

# Calculating with Percentages

Businesses use percentage change to compare profits in different years.  
When you save or borrow money the interest is calculated using repeated percentage changes.



By the end of this topic you will have learned to:

- Solve problems involving percentage change, including:
- percentage increase / decrease problems
- original value problems
- simple interest, including in financial mathematics



## WORDS

Percentage,  
percentage change,  
original value,  
increase, decrease,  
multiplier,  
difference, parts  
per one hundred,  
simple interest,  
compound interest,  
per annum, account

Mastery  
Indicators

Pre-test  
Progress check  
Topic test

## Pre-test Calculating with Percentages

Gabriel's salary is £24500.

Next year he is due to get a 9% increase.

What will his new salary be?

The height of a tree increases by 60% each year.

When planted the tree was 40cm tall.

How tall will the tree be in 5 years time.

Evie is given a 22% pay rise.

Her new salary is £21960

What was Evie's salary before the pay rise?

A shop sells holidays.

The table shows the number of holidays sold each month from August to December.

Aug	Sept	Oct	Nov	Dec
28	40	54	80	111

Between which two consecutive months was the greatest percentage increase in the number of holidays sold.

# Measures

Being able to rely on accurate decimal measurements is vital in athletics. In a 'photo-finish' with two competitors crossing the finishing line apparently together, 0.01 seconds can be the difference between gold and silver!



By the end of this topic you will have learned to:

- Apply and interpret limits of accuracy including upper and lower bounds
- Use standard units of measure and related concepts (length, area, volume / capacity, mass, time, money etc)
- Use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate
- Change freely between related standard units (e.g. time, length, area, volume / capacity, mass) and compound units (e.g. speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts
- Use compound units such as speed, rates of pay, unit pricing, density and pressure



## WORDS

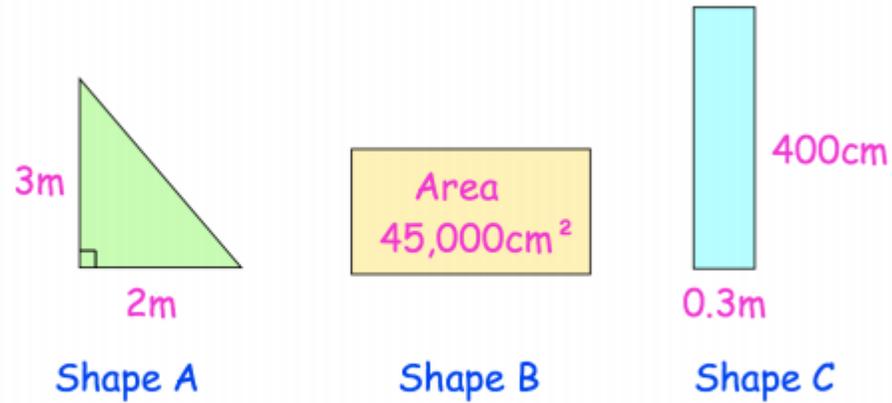
Bounds, length, capacity, mass, area, volume, currency, time, speed, distance, density, pressure

Mastery Indicators

Pre-test  
Progress check  
Topic test

## Pre-test Measures

Shown below are three shapes (not drawn accurately).



Grace and George complete a crossword.

It takes Grace 9 minutes to complete the crossword to the nearest minute.

It takes George 11 minutes to complete the crossword to the nearest minute.

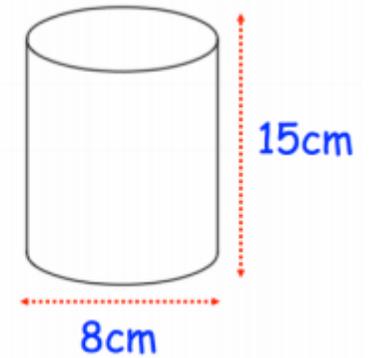
Show that the total time for both people to complete the crossword could be 20 minutes 50 seconds.

List the shapes in order of area, from smallest to greatest.

A cube has a volume of  $0.008\text{m}^3$   
Work out the surface area of the cube.  
Give your answer in  $\text{cm}^2$

Shown is a solid cylinder made from carbon.  
The density of carbon is  $1.95\text{g/cm}^3$

Find the mass of the cylinder.



# Surds

Surds are only really used when you are doing mathematical calculations that require exact answers. For all practical purposes surds are approximated. You cannot tell a builder to cut a length that is  $\sqrt{2}$  because it is an irrational number.

By the end of this topic you will have learned to:

- Calculate exactly with surds
- Simplify surd expressions involving squares and rationalise denominators
- Recognise and use simple geometric progressions ( $r^n$  where  $n$  is an integer and  $r$  is a surd)



## WORDS

Surds, square root, simplify, multiply, divide, rationalise, denominator, geometric progression, common ratio

Mastery Indicators

Pre-test  
Progress check  
Topic test

## Pre-test Surds

Work out the following additions/subtractions

$$\sqrt{50} + \sqrt{8}$$

$$\sqrt{200} - \sqrt{32}$$

Find the next three terms in the geometric sequence:

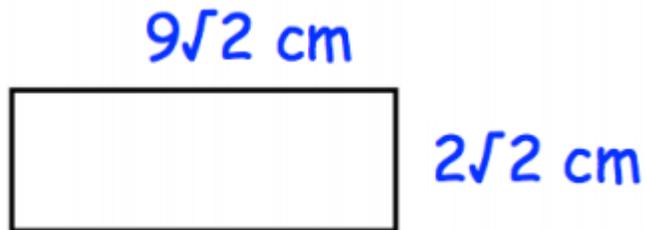
$$3, 3\sqrt{3}, 9, 9\sqrt{3}, 27, \dots$$

Rationalise the denominators for each of the following

$$\frac{9}{\sqrt{6}}$$

$$\frac{4}{1 + \sqrt{5}}$$

Find the area



# Statistical Measures

Understanding the relationship between quantities helps us to make informed decisions on a global scale. Literacy problems will not be resolved effectively unless poverty is also tackled.



**By the end of this topic you will have learned to:**

- Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through:
- appropriate measures of central tendency (median, mean, mode and modal class)
- spread (range, including consideration of outliers, quartiles and inter-quartile range)
- Apply statistics to describe a population
- Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling



## WORDS

Primary data,  
secondary data,  
discrete data,  
continuous data,  
mean, mode,  
median, range,  
upper quartile,  
lower quartile,  
inter-quartile  
range, maximum,  
minimum, sampling

Mastery  
Indicators

Pre-test  
Progress check  
Topic test

## Pre-test Statistical Measures

Age	Frequency
16	28
17	7
18	3
19	2

Work out the mean from this frequency table

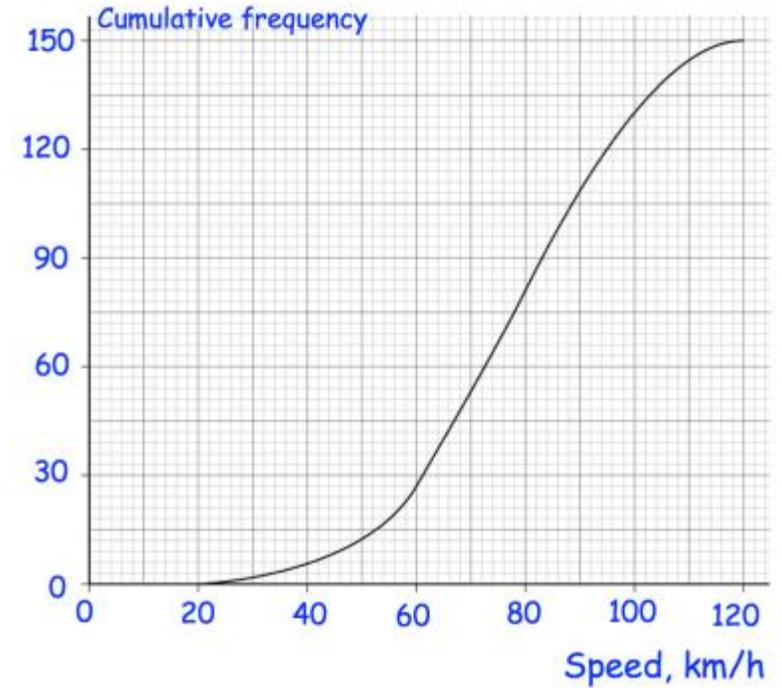
Sally is raising money for charity for a fun run.

The table below has been given to her from the website.

Sally says the average donation is £10.

By calculating the estimated mean, decide if you agree with Sally.

Donation	Frequency
$0 < d \leq 5$	44
$5 < d \leq 10$	35
$10 < d \leq 20$	16
$20 < d \leq 50$	3
$50 < d \leq 100$	2



The graph shows information about the speed of cars on a road.

- How many cars travelled under 50km/h?
- How many cars travelled over 110km/h?
- 42 cars were exceeding the speed limit. What is the speed limit?
- Mr Rodgers says 18% of the cars were travelling too slowly on this road. Below what speed does he feel is too slow?

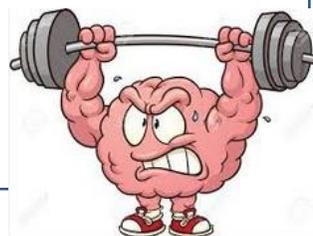
# Indices

Mathematics needs to be able to describe very small quantities, such as lengths measured in nanometres (0.000000001 m). Without this ability, researchers could not analyse microscopic organisms like viruses.



By the end of this topic you will have learned to:

- Use positive integer powers and associated real roots (square, cube and higher)
- Recognise powers of 2, 3, 4, 5
- Estimate powers and roots of any given positive number
- Calculate with roots, and with integer and fractional indices



## WORDS

Index, base, fractional, negative, multiply, divide, combine, square root, cube root, square number, cube number, powers, integer, evaluate

Mastery Indicators

Pre-test  
Progress check  
Topic test

## Pre-test Indices

Place each of the digits in the correct position to make the correct calculation.

1 2 4 8 9

$$\sqrt{\square\square\square} = \square\square$$

Work out each of the following

You may not use a calculator

- (a)  $2^3$       (b)  $1^3$       (c)  $5^3$       (d)  $6^3$

Estimate each of the following.

Give each answer to 1 decimal place.

- (a)  $\sqrt{30}$       (b)  $\sqrt{10}$       (c)  $\sqrt{19}$

Evaluate each of the following

$$64^{\frac{2}{3}}$$

$$2^{-5}$$

$$(8^{-5})^2$$

# Properties of Polygons

An understanding of angles and shapes allows us to create beautiful things.

Spanners are designed to fit hexagonal nuts and bolts.



**By the end of this topic you will have learned to:**

- Derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons)
- Derive and apply the properties and definitions of :
- special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus and triangles and other plane figures using appropriate language



## KEY WORDS

Angle, polygon, quadrilateral, triangle, interior, exterior, sum, isosceles, regular.

Mastery Indicators

Pre-test  
Progress check  
Topic test

## Pre-test Properties of Polygons

Work out the sum of the interior angles for polygons with

- (a) 10 sides            (b) 14 sides

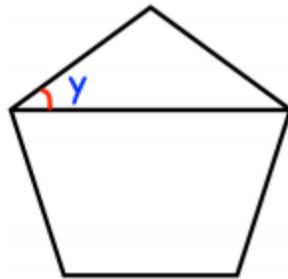
Work out the number of sides of polygons with these sum of interior angles

- (c)  $3960^\circ$             (d)  $5040^\circ$

Calculate the size of each exterior angle in regular polygons with

- (e) 30 sides            (f) 36 sides

Shown is a regular pentagon.  
Find  $y$ .



# Number Recap and Review

Nurses and other medical support staff work with fractions, decimals, percentages, rates and ratios every day. They calculate medicine doses, convert between different systems of measurement and set the patients' drips to supply the correct amount of fluid per hour.



**By the end of this topic you will have learned to:**

- Change recurring decimals into their corresponding fractions and vice versa
- Apply and interpret limits of accuracy including upper and lower bounds
- Deduce expressions to calculate the  $n$ th term of linear and quadratic sequences
- Recognise and use simple geometric progressions ( $r^n$  where  $n$  is an integer and  $r$  is a surd)
- Calculate exactly with surds
- Simplify surd expressions involving squares and rationalise denominators
- Calculate with roots and with integer and fractional indices



## KEY WORDS

Recurring,  
decimals,  
fractions,  
accuracy, bounds,  
upper limit, lower  
limit, linear,  
quadratic,  
geometric,  
integer, surd,  
square root,  
indices.

Mastery  
Indicators

Pre-test  
Progress check  
Topic test

## Pre-test Number recap and review

Convert the following recurring decimals to fractions.  
Give each answer in its simplest form.

$$0.\dot{8}$$

$$0.\dot{1}1\dot{2}$$

Find the  $n^{\text{th}}$  term for each of the following sequences

$$13, 22, 31, 40, \dots$$

$$7, 12, 19, 28, 39, \dots$$

The 1st term of a geometric progression is 2 and the common ratio is 4.

- Write down the first four terms of the progression.
- What is the 7th term of the progression?

# Congruence and Similarity

Car manufacturers produce car parts which are congruent so that they fit into all cars in the production line.



**By the end of this topic you will have learned to:**

- Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides including the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs
- Apply and use the concepts of congruence and similarity, including the relationships between lengths, areas and volumes in similar figures



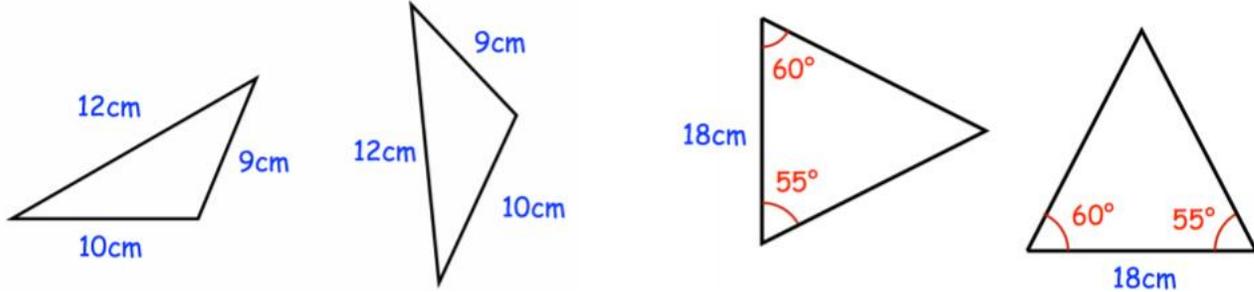
**WORDS**

Mastery  
Indicators

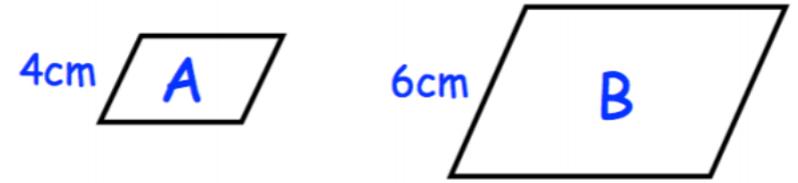
Pre-test  
Progress check  
Topic test

# Pre-test Congruence and Similarity

The following pairs of triangles are congruent, state the condition that shows they are congruent.



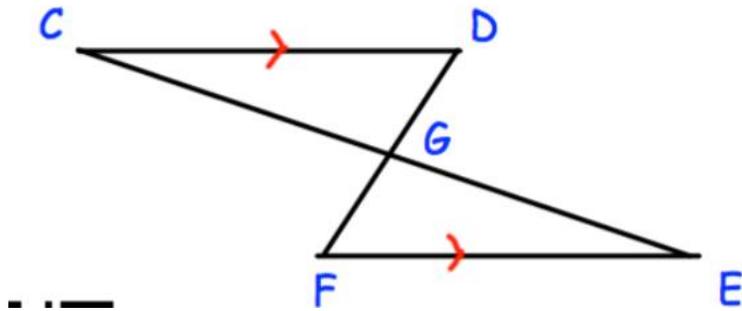
Below are two similar parallelograms.



The area of parallelogram A is  $28\text{cm}^2$

Work out the area of parallelogram B.

In the diagram, the lines CE and DF intersect at G. CD and FE are parallel and  $CD = FE$ . Prove that triangles CDG and EFG are congruent.



Explain why the area of a rectangle increases by a factor of 4 when the side length is doubled.

# Pythagoras Theorem and Basic Trigonometry

Trigonometry means 'triangle measurements' and it is very useful for finding lengths of sides and size of angles. Trigonometry is used to determine lengths and angles in navigation, surveying, astronomy, engineering, construction and even in the placement of satellites and satellite receivers.



## By the end of this topic you will have learned to:

- Know the formula for Pythagoras' Theorem ' $a^2+b^2=c^2$ '
- Apply it to find angles and lengths in right angled triangles and, where possible, general triangles in two and three dimensional figures
- Know and use the trigonometric ratios
- Know the exact values of Sin and Cos (0, 30, 45, 60 and 90)
- Know the exact values of Tan (0, 30, 45 and 60)
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides including Pythagoras' Theorem and use known results to obtain simple proofs
- Compare lengths using ratio notation; make links to trigonometric ratios



## WORDS

Pythagoras, Right Angled Triangle, Sine, Cosine, Tangent, Opposite, Adjacent, Hypotenuse, square, square root, formulae, exact, degrees, length

Mastery Indicators

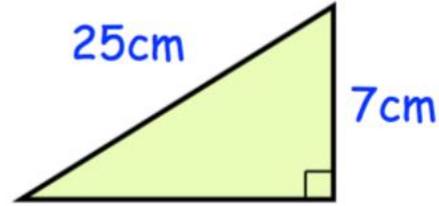
Pre-test  
Progress check  
Topic test

# Pre-test Pythagoras and Trigonometry

Shown is a right angle triangle.

Calculate:

- (a) the perimeter of the triangle.
- (b) the area of the triangle.



Using the triangle below, explain each of the following.



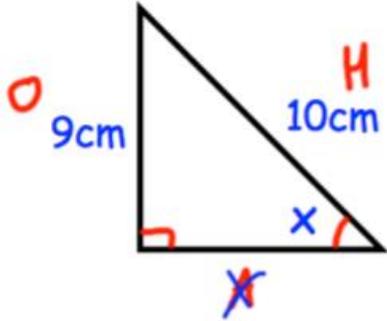
Can you spot any mistakes in the question below?

(a)  $\sin(30^\circ) = \frac{1}{2}$

(b)  $\cos(30^\circ) = \frac{\sqrt{3}}{2}$

(c)  $\tan(30^\circ) = \frac{\sqrt{3}}{3}$

Find the size of the angle x.



$\sin x = \frac{9}{10}$   
 $\sin x = 0.9$   
 $x = \sin^{-1} 0.9$   
 $x = 0.016^\circ$

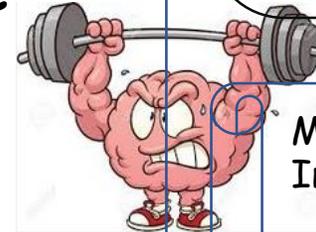
# Simultaneous Equations

Accounting involves a great deal of mathematics. Accountants set up computer spreadsheets to calculate and analyse data. Programs such as Microsoft Excel work by applying different equations to values in columns or cells, so you need to know what equations of formulae to use to get the results you need.



By the end of this topic you will have learned to:

- **Solve two simultaneous equations in two variables (linear / linear or linear/quadratic) algebraically**
- **Find approximate solutions using a graph**
- **Translate simple situations or procedures into algebraic expressions or formulae**
- **Derive two simultaneous equations**
- **Solve the equations and interpret the solution**



## WORDS

Simultaneous Equations, Solve, Eliminate, Scaling up, Variables, Addition, Subtraction, Quadratic, Graphs, Bisect, Derive

Mastery Indicators

Pre-test  
Progress check  
Topic test

# Pre-test Simultaneous Equations

Solve the following simultaneous equations

$$6x + 3y = 48$$

$$6x + y = 26$$

$$6x + 3y = 45$$

$$2x - 2y = 12$$

Four chairs and two tables cost £218.

Six chairs and seven tables cost £587.

Find the total cost of buying twenty chairs and five tables.

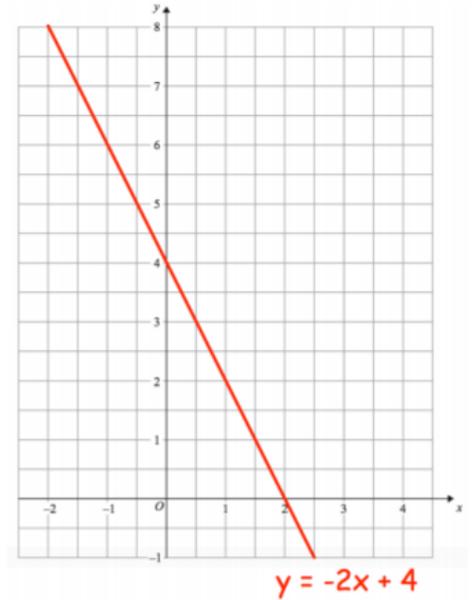
The straight line  $y + 2x = 4$  has been drawn on the grid.

(a) On the same grid, draw the graph of  $y = x + 1$

(b) Use the graphs to solve the simultaneous equations

$$y + 2x = 4$$

$$y = x + 1.$$

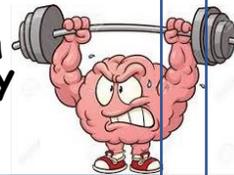


# Probability

Data is collected by many professionals and used to find the probability of particular things happening. For example, in a fertility clinic data collected over a period of many years can be used to draw a graph that shows the probability that a woman of a certain age will be successful at falling pregnant.

By the end of this topic you will have learned to:

- **Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes or multiple future experiments**
- **Relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale**
- **Understand that empirical unbiased samples tend towards theoretical probability distributions with increasing sample size**
- **Enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams**
- **Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions**
- **Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams**



## KEY WORDS

Probability, Chance, Equal, Certain, Impossible, Likely, Unlikely, Fraction, Decimal, Percentage, Theoretical, Independent, Dependent, Bias, Relative Frequency, Experimental, Venn Diagram, Tree Diagram, Sample

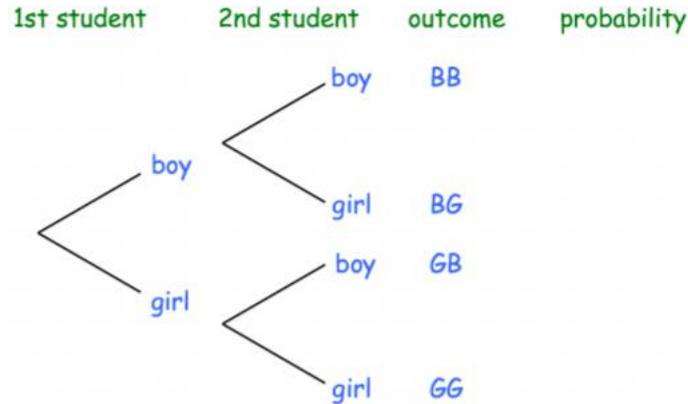
Mastery Indicators

Pre-test  
Progress check  
Topic test

# Pre-test Probability

13 of the 20 students in Mr Davidson's class are girls.  
Two students are chosen at random.

- (a) Copy and complete the tree diagram
- (b) Work out the probability of two boys being selected.
- (c) Work out the probability of two girls being selected.



A spinner lands of white, black, red or orange.  
The relative frequencies after 300 spins are shown in the table below.

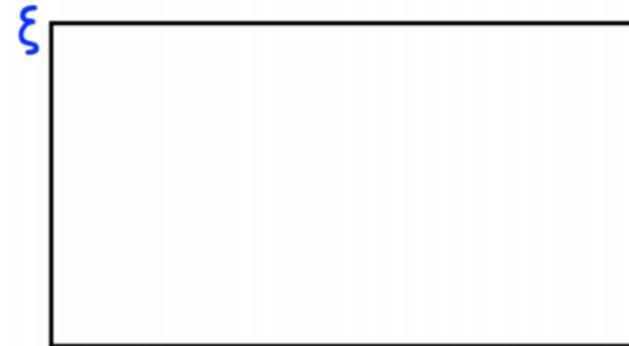
Colour	White	Black	Red	Orange
Relative Frequency	0.25	0.4	0.2	0.15

- (a) How many times did the spinner land on white?
- (b) How many times did the spinner land on red?
- (c) How many more times did the spinner land on black than orange?

A gym runs two fitness classes, spinning and circuits.

On Saturday 100 people visited the gym.  
18 people attended the spinning class.  
10 people attended both classes.  
56 people did not attend either class.

- (a) Represent this information on a Venn diagram



A person who attended the gym is selected at random.

Find the probability that this person

- (b) attended only circuits

.....  
(2)

- (c) attended exactly one class

.....  
(2)

- (d) attended spinning, given that they attended circuits

.....  
(2)

# Statistics Recap and Review

Understanding the relationship between quantities helps us to make informed decisions on a global scale. Literacy problems will not be resolved effectively unless poverty is also tackled.



By the end of this topic you will have learned to:

- **Construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use**
- **Interpret, analyse and compare distributions of data sets from univariate empirical distributions through appropriate graphical representation involving discrete, continuous and grouped data, including box plots**
- **interpret, analyse and compare the distributions of data sets from univariate empirical distributions through consideration of outliers, quartiles and inter-quartile range**
- **Draw estimated lines of best fit**
- **Make predictions**
- **Interpolate and extrapolate apparent trends whilst knowing the dangers of doing so**
- **Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling**



## WORDS

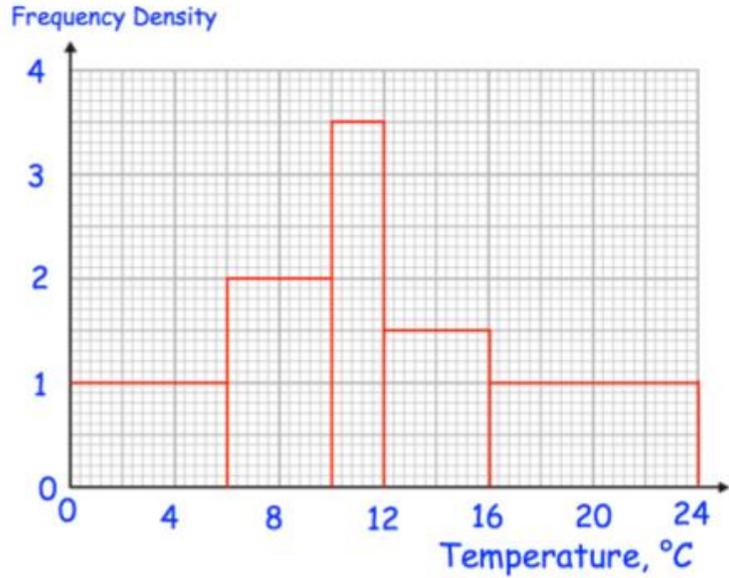
Statistics,  
Histograms,  
Cumulative  
Frequency  
Diagrams,  
Continuous,  
Discrete, Primary,  
Secondary, Box  
Plots, Compare,  
Upper Quartile,  
Lower Quartile,  
Inter-Quartile  
Range, Sampling,  
Populations

Mastery  
Indicators

Pre-test  
Progress check  
Topic test

# Pre-test Statistics Recap and Review

The histogram shows information about the temperatures in various locations.



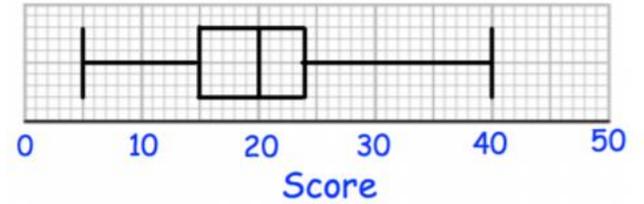
Complete the frequency table.

Temperature, °C	Frequency
$0 < t \leq 6$	
$6 < t \leq 10$	
$10 < t \leq 12$	
$12 < t \leq 16$	
$16 < t \leq 24$	

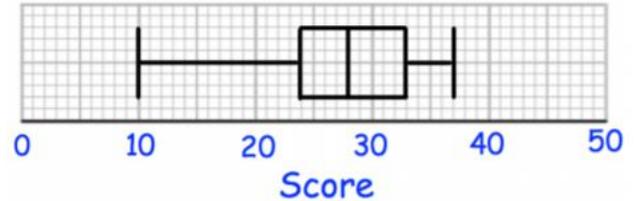
Compare the distributions of each pair of box plots below.

(a)

7A results



7B results



A call centre has 800 workers.  
The building has 20 floors.  
Each floor has 40 workers.

Describe a method that could be used to obtain a random sample of 120 workers from the call centre.

.....

.....

.....

## Algebra: introduction to quadratics and rearranging formulae

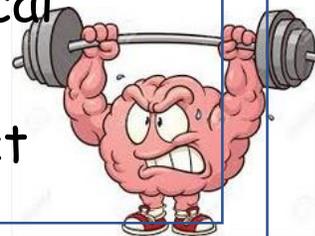
Algebra lets you describe and represent patterns using concise mathematical language.

This is useful in many different careers including accounting, navigation, building, plumbing, health, medicine, science and computing.



**By the end of this topic you will have learned to:**

- Simplify and manipulate algebraic expressions by:
  - expanding products of two binomials
  - factorising quadratic expressions of the form  $x^2 + bx + c$  including the difference of two squares
  - simplifying expressions involving sums, products and powers, including the laws of indices
- Understand and use standard mathematical formulae
- Rearrange formulae to change the subject



### WORDS

Quadratic,  
Coefficient,  
Expand, Sum,  
Product,  
Factorise, Square  
root, Base,  
Index, Power,  
Formulae,  
Rearrange,  
Balance, Subject

Mastery  
Indicators

Pre-test  
Progress check  
Topic test

## Pre-test Algebra: introduction to quadratics and rearranging formulae

Factorise each of the following

$$x^2 + 17x + 60$$

$$x^2 - 4x - 32$$

$$c^2 - 64$$

Expand and simplify

$$(a - 5)(a + 7)$$

$$(2a - 3)(4a + 7)$$

Make  $x$  the subject of the following formulae

$$\frac{x + 3}{c} = h$$

$$g = \frac{t}{x - 2}$$

# Volume

Freight costs are dependent upon the volume of material being transported. Freight rates are calculated using the container volume measured against the length of the container. The longer the container the higher the freight cost.



**By the end of this topic you will have learned to:**

- Compare lengths, areas and volumes using ratio notation
- Scale factors
- Make links to similarity
- Know and apply the formulae to calculate the volume of cuboids and other right prisms (including cylinders)
- Calculate the volume of spheres, pyramids, cones and composite solids
- Calculate exactly with multiples of `pi`



## WORDS

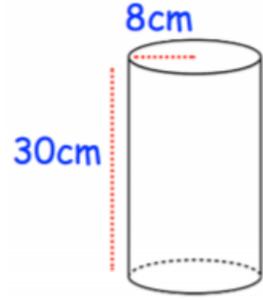
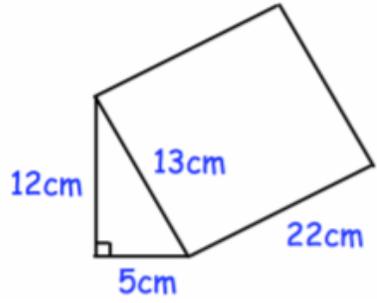
Volume, Units,  
Cubed, Depth,  
Width, Height,  
Cube, Cuboid,  
Prism, Cylinder,  
Sphere, Cone,  
Pyramid

Mastery  
Indicators

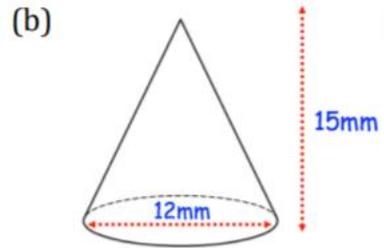
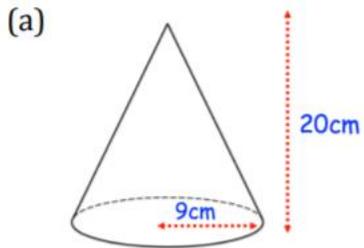
Pre-test  
Progress check  
Topic test

# Pre-test Volume

Calculate the volume of each prism below

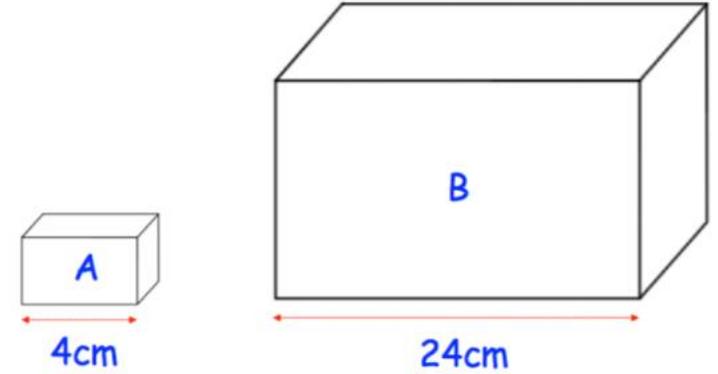


Work out the volumes of each of the following cones.  
Give each answer in terms of  $\pi$



$$\text{Volume} = \frac{1}{3} \pi r^2 h$$

Shown below are two mathematically similar cuboids.



The volume of cuboid B is  $1728\text{cm}^3$

Find the volume of cuboid A.

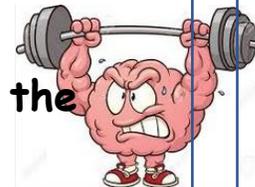
# Algebra recap and review

Without algebra, we would not be able to work with large mechanical forces - so there would be no skyscrapers or suspension bridges; we would also not be able to understand electronics, so there would be no tablets or mobile phones.



By the end of this topic you will have learned to:

- Use the form  $y=mx+c$  to identify parallel and perpendicular lines
- Find the equation of the line through two given points, or through one point with a given gradient.
- Identify and interpret gradients and intercepts of linear functions graphically and algebraically
- Plot and interpret graphs (including reciprocal graphs and exponential graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematics problems involving distance, speed and acceleration
- Solve linear equations in one unknown algebraically
- Including those with the unknown on both sides of the equation



## WORDS

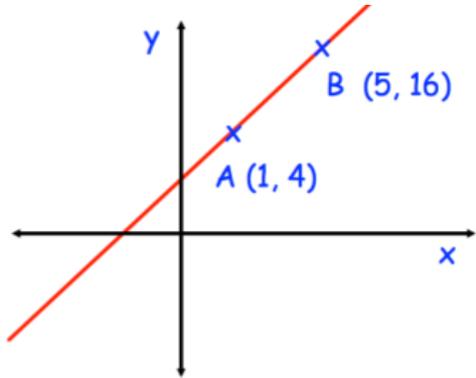
Linear Graphs,  
Straight line,  
Parallel,  
Perpendicular,  
Gradient, Y-  
intercept,  
Coordinates, Table  
of values,  
Reciprocal,  
Exponential,  
Kinematics, Speed,  
Acceleration,  
Solving, Equals,  
Balancing

Mastery  
Indicators

Pre-test  
Progress check  
Topic test

# Pre-test Algebra Recap and Review

A straight line passes through the points A(1, 4) and B(5, 16).



- (a) Find the equation of the line parallel to AB that passes through (1, 7)
- (b) Find the equation of the line perpendicular to AB that passes through the midpoint of AB.

Solve the following equations

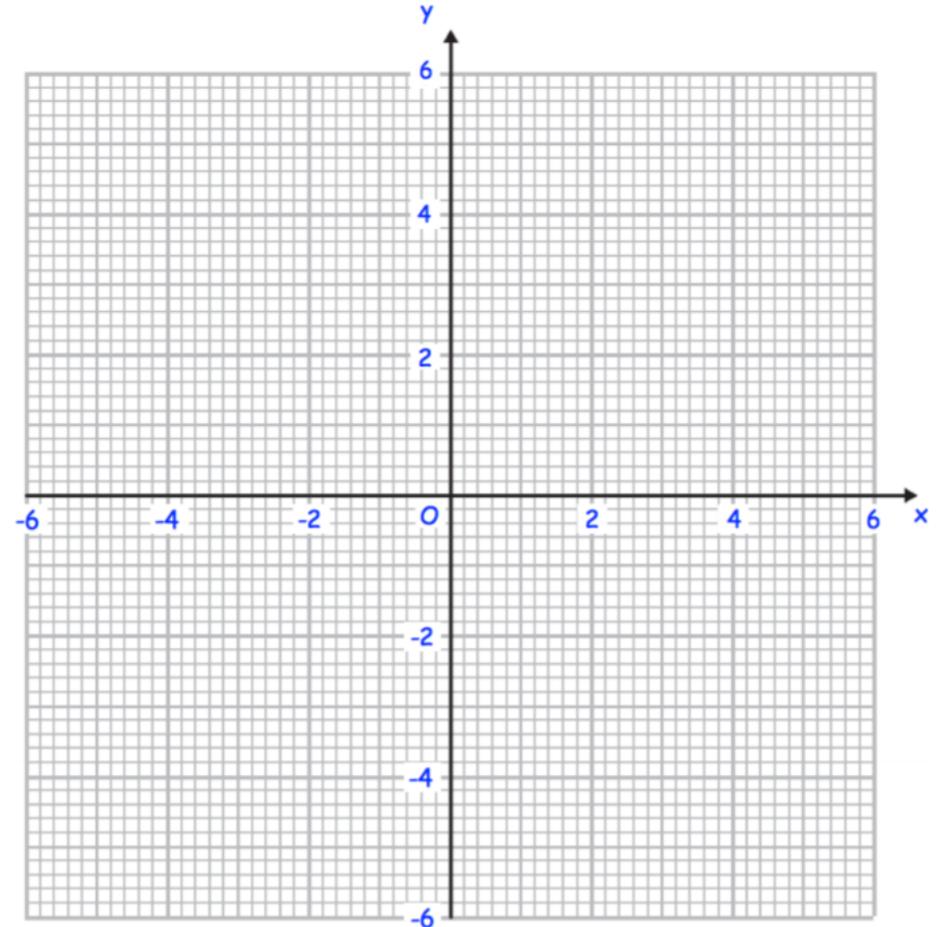
$$8(x - 1) = 4(x + 3)$$

$$5(2x + 9) + 2(x + 11) = 3(3x + 4) + 46$$

(a) Complete the table of values for  $y = \frac{2}{x}$

x	-5	-2	-1	-0.5	0.5	1	2	5
y								

On the grid, draw the graph of  $y = \frac{2}{x}$  for  $0.5 \leq x \leq 10$



# Sketching Graphs

A geophysicist studies the Earth using gravity, magnetic, electrical and seismic methods. Graphs are used in a study of the Pacific and Atlantic Oceans. They need to be able to understand equations and recognise the features of graphs to understand and interpret it.



By the end of this topic you will have learned to:

- **Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions and the reciprocal function**



## WORDS

Graph, Axis, Accuracy, Quadratic, Linear, Parabola, Cubic Reciprocal

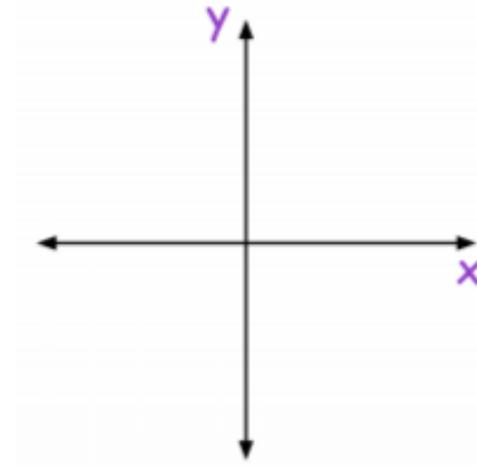
Mastery Indicators

Pre-test  
Progress check  
Topic test

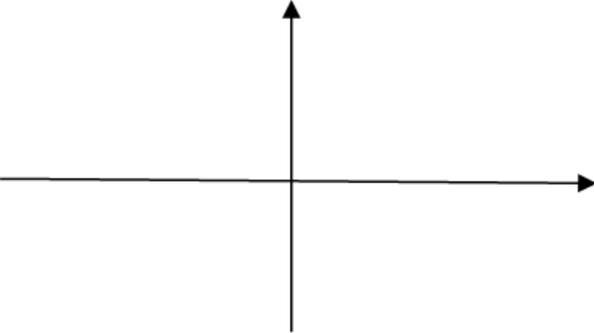
## Pre-test Sketching Graphs

Rebecca wants to sketch the graph of  $y = x^2 + 7x - 8$

- (a) Find the value of  $y$  when  $x = 0$
- (b) Use your answer to (a) to plot where the graph crosses the  $y$ -axis.
- (c) Solve the equation  $x^2 + 7x - 8 = 0$
- (d) Use your answers to (c) to help you plot where the graph crosses the  $x$ -axis.
- (e) Sketch the graph of  $y = x^2 + 7x - 8$



Sketch the cubic graph

Curves	Points of intersection with the x-axis.	Points of intersection with the y-axis.	Graphs (sketch)
$y = (x - 5)(x - 2)(x - 1)$			

# Linear and Quadratic Equations and their graphs

Kinematics is the topic within maths that deals with motion. By writing equations and drawing graphs that describe the relationship between distance, speed and acceleration, it is possible to calculate things such as speed of a vehicle at a particular time during its journey.



**By the end of this topic you will have learned to:**

- Solve linear equations in one unknown algebraically including those with the unknown on both sides of the equation
- Find approximate solutions using a graph
- Solve quadratic equations algebraically by factorising
- Find approximate solutions using a graph
- Translate simple situations or procedures into algebraic expressions or formulae; derive an equation and solve the equation and interpret the solution



## KEY WORDS

Equation,  
substitution,  
formula,  
expression, linear  
equation,  
variable,  
coefficient.

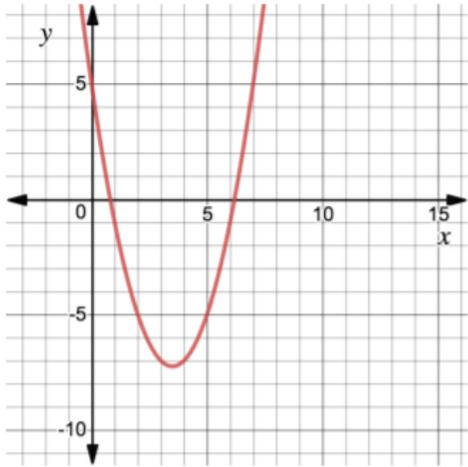
Mastery  
Indicators

Pretest  
Progress check  
Topic test

# Pre-test Linear and Quadratic Equations and their graphs

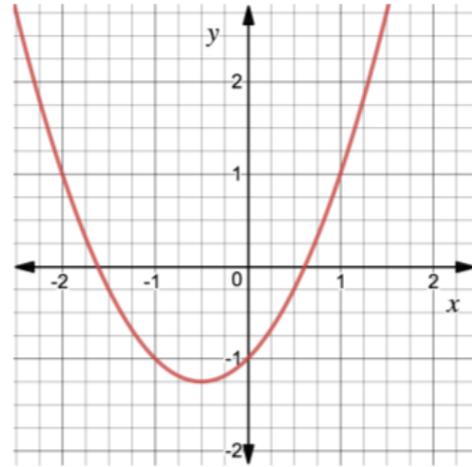
Using the graphs, find estimates of the solutions to the following equations

$$y = x^2 - 7x + 5$$



(a)  $x^2 - 7x + 5 = 0$

$$y = x^2 + x - 1$$

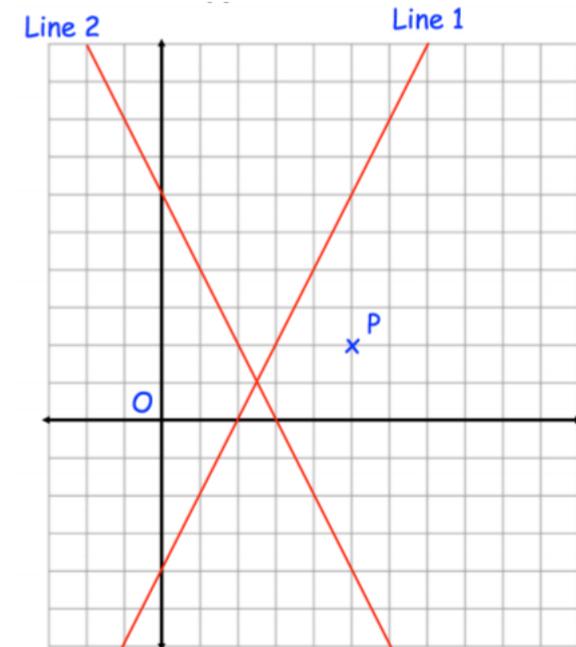


(b)  $x^2 + x - 1 = 0$

Line 1 has equation  $y = 3x - 12$

(a) Find the coordinates of P

(b) Find the equation of Line 2



# Year 10 Higher

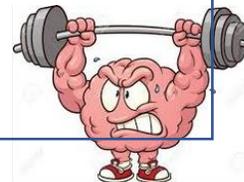
## Geometry and Measures recap and review

Car manufacturers produce car parts which are congruent so that they fit into all cars in the production line.



By the end of this topic you will have learned to:

- **Solve geometrical problems on co-ordinate axes**
- **Identify, describe and construct congruent and similar shapes, including on co-ordinate axes, by considering rotation, reflection, translation and enlargement (including fractional and negative scale factors)**
- **Describe the changes and invariance achieved by combinations of rotations, reflections and translations**
- **Find the surface area of pyramids and composite solids**
- **Calculate surface area of spheres, cones and composite solids**
- **Calculate the volume of spheres, pyramids, cones and composite solids**
- **Calculate arc lengths, angles and areas of sectors of circles**



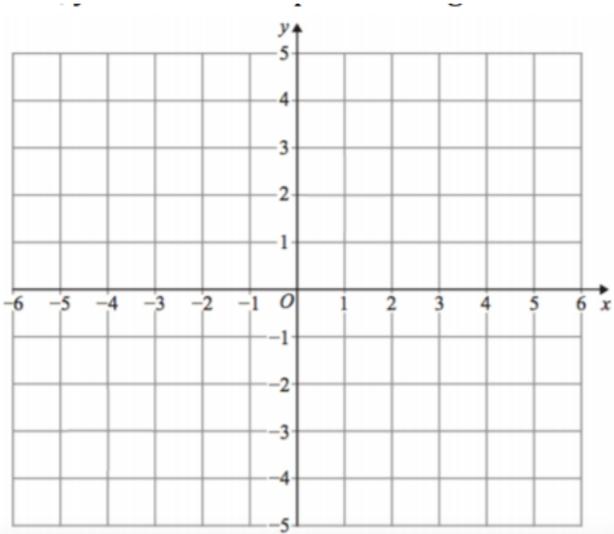
### WORDS

Co-ordinate,  
Shapes, Congruent,  
Similar, Rotation,  
Reflection,  
Translation,  
Enlargement, Scale  
Factor, Surface  
Area, Volume, Arc  
lengths, Angles,  
Area

Mastery  
Indicators

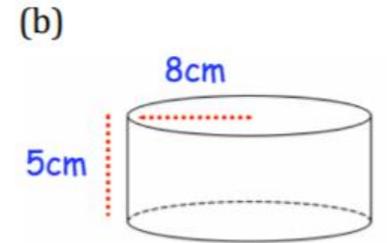
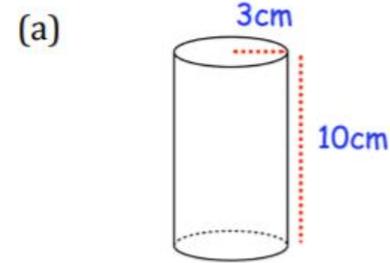
Pretest  
Progress check  
Topic test

# Pre-test Geometry Recap and Review



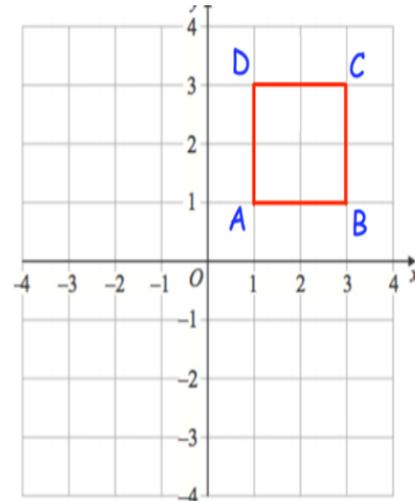
- (a) Plot the coordinates A (-4, 1), B (1, -2) and C (2, 1)
- (b) ABCD is a kite.
- (c) Plot D
- (d) Write down the coordinates of the point D.

Work out the surface area of each of the following cylinders.  
Give each answer to 2 decimal places.



ABCD is a square.

- (a) Translate ABCD using vector  $\begin{pmatrix} -3 \\ -1 \end{pmatrix}$



- (b) Are there any invariant points?  
If so, which point(s) are invariant?

...