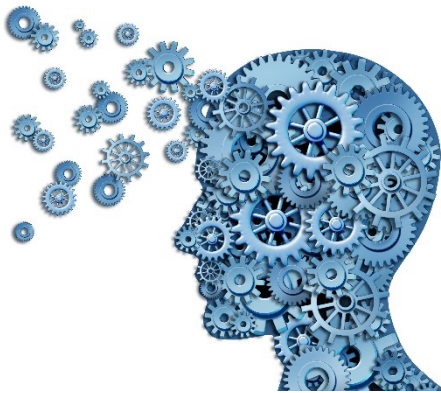


Name:

Set:



Unit	Topic	Complete
1	Percentages	
2	Proportion	
3	Multiplicative Reasoning	
4	Tables	
5	Charts and Graphs	
6	Pie Charts	
7	Scatter Graphs	
8	Straight Line Graphs	
9	Quadratic Graphs	
10	Real life Graphs	
11	Inequalities	
12	Sequences	
13	Perimeter and Area	
14	3D Shapes	
15	Pythagoras and Trigonometry	

Pi Unit 1: Percentages

Prior Knowledge

Find percentages of amounts.

$$50\% = \div 2 \quad 10\% = \div 10 \quad 1\% = \div 100$$

E.G. Find 21% of 600:

$$10\% = 600 \div 10 = 60$$
$$1\% = 600 \div 100 = 6$$
$$21\% = 60 \times 2 + 6 = 126$$

Use a percentage multiplier to find a percentage of amount.

E.G. Find 21% of 600

$$21\% \div 100 = 0.21$$
$$600 \times 0.21 = 126$$

Perform a percentage increase/decrease.

E.G. Increase 450 by 10%:

$$10\% = 450 \div 10 = 45$$
$$450 + 45 = 495$$

E.G. Decrease 700 by 28%:

$$10\% = 700 \div 10 = 70 \quad 1\% = 700 \div 100 = 7$$
$$28\% = 70 \times 2 + 7 \times 8 = 196$$
$$700 - 196 = 504$$

Express one amount as a percentage of another.

Express change as a percentage.

$$\frac{\text{difference}}{\text{original}} \times 100$$

E.G. Find the percentage increase from £60 to £81.

$$81 - 60 = 21$$
$$\frac{21}{60} \times 100 = 35\%$$

Exam Questions

E.G.

Barry buys 30 cans of cokes from the supermarket.

He buys them in packs of 6 for £3.00.

He also has a 10% off voucher.

Barry then sells the cans for 65p each to his friends.

Work out the percentage profit that Barry makes.

Step 1: Calculate how much he pays.

$$30 \text{ cans, } 30 \div 6 = 5. \quad \text{Spending } 5 \times \text{£}3.00 = \text{£}15.$$

Step 2: Calculate the discount.

$$10\% \text{ of } \text{£}15 \text{ is } \text{£}1.50. \text{ So he spends } 15 - 1.50 = \text{£}13.50$$

Step 3: Calculate the money he makes.

$$30 \times 65\text{p} = 30 \times 0.65 = \text{£}19.50$$

Step 4: Calculate the profit.

$$\text{£}19.50 - \text{£}13.50 = \text{£}6$$

Step 5: Work out the percentage profit.

$$\text{Profit} = \frac{\text{difference}}{\text{original}} \times 100 = \frac{6}{13.5} \times 100 = 44\%.$$

Literacy

Write the definition of percentage.

Write a question about finding a percentage of an amount that you could be asked to answer.

Reasoning

There are 800 students at Prestfield School. 144 of these were absent on Wednesday.

- a) How many attended on Wednesday?
- b) Trudy says more than 25% were absent, is this true?

Fluency

Without a calculator.

- 1) 10% of £80 =
- 2) 10% of £130 =
- 3) 10% of £459 =
- 4) 10% of £36 =
- 5) 20% of £60 =
- 6) 20% of £140 =
- 7) 20% of £62 =
- 8) 30% of £70 =
- 9) 30% of £180 =
- 10) 30% of £120 =

With a calculator.

- 1) 28% of £200 =
- 2) 63% of £500 =
- 3) 19% of £400 =
- 4) 37% of £80 =
- 5) 82% of £54 =

Problem Solving

The table gives information about an estate agents charges when selling houses.

Value of the house	Estate agent's charges
Up to £60 000	2% of the value of the house
Over £60 000	2% of the first £60 000 plus 1% of the remaining value of the house

The agent sold a home for £80 000.
Work out the charge.

Pi Unit 2: Proportion

Prior Knowledge

Understand what proportion is.

Use unitary method for proportion.

$$\begin{array}{l} 5 \text{ pens cost } 60\text{p} \\ \downarrow \div 5 \\ 1 \text{ pen cost } 12\text{p} \\ \downarrow \times 8 \\ 8 \text{ pens cost } 96\text{p} \end{array}$$

Scale recipes.

Ratios for Currency Conversions

The conversion rate for £ to € is 1:1.09. So every £1 is worth €1.09.

To convert £ to € we multiply. To convert € to £ we divide.

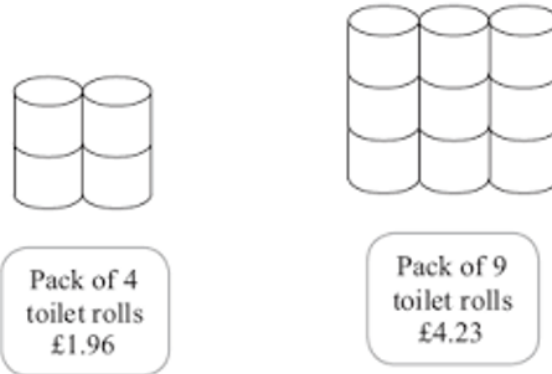
E.G.
Convert £120 to euros.
 $120 \times 1.09 = \text{€}130.80$.

E.G.
Convert €330 to pounds.
 $330 \div 1.09 = \text{£}302.75$.

Best Buys

We need to use proportion to make comparisons on which is the best offer. We need to do this, by making them comparable.

E.G.



Which pack offers the best value for money?

We need to work out the cost for 1 toilet roll from each.

Option 1 (9 rolls)
1 toilet roll costs $\text{£}4.23 \div 9 = 47\text{p}$.

Option 2 (4 rolls)
1 toilet roll costs $\text{£}1.96 \div 4 = 49\text{p}$.

Conclusion: Option 1 is better value.

You must always show your working on these questions.

Literacy

Use an example to explain what the “unitary method” for proportion is.

Reasoning

It takes Jane 2 hours to drive 120 miles from Leeds to Birmingham.

(a) How long would it take to continue the journey a further 40 miles from Birmingham to Worcester?

(b) State one assumption you made in calculating your answer.

Fluency

1) *3 pencils cost 90 pence. How much is (a) 1 pencil?*

(b) 5 pencils?

2) *At a café, 2 teas and 3 coffees cost £6.90.*

(a) How much do 4 teas and 6 coffees cost?

(b) Is it possible to work out the cost of 6 coffees and 4 teas? Explain.

3) *Cushtee toilet roll comes in packs of 4 costing £2.40 or packs of 9 costing £5.50. Which size of Cushtee toilet roll gives the best value for money? Explain.*

Problem Solving

The total weight of 5 tins of waggy-tail puppy mix and 2 pouches of kitty-kins catfood is 2.4kg.

The total weight of 3 pouches of kitty-kins catfood is 0.6 kg.

Work out the weight of 1 tin of waggy-tail puppy mix.

Pi Unit 3: Multiplicative Reasoning

Prior Knowledge

Rearrange formulae.

Solve equations.

Use the kinematics formulae.

Units for compound measures.

Fractions and Ratio

The denominator of the fraction is the total number of parts added together.

E.G.

$$4 : 3 = \frac{4}{7} : \frac{3}{7}$$

4 + 3 = 7

Simple Compound Measures

You must know and be able to use the formulas and be able to rearrange them when needed.

$$\text{speed} = \frac{\text{distance}}{\text{time}} \quad \text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Harder Compound Measures

Use a table to help you organise your working out. This is helpful when there are multiple parts to journeys.

Example:

Sienna travels from Birmingham to Leeds at an average speed of 60mph. She then travels from Leeds to Darlington at an average speed of 40mph. The distance from Birmingham to Leeds is 150miles. The distance from Leeds to Darlington is 70miles. Calculate Sienna's average speed.

	B TO L	L TO D	TOTAL B TO D
SPEED	60mph	40mph	51.76mph
DISTANCE	150miles	70miles	220miles
TIME	2.5h	1.75h	4.25h

Literacy

Write the definition of density.

Write the definition of mass.

Reasoning

If wood has density less than 1g/cm^3 it will float.

Which of these will be best for building a toy boat?

Plank A

Volume = 750cm^3
Mass = 900g

Plank B

Volume = 0.0152m^3
Mass = 7.6kg

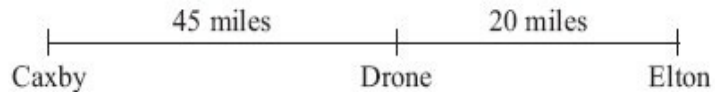
Plank C

Volume = 1000cm^3
Mass = 1.02kg

Fluency

The distance from Caxby to Drone is 45 miles.

The distance from Drone to Elton is 20 miles.



Colin drives from Caxby to Drone. Then he drives from Drone to Elton.

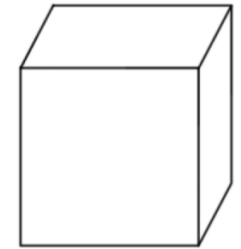
Colin drives from Caxby to Drone at an average speed of 30 mph.

He drives from Drone to Elton at an average speed of 40 mph.

Work out Colin's average speed for the whole journey from Caxby to Elton.

Problem Solving

The diagram below shows a solid block of ice.



81cm

A block of ice weighs $\frac{1}{2}$ tonne.

The block is a cube with side length 81cm.

Find the density of the ice.

Give your answer in kilograms per cubic metre.

Pi Unit 4: Tables

Prior Knowledge

Be able to complete a frequency table using a tally chart.

Complete a two-way table.

Extract data from lists and tables.

Understand the different types of data.

Use time notation.

Add and subtract using time.

Identify the mode from data, the most common number.

Identify the range for data, largest number subtract the smallest.

Two-Way Table

Felicity asked 100 students how they came to school one day. Each student walked or came by bicycle or came by car.

49 of the 100 students are girls.

10 of the girls came by car.

16 boys walked.

21 of the 41 students who came by bicycle are boys.

Work out the total number of students who walked to school. Complete this yourself.

	Boys	Girls	Total
Car		10	
Walk	16		
Bicycle	21		41
Total		49	100

Averages and range from a frequency table:

The table shows the amount of goals scored in 21 matches.

Goals scored	Frequency	$\sum fx$
0	6	0
1	8	8
2	4	8
3	2	6
4	1	4
	total = 21	total = 26

The **modal** number of goals is 1 as it has highest frequency.

The **range** is the biggest amount of goals – smallest goals = $4 - 0 = 4$

Mean = $26 \div 21 = 1.24$

Literacy

Explain how to calculate of the following words:

Mode-

Median-

Mean-

Range-

Reasoning

Miss Clark says that the number of matches played is 5. Is she correct? Give reasons for your answer.

Goals scored	Frequency
0	3
1	4
2	15
3	9
4	1

Fluency

Complete the following:

	Walk	Car	Other	Total
Boy	15		14	54
Girl		8	16	
Total	37			100

Convert the following to 24 hour clock:

- a) 5.15pm b) 1.07am c) 12.06pm

Convert the following to 12 hour clock:

- a) 18:10 b) 02.17 c) 12:18

Problem Solving

Goals scored	Frequency
0	3
1	4
2	15
3	9
4	1

The table shows the number of goals scored in a match.

- 1) What is the modal goal score?
- 2) What range of the goals scored?
- 3) What is the median goals scored?

Pi Unit 5: Charts and Graphs

Prior Knowledge

Plotting coordinates

Plot and interpret frequency tables.

Draw and interpret the following charts and graphs-

- Bar charts
- Dual bar charts
- Composite bar charts
- Stem and Leaf diagrams
- Pictograms

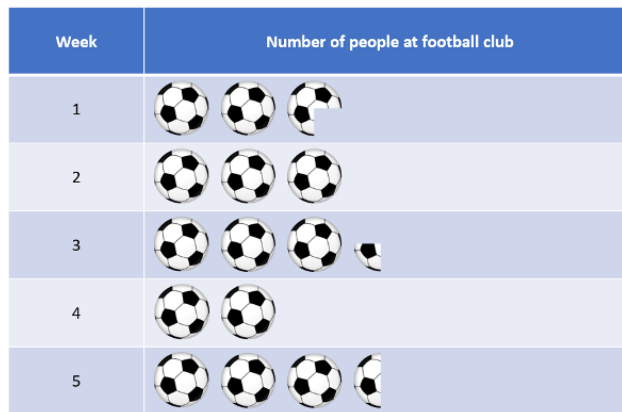
Pictograms


Pictograms use pictures to portray data, with each symbol representing an amount. Part of a picture can be used to represent different frequency.

E.G.

Put the following information into a pictogram.

Week	No of people at a football club
1	55
2	60
3	65
4	40
5	70



 = 20 people

Spotting Mistakes

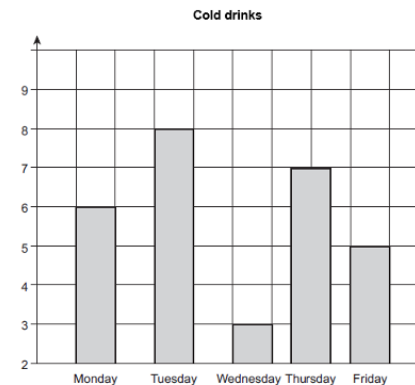
Examiners may try to catch you out, by giving you a chart to spot a mistake on, watch out for these errors.

- Gaps between bars for discrete data.
- Scale goes up in the same amount.
- Labels for both axis.
- Bars are same width on bar charts.

E.G.

Jon records the number cold drinks he has each day.

	Monday	Tuesday	Wednesday	Thursday	Friday
Number of cold drinks	6	8	3	7	5



Here are three mistakes with this graph:

- 1) Gaps between bars are different sizes.
- 2) The axis are not labelled correctly.
- 3) The y axis does not start at 0.

Literacy

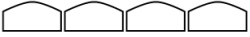


Write the definition of discrete data and give an example.

Write the definition of continuous data and give an example.

Fluency

 represents 20 loaves of bread

The pictogram shows the numbers of loaves of bread made by Miss Smith, Mr Jones and Mrs Gray.

Miss Smith	
Mr Jones	
Mrs Gray	
Ms Shah	
Mr Khan	

(a) Write down the number of loaves of bread made by Mr Jones.

(b) Write down the number of loaves of bread made by Mrs Gray.

Ms Shah made 60 loaves of bread.
Mr Khan made 90 loaves of bread.

(c) Use this information to complete the pictogram.

Reasoning Problem Solving

Plot a time series graph for both the number of ice creams sold by Tim and the number of ice creams sold by Bob.

This table shows the number of ice creams sold by Tim at the beach each day for a week:

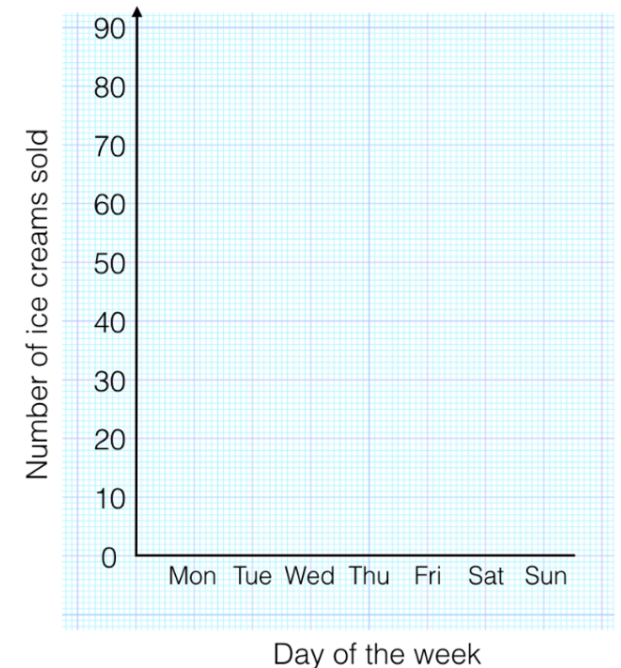
Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Number sold	60	12	64	7	70	84	65

This table shows the number of ice creams sold by Bob at the other end of the beach each day:

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Number sold	50	15	67	70	75	90	71

a) It rained one day that week. Which day do you think it was? Why?

b) Tim's freezer broke down on one of the days, so he had to get it repaired. Which day do you think it was?



Pi Unit 6: Pie Charts

Prior Knowledge

Construct angles.

Draw a pie chart.

E.g.

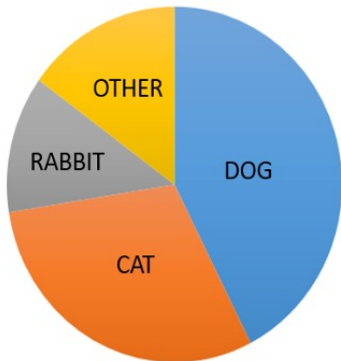
The table shows the pets 40 people own:

$$1 \text{ person} = 360^\circ \div 40 = 9^\circ$$

Type of pet	Frequency	Angle
Dog	17	$17 \times 9 = 153^\circ$
Cat	12	$12 \times 9 = 108^\circ$
Rabbit	5	$5 \times 9 = 45^\circ$
Other	6	$6 \times 9 = 54^\circ$

$$360^\circ \div 40 = 9$$

Draw your pie chart with the correct angles and label each section:

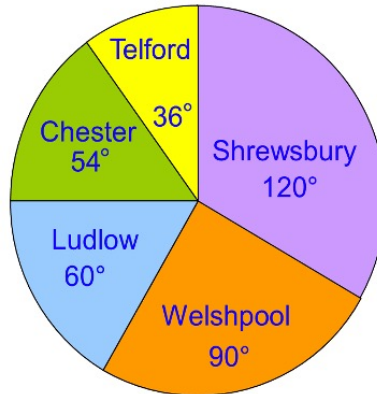


Interpret Pie Charts

When interpreting pie charts, always work out the degrees per person first.

E.G.

The following pie chart shows the amount of people travelling to certain destinations.



15 people are going to Welshpool, how many are going to Telford?

$$90 \div 15 = 6^\circ$$

$$36 \div 6 = \underline{6 \text{ people}}$$

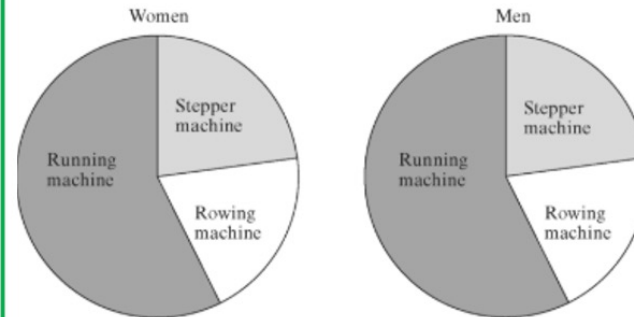
Misleading Pie Charts

Remember pie charts can be misleading as they represent proportions and if you don't know the total, they can be misleading.

E.G.

Men and women at a gym were asked which of these fitness machines they spent the most time on.

The gym instructor produced these pie charts.



Tomas states,

"Men and women spend the same time on each machine".

Give a reason why Tomas may be wrong.

Although the proportions are the same, we don't know if there are the same amount of men and women.

Literacy

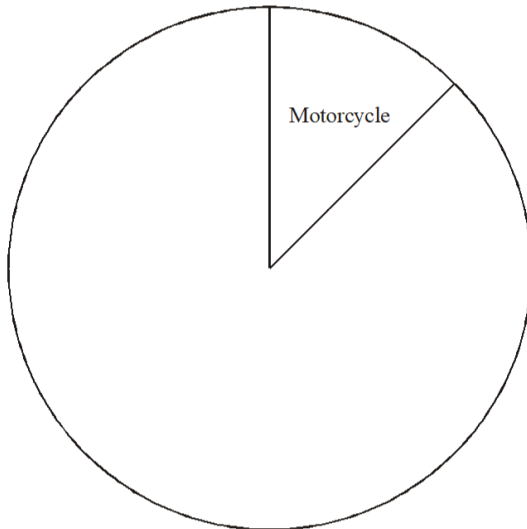
Explain the difference between a population and a sample.

Fluency

The table shows information about 40 vehicles crossing a bridge.

Type of vehicle	Number of vehicles	Size of angle
Motorcycle	5	45°
Car	16	
Bus	11	
Other	8	

Complete the pie chart to show this information.

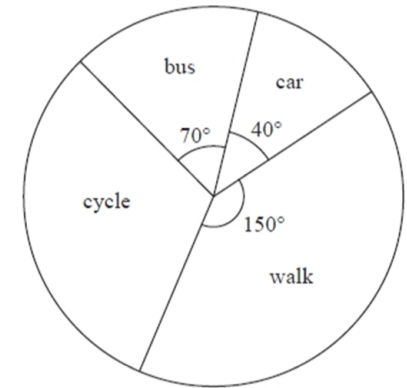


Reasoning

The pie chart shows information about how the students in Year 11 get to school.

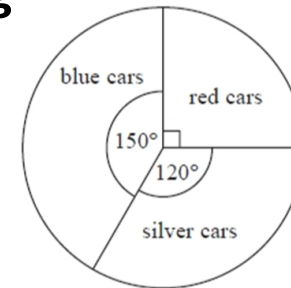
Mr Morley says "Less than 10% of Year 11 get to school by car".

Is Mr Morley correct?

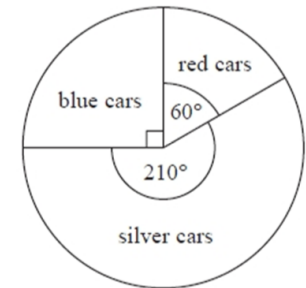


Problem Solving

Allerton School



Bragdon School



There are only silver cars, blue cars and red cars in the car parks at Allerton School and at Bragdon School.

The pie charts show information about the numbers of these cars.

- (a) What fraction of the cars in the car park at Allerton School are blue?
Give your fraction in its simplest form.

.....

There are 12 red cars in the car park at Bragdon School.

- (b) How many silver cars are there in this car park?

Pi Unit 7: Scatter Graphs

Prior Knowledge

Plot coordinates.

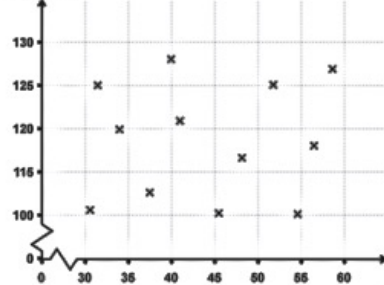
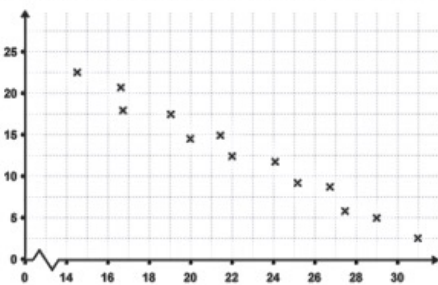
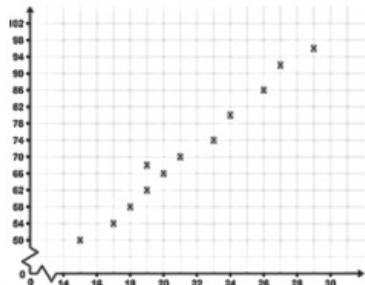
Read diagrams.

Plot a scatter graph.

Interpreting Correlation

A frequency polygon is used to plot grouped data, it is plotted as mid-point against frequency, the points are then joined using a ruler.

Positive correlation means as one variable increases so does the other variable.
Negative correlation means as one variable increases the other variable decreases.
No correlation means there is no relationship between the two variables.



Interpolation and Extrapolation

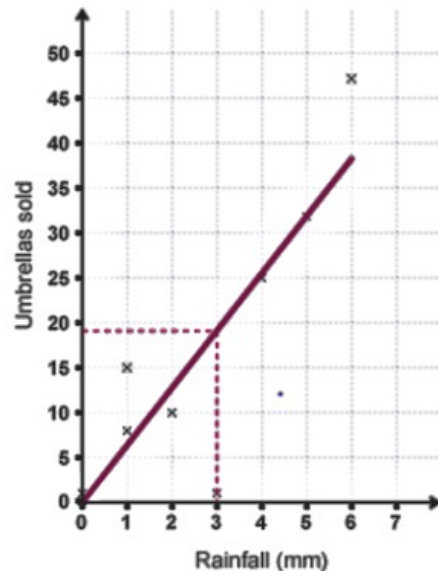
Scatter diagrams can be used to make estimates, first we need to draw a line of best fit.

Example:

For the data in the example, estimate how many umbrellas would be sold when there is 3mm of rain.

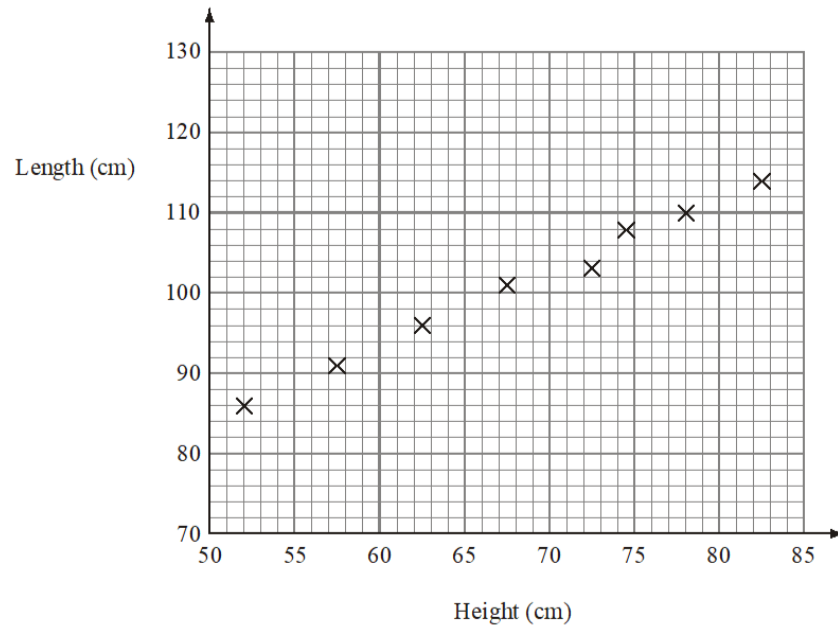
Therefore reading from our line of best fit, we'd estimate 19 umbrellas to be sold. This is **interpolation** as it is within the data range we have.

When we are asked to do this outside of the data range it is called **Extrapolation** and is less accurate as we have no data in this range.



Fluency

The scatter graph shows information about eight sheep. It shows the height and the length of each sheep.



The table gives the height and the length of two more sheep.

Height (cm)	65	80
Length (cm)	100	110

- (a) On the scatter graph, plot the information from the table.
- (b) Describe the relationship between the height and the length of these sheep.

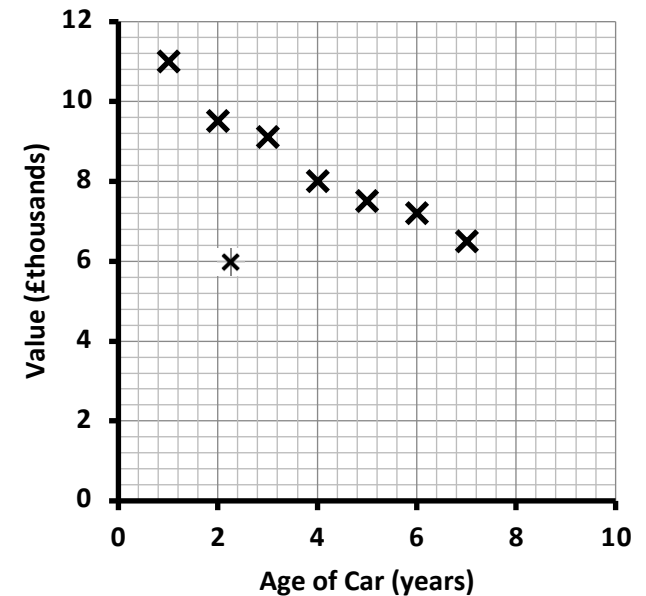
.....

Literacy

Give an example of two variables that you might expect to have positive correlation.

What does the term outlier mean?

Reasoning



One of these points is an outlier. Which one and why?

Pi Unit 8: Linear Graphs

Prior Knowledge

Plot Linear graphs.

Identify the gradient, m , of a linear graph.

Find the equation of a straight-line graph in the form $y=mx + c$.

Identify parallel lines, they have the same gradient.

Identify perpendicular lines, the gradients are the negative reciprocal of one another.

Equation of a Straight Line

The equation of a line is in the form:

$$y = mx + c$$

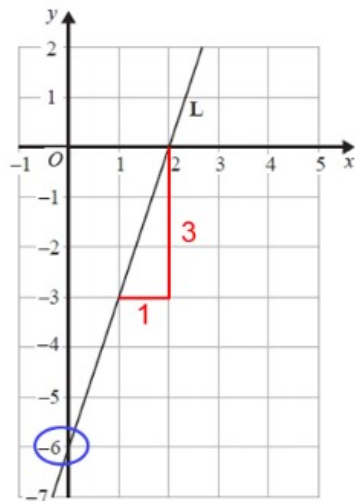
M is the gradient. C is the y intercept

E.G.

$$m = 3 \div 1 = 3$$

$$c = -6 \text{ (crosses } y\text{-axis)}$$

$$\text{So } y = 3x - 6$$

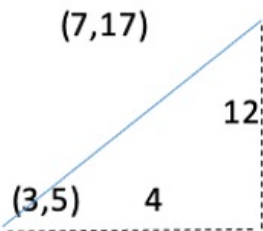


Equation of a Line Given Two Points

To find the equation of a line between two points, first it's good to draw a picture, find the gradient between the two points, then use this in the equation for m and use one point to find the intercept.

Example

Find the equation of the line that passes through the points $(3,5)$ and $(7, 19)$



$$\text{Gradient} = \frac{17-5}{7-3} = \frac{12}{4} = 3$$

$$\text{so } y = 3x$$

+ c

$$5 = 3 \times 3 + c$$

$$5 = 9 + c$$

$$\text{Answer } y = 3x - 4$$

Literacy

Describe the term 'linear graph'.

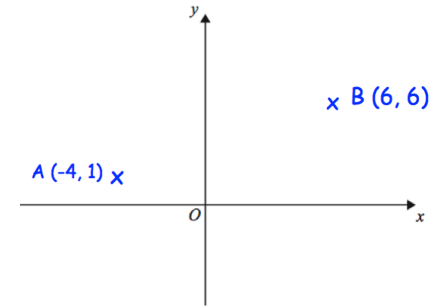
Describe the term 'substitute'.

Problem Solving

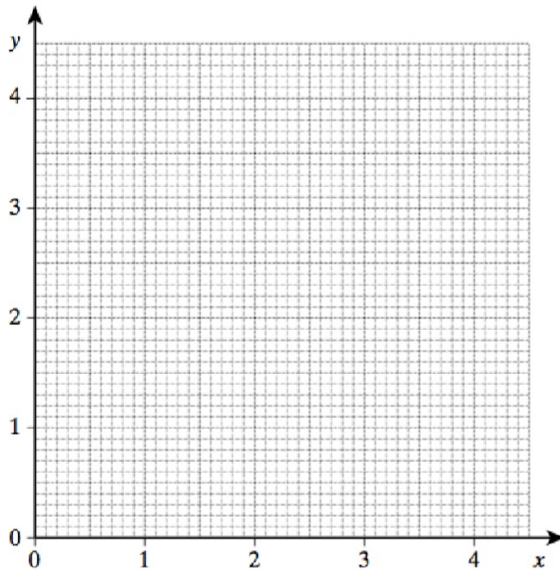
A is the point $(-4, 1)$

B is the point $(6, 6)$

Find the gradient of AB.



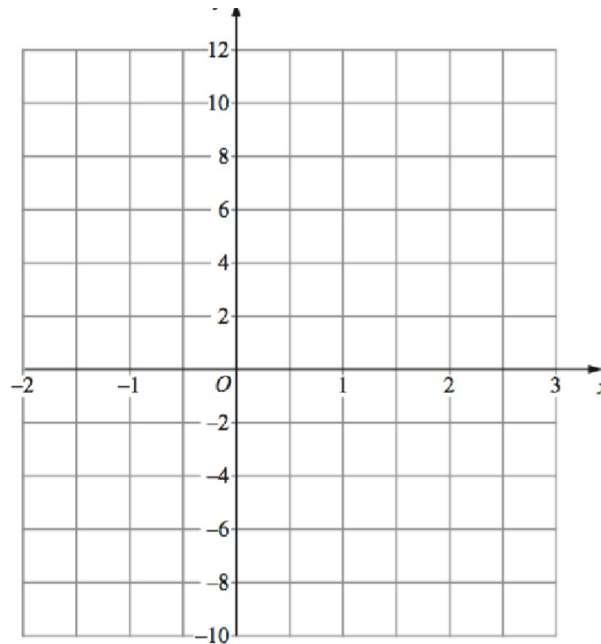
Fluency



(a) Complete the table of values for $y = 2x + 4$.

x	-1	0	1	2	3
y		4			10

(b) On the grid, draw the graph of $y = 2x + 4$ for values of x from -1 to 3 .

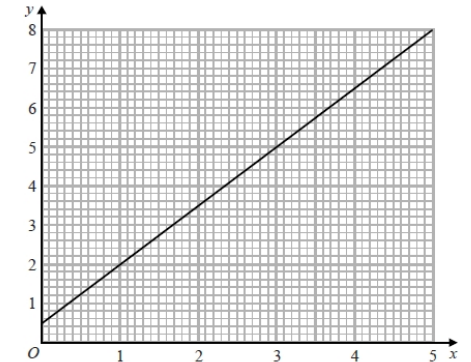


(a) On the grid, draw the graph of $x = 3$.

(b) On the grid, draw the graph of $y = 1$.

(c) Write down the coordinates of where the two lines met.

Reasoning



Phone calls cost $\pounds y$ for x minutes.

The graph gives the values of $\pounds y$ between 0 and 5 minutes.

Give an interpretation of the y intercept.

Give an interpretation of the gradient.

Pi Unit 9: Quadratic Graphs

Prior Knowledge

Multiply negative numbers.

Plot coordinates.

Substitute numbers into quadratic expressions.

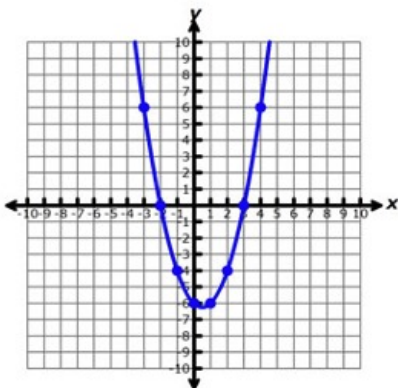
Substitute negative numbers into quadratic expressions.

Understand lines of symmetry.

Plotting a Quadratic Graph

Plot the graph of the function $x^2 - 1x - 6$

x	y
-3	6
-2	0
-1	-4
0	-6
1	-6
2	-4
3	0
4	6



Quadratic Graph Hints

- A negative squared is positive.
- The graph should be curved, not point to point straight lines.
- The graph should be symmetrical.
- No flat section at the bottom.

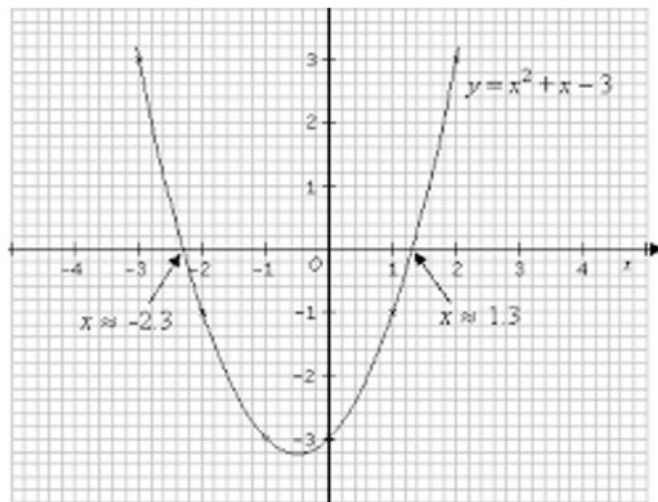
Solutions from Quadratic Graphs

When given a graph of a quadratic function, the roots, also known as the solutions, can be estimated by finding where the function crosses the x-axis.

Example

Given the graph of the function $y = x^2 + x - 3$ find the solutions.

So the roots are $x = -2.3$ or $x = 1.3$.



Literacy

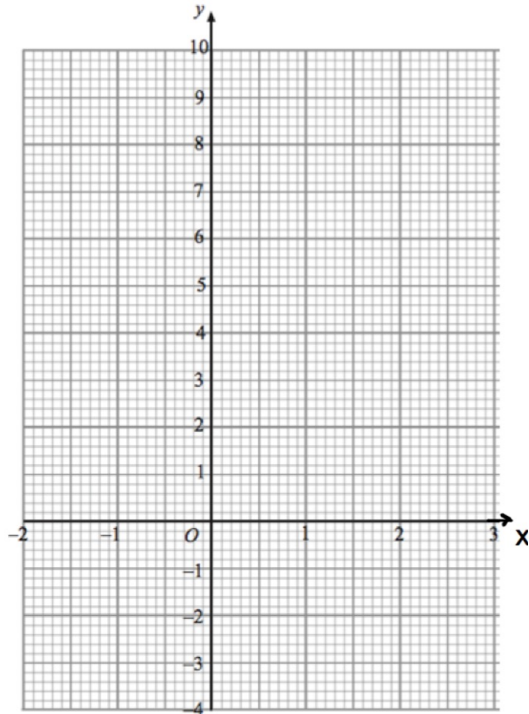
Explain the difference between a linear and a quadratic graph.

Fluency

Complete the table of values for $y = x^2 - 1$.

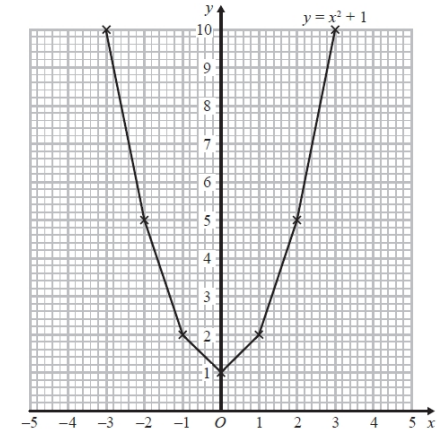
x	-2	-1	0	1	2	3
y	3		-1		3	

Draw the graph for $y = x^2 - 1$ on the graph below.



Reasoning

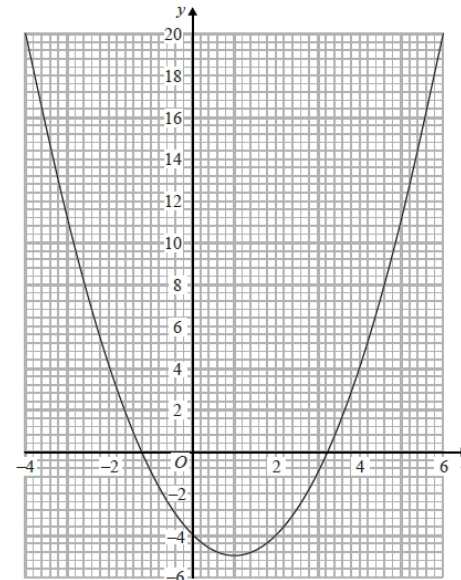
State one thing wrong with the quadratic graph.



Problem Solving

Here is the graph of $y = x^2 - 2x - 4$

(a) Write down estimates for the roots of $x^2 - 2x - 4 = 0$



Pi Unit 10: Real life graphs

Prior Knowledge

Plot and identify coordinates.

Find mid-point of a line segment.

Draw and label axes.

Draw and interpret distance-time graphs.

Substitute into a formula.

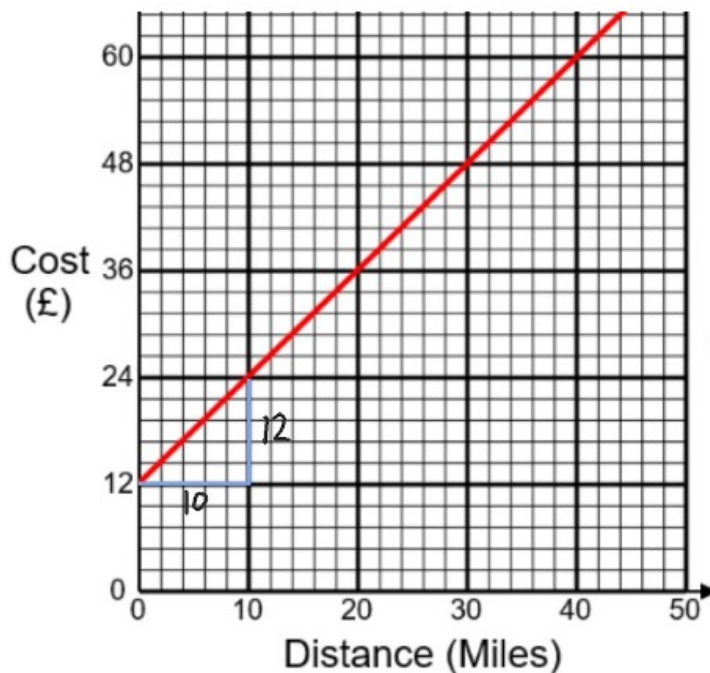
Complete a table of values.

Find the gradient of a line.

Use a conversion graph.

Interpreting a Real Life Graph

The graph shows the amount that a taxi company charges for a journey.



The gradient is the rate of change so in this case $\frac{\text{cost}}{\text{distance}} = \frac{12}{10} = 1.2$.

In this context it means £1.20 per mile. So the company charges £1.20 per mile.

There is also a fixed charge, also the intercept, which is £12.

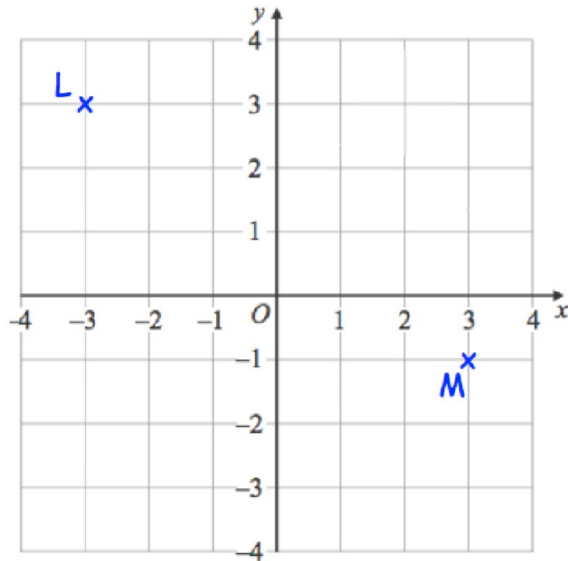
The formula would be $\text{Cost} = \text{£}12 + 1.2 \times \text{number of miles}$.

Literacy

Write the definition of gradient.

Define the word intercept.

Problem Solving

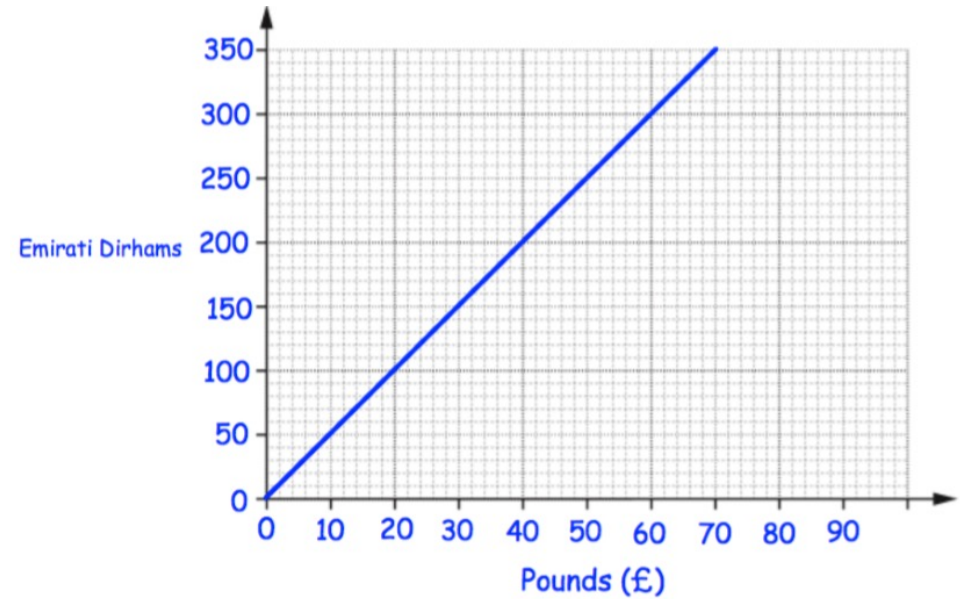


Write down the coordinates of L.

Write down the coordinates of M.

Find the coordinates of the midpoint of LM.

Fluency Reasoning



(a) Convert £50 into Dirhams.

.....Dirhams
(1)

(b) Convert 175 Dirhams into Pounds (£).

£.....
(1)

Tom wants to buy a camera.
In London the camera costs £380.
In Abu Dhabi the camera costs 2000 Dirhams.

In which city is the camera cheaper and by how much?
Give your answer in pounds.

Pi Unit 11: Inequalities

Prior Knowledge

Integer means whole number.

Use a number line.

Use inequality notation:

- < means less than
- ≤ means less than or equal to
- > Means more than
- ≥ means more than or equal to

Put inequality symbols between numbers, to show which is bigger.

Understanding an Inequality

E.G.
Give the integers which satisfy the inequality:

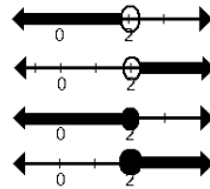
$$5 \leq x < 10$$

This means all the numbers less than 10, but bigger than and including 5.

5,6,7,8,9

Representing Inequalities on a Number Line

We can represent inequalities on a number line, hollow means not included, filled in means included.



$$x < 2, \text{ } x \text{ is less than } 2$$

$$x > 2 \text{ } x \text{ is greater than } 2$$

$$x \leq 2 \text{ } x \text{ is less than or equal to } 2$$

$$x \geq 2 \text{ } x \text{ is greater than or equal to } 2$$

Solving Inequalities

To solve inequalities use the balancing method. This is the same as when solving linear equations.

E.G. Solve $5x - 24 > 11$

$$\begin{aligned} 5x - 24 &> 11 \\ +24 & \quad +24 \\ 5x &> 35 \\ \div 7 & \quad \div 7 \\ x &> 7 \\ x &= 8, 9, 10, 11, 12, \dots \end{aligned}$$

Solving inequalities gives a range of answers, rather than an individual solution.

Error intervals

Find maximum and minimum values given a rounded value.

E.G.
A number was rounded to 4000, to the nearest 1000.

It could have been 3780 or 4320, there are lots of possibilities.

We can use inequalities to say it was any number between 3500 (anything below would be rounded down to 3000) And 4500 (anything above this would be rounded up to 5000)

So we write:

$$3500 \leq x < 4500$$

LITERACY

Explain these mathematic symbols

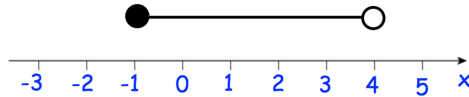
$<$
 \leq
 $>$
 \geq

REASONING

Brian is asked to list the integers satisfying the diagram

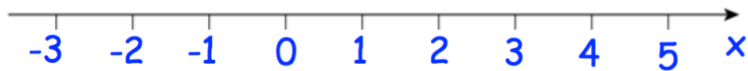
She writes 0, 1, 2, 3

Is he correct? Give reasons for your answer



FLUENCY

Represent the inequality $x > 2$ on this number line.



Solve the inequality $3x - 8 > 16$

PROBLEM SOLVING

Lee is y years old.

Toby is 8 years younger than Lee.

The sum of their ages is less than 41.

(a) Write down in terms of y , an inequality to show this information.

.....

Pi Unit 12: Sequences

Prior Knowledge

Substitute into linear expressions.

Spot the pattern in a sequence.

Continue a sequence made of numbers or pictures.

Find the term-to-term rule for sequence.

Generate sequences from an n^{th} term.

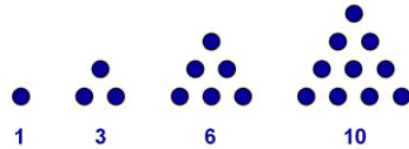
Find the n^{th} term of a sequence.

Substitute into a quadratic expression.

Key sequences

Here are some key sequences you need to recognise:

Triangle numbers (add one more row each time)



Fibonacci Sequence are generated by adding the previous two terms together.

E.G.

1, 1, 1 + 1, 2 + 1, 3 + 2, 5 + 3

Here are the first 6 terms:

1, 1, 2, 3, 5, 8

Geometric sequences

Geometric sequences are generated, by multiplying to get the next term.

E.G.

2, 4, 8, 16 is geometric as you multiply by 2.

More examples

- 3, 6, 12, 24
- 1, 3, 9, 27
- 0.5, 1, 2, 4,

Nth Term

The nth term is the rule that tells us how to find any term in the sequence.

E.G.

Find the nth term of the sequence 3, 7, 11, 15, 19, ...

$$3, 7, 11, 15, 19, \dots$$

$$\begin{array}{ccccccc} & \xrightarrow{+4} & \xrightarrow{+4} & \xrightarrow{+4} & \xrightarrow{+4} & & \\ & & & & & & \end{array}$$

$$4n$$

$4n$ means 4 times table.

	$4, 8, 12, 16, \dots$	New sequence	
-1	\downarrow	$3, 7, 11, 15, \dots$	Original sequence
			\downarrow
			$4n - 1$

Generating a Sequence

You generate a linear sequence from by substituting into the nth term.

$n = 1$ gets you the first term, $n = 2$ gets you the second term. Etc.

E.G.

Generate the sequence $2n + 4$.

	$n = 1$	$n = 2$	$n = 3$	$n = 4$
Sequence:	6	8	10	12

This also works for a quadratic sequence.

Literacy

Explain what a geometric sequence is?

What does the term 'generate' mean?

Reasoning

A sequence of numbers is shown below.

1 5 9 13 17

- (a) Find an expression for the n th term of the sequence.
(b) Explain why 95 will not be a term in this sequence.

Fluency

Find the n th term of these sequences:

- a) 6, 11, 16, 21
b) 7, 12, 17, 22
c) 4, 6, 8, 10
d) 4, 8, 12, 16
e) 5, 9, 13, 17
f) 10, 7, 4, 1

Generate the first 5 terms of these sequences

- a) $6n + 1$
b) $4n - 6$

Problem Solving

Here are the n th terms of 4 sequences.

Sequence 1	n th term	$3n + 1$
Sequence 2	n th term	$5n + 10$
Sequence 3	n th term	$10n$
Sequence 4	n th term	$5n - 1$

For each sequence state whether the numbers in the sequence are

- A Always multiples of 5
S Sometimes multiples of 5
N Never multiples of 5

Sequence 1

Sequence 2

Sequence 3

Sequence 4

Pi Unit 13: Perimeter and Area

Prior Knowledge

Use suitable measurements.

Read and place markers on a scale.

Convert between metric units of measurement.

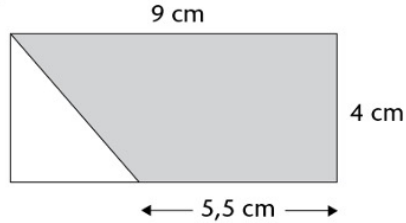
Conversions with time.

Area and perimeter of 2D shapes, including: rectangles, triangles, parallelograms and trapeziums.

Find areas and perimeters of compound shapes.

Calculating the Percentage of a Shaded Shape

E.G.
Calculate the percentage of the rectangle shaded in.



Step 1: Calculate the area of the total shape.

$$\text{Area of rectangle} = 9 \times 4 = 36\text{cm}^2$$

Step 2: Calculate the area of the shaded section.

$$\text{Area of shaded (trapezium)} = \frac{9+5.5}{2} \times 4 = 29\text{cm}^2$$

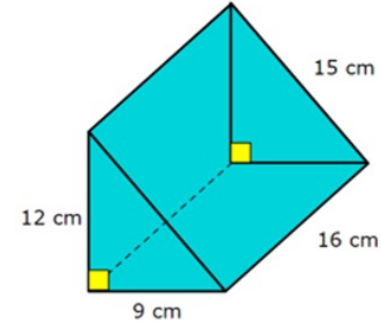
Step 3: Calculate the percentage.

$$\text{Percentage shaded} = \frac{29}{36} \times 100 = 81\%$$

Surface Area of Prisms:

The total area of all faces on a 3D solid.

E.G.



$$\text{Front Face} = \frac{12 \times 9}{2} = 54\text{cm}^2$$

$$\text{Back Face} = \frac{12 \times 9}{2} = 54\text{cm}^2$$

$$\text{Bottom Face} = 9 \times 16 = 144\text{cm}^2$$

$$\text{Left Face} = 16 \times 12 = 192\text{cm}^2$$

$$\text{Right Face} = 16 \times 15 = 240\text{cm}^2$$

$$\text{Total surface area} = 684\text{cm}^2.$$

Units of Measure for Area Scaled

$$1\text{cm}^2 = (10 \times 10)\text{mm}^2 = 100\text{mm}^2$$

$$1\text{m}^2 = (100 \times 100)\text{cm}^2 = 10000\text{cm}^2$$

E.G.

$$5.6\text{cm}^2 = 560\text{mm}^2$$

$$3400000\text{cm}^2 = 340\text{m}^2$$

Literacy

Explain the meaning of “perimeter”.

Use the word “area” within a sentence.

Reasoning

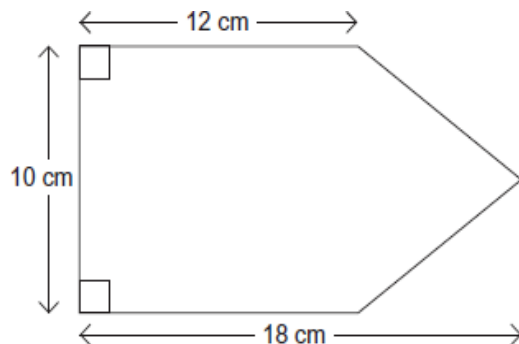
John says $5\text{cm}^2 = 25\text{mm}^2$. Is he right?

Explain your answer

Fluency

- 1) Change 9.7 m into cm
- 2) Change 3.5km into m
- 3) Change 48 mm into cm
- 4) Change 435cm into m

5) Find the area of this shapes:



Problem Solving

Field A is a rectangle with sides of 30m and 70m

Field B is a square with the same **perimeter** as Field A.

How much bigger in area is Field B than Field A?



Pi Unit 14: 3D Shapes

Prior Knowledge

Identify basic 3D shapes.

Find the volume of a cuboid.

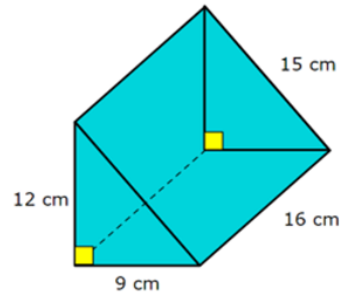
Recognise the nets of shapes.

Accurately draw the net of 3D shape.

Know metric units of measurement.

Volume of Prisms

The volume of a prism is area of cross section multiplied by the depth.



Step 1:

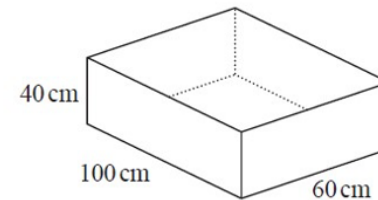
$$\text{Area of cross section} = \text{area of triangle} = \frac{12 \times 9}{2} = \frac{108}{2} = 54 \text{ cm}^2$$

Step 2:

$$\text{Cross section} \times \text{depth} = 54 \times 16 = 864 \text{ cm}^3$$

Volume Reasoning Question

The diagram shows a sand pit. The sand pit is in the shape of a cuboid. Sally wants to fill the sand pit with sand. A bag of sand costs £2.50 There are 8 litres of sand in each bag.



Sally says, "The sand will cost less than £70". Show that Sally is wrong.

Step 1: Calculate the volume = $100 \times 40 \times 60 = 240000 \text{ cm}^3$.

Step 2: Convert to ml cubed = $240000 \text{ cm}^3 = 240000 \text{ ml}^3$.

Step 3: Convert ml to litres = $240000 \div 1000 = 240 \text{ litres}$.

Step 4: Calculate the number of bags = $240 \text{ litres} \div 8 = 30 \text{ bags}$.

Step 5: Calculate the cost $30 \times 2.50 = £75$.

In conclusion, Sally is wrong.

Units of Measure for Volume Scaled

$$1 \text{ cm}^3 = (10 \times 10 \times 10) \text{ mm}^3 = 1000 \text{ mm}^3$$

$$1 \text{ m}^3 = (100 \times 100 \times 100) \text{ cm}^3 = 1000000 \text{ cm}^3$$

E.G.

$$5.6 \text{ cm}^3 = 5600 \text{ mm}^3$$

$$34000000 \text{ cm}^3 = 34 \text{ m}^3$$

Literacy

Write the definition of “volume”.

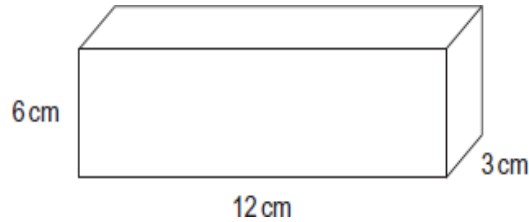
Explain what a “prism” is.

Reasoning

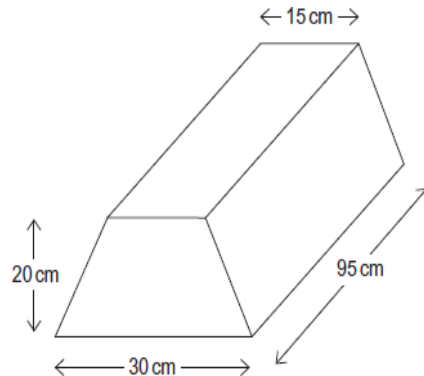
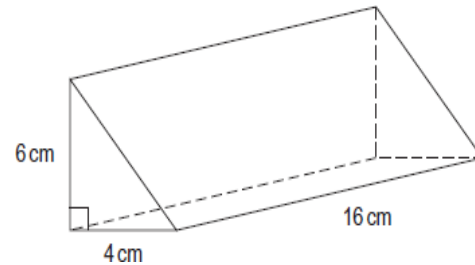
The area of one face of a cube is 64mm^2 . What is the volume of the cube? Explain your answer.

Thomas thinks that $25\text{cm}^3 = 250\text{mm}^3$.
Is Thomas correct? Explain your answer.

Fluency



Find the volume of each shape.



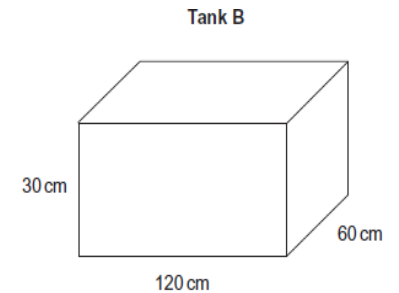
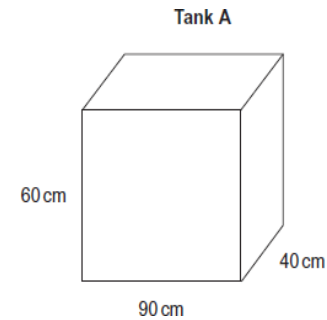
Problem Solving

Two empty water tanks, A and B, are in the shape of cuboids as shown.

Each tank has water added at the same constant rate.

(a) Show that it takes the same time to fill each tank to the top. You must show your working.

(b) In which tank does the depth of water increase faster? Give a reason for your answer.



Pi Unit 15: Pythagoras and Trigonometry

Prior Knowledge

Square numbers
E.G.
 $3^2 = 9, 7^2 = 49$

Understand what square root means.
E.G.

$$\sqrt{49} = 7,$$

$$\sqrt{57} = 7.54 \dots$$

Use a calculator for square and square root.

Use BIDMAS for correct order of operations.

Recognise right-angled triangles.

Pythagoras' Theorem

Pythagoras' theorem states works for all right-angled triangles and states: $a^2 + b^2 = c^2$.

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

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

$$3^2 + 4^2 = c^2$$

$$2^2 + b^2 = 12^2$$

$$25 = c^2$$

$$4 + b^2 = 144$$

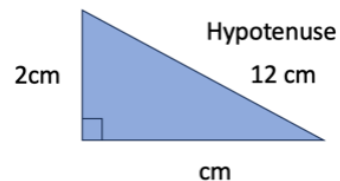
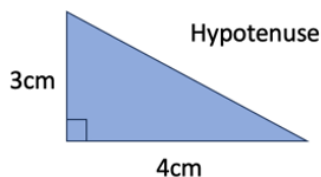
$$\sqrt{25} = c$$

$$b^2 = 140$$

$$5 = c$$

$$b = \sqrt{140}$$

$$b = 11.83$$



Trigonometry

$$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

$$\tan(x) = \frac{4}{6}$$

$$x = \tan^{-1}\left(\frac{4}{6}\right)$$

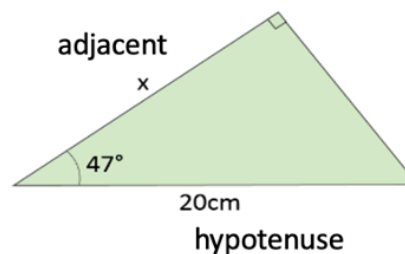
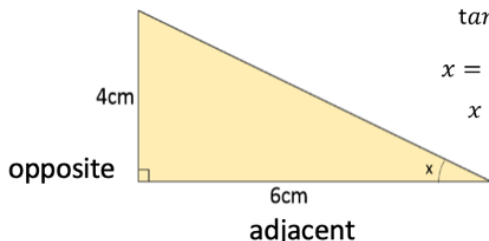
$$x = 33.7^\circ$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\cos(47) = \frac{x}{20}$$

$$20 \times \cos(47) = x$$

$$13.64\text{cm} = x$$



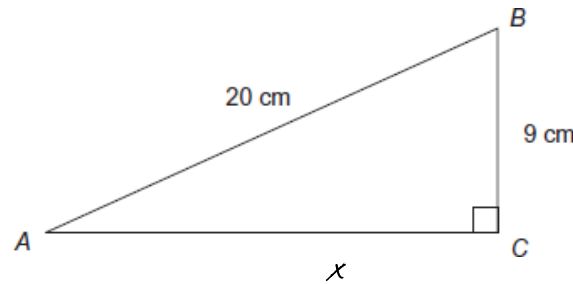
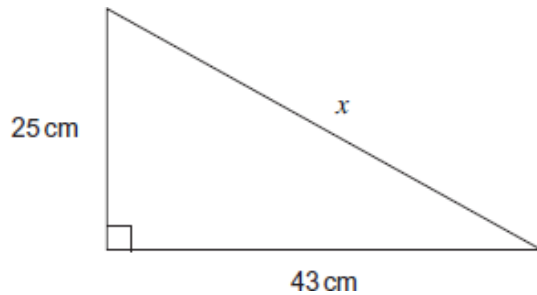
Literacy

Write TWO sentences (for two different ways) to describe the “hypotenuse” of a right-angled triangle.

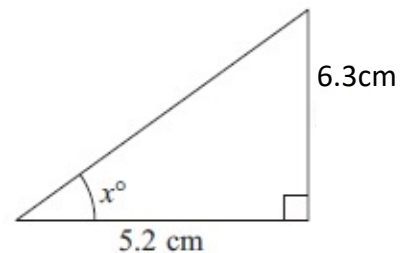
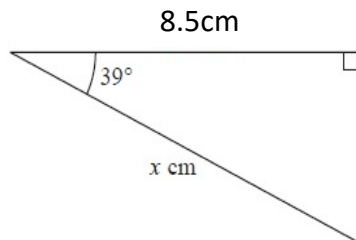
Reasoning

Rebecca says that the three sides of a right-angled triangle are 5.5cm, 7.5cm and 9.5cm.
Is Rebecca correct? Explain your answer.

Fluency

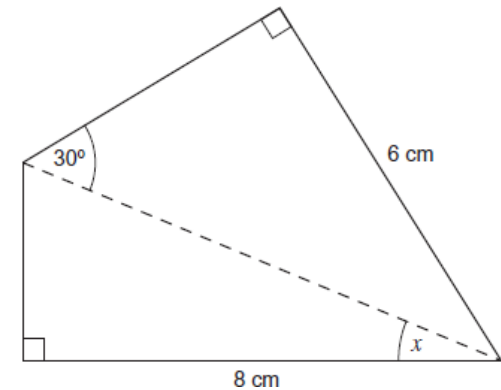


For each triangle, find the value of x to 1 decimal place



Problem Solving

The diagram shows a quadrilateral.



Work out the size of angle x .