interactive bar modelling: http://www.mathplayground.com/ThinkingBlocks/thinking_blocks_modeling%20_tool.html

Problem solving activities/Maths games: http://www.transum.org/Software/

Starters, Practice questions, Videos: https://corbettmaths.com/

www.mathsisfun.com

http://nrich.maths.org/frontpage

http://www.mathematicshed.com/

https://whiterosemaths.com/

https://www.mymaths.co.uk/