

The UCL Academy Mathematics Department

Achieving a grade 5 at GCSE Maths

This document lists all the skills that are the minimum requirement to score a grade 5 or higher on the topics you learned up to Easter. Most of the skills have example questions next to them for you to practice.

Note that competence in these skills and questions is the minimum requirement. You will also need to be able to apply these skills in questions with greater need for reasoning and problem solving.

Chapter	I can...	Example question
Chapter 1 – Working with Integers	Calculate with non-calculator methods AND calculator methods all four operations (+, -, x, ÷) of arithmetic using positive and negative integers	<p>1) The population of Cambridge is 108 863 The population of Oxford is 153 904 How many more people live in Oxford than in Cambridge?</p> <p>2) There are 75 students travelling in 16-seater mini-coaches. If as many of the mini-coaches as possible are full, how many students travel in the mini-coach that is only partly full?</p> <p>3) The temperature falls 4°C from –3.5°C. Work out the new temperature.</p> <p>4) A builder employs seven bricklayers. Each bricklayer earns £12.60 per hour worked. They each work $37\frac{1}{2}$ hours per week. The builder says he needs £33 075 each week to pay his bricklayers. Use a calculator to check if he is correct.</p> <p>5) A cup of coffee costs £1.30 A cup of tea costs £1.10 I buy three cups of coffee and two cups of tea. How much change should I get from a £10 note?</p> <p>6) A cup of coffee costs £1.30 A cup of tea costs £1.10 I want to buy three cups of coffee and two cups of tea. I have a voucher for one free cup of coffee with every two cups of coffee bought. How much should I pay?</p>
	Use the order of operations at all times (BIDMAS)	Luke says that $3 + 4 \times 5 = 35$

		<p>Is he correct?</p> <p>Give a reason for your answer.</p>									
Chapter 2 – Collecting, representing and interpreting data	Know suitable methods for obtaining a sample of data from a population										
	Know the limitations of sampling	<p>Jerry has a hypothesis that most days at his house are dry.</p> <p>In June there were 20 dry days at his house.</p> <p>Give a reason why this may not support Jerry's hypothesis.</p>									
	<p>Construct:</p> <p>Pictograms</p> <p>Bar and line charts</p> <p>Multiple bar charts</p> <p>Compound bar charts</p> <p>Frequency tables</p> <p>Grouped frequency tables</p> <p>Pie charts</p> <p>Time series graphs</p>	<p>The table shows information about a large flock of sheep.</p> <table border="1" data-bbox="1256 580 2152 762"> <thead> <tr> <th></th> <th>Sheared sheep</th> <th>Unsheared sheep</th> </tr> </thead> <tbody> <tr> <td>Black sheep</td> <td>24</td> <td>16</td> </tr> <tr> <td>White sheep</td> <td>176</td> <td>264</td> </tr> </tbody> </table> <p>Draw a pie chart to illustrate the data.</p>		Sheared sheep	Unsheared sheep	Black sheep	24	16	White sheep	176	264
		Sheared sheep	Unsheared sheep								
Black sheep	24	16									
White sheep	176	264									
Interpret these tables, charts and graphs and understand the data they represent, e.g. numbers, quantities etc.											

- 1) The mean weight of 9 people is 79 kg
A 10th person is such that the mean weight increases by 1 kg

How heavy is the 10th person?

- 2) 125 people raise money for charity by running a marathon.
They raise £5212.50 altogether.

Work out the mean amount raised per person.

- 3) The table shows the time taken for 100 runners to finish a fun run.

Time, t (minutes)	Frequency
$10 < t \leq 20$	8
$20 < t \leq 30$	26
$30 < t \leq 40$	51
$40 < t \leq 50$	15

- a) Work out an estimate for the mean
- b) Which interval contains the median?
Circle the correct answer

$10 < t \leq 20$

$20 < t \leq 30$

$30 < t \leq 40$

$40 < t \leq 50$

Calculate the mean, median, mode and range from a frequency table

The mean of this frequency distribution is 16

Data	Frequency
	10
15	43
20	21
25	11

- a) Work out the missing data value.
- b) Work out the median

Calculate the mean, median, mode and range from a grouped frequency table

The table shows the time taken for 100 runners to finish a fun run.

Time, t (minutes)	Frequency
$10 < t \leq 20$	8
$20 < t \leq 30$	26
$30 < t \leq 40$	51
$40 < t \leq 50$	15

- a) Work out an estimate for the mean
- b) Which interval contains the median?
Circle the correct answer

$10 < t \leq 20$ $20 < t \leq 30$ $30 < t \leq 40$ $40 < t \leq 50$

	<p>Compare data by comparing the means or medians and ranges</p> <p>Understand that range is a measure of how spread out the data is (smaller spread is better as the data is more consistent)</p>	<p>1) The table shows the gender of students in each year group in a school.</p> <table border="1" data-bbox="1256 164 2157 376"> <thead> <tr> <th>Year</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th> </tr> </thead> <tbody> <tr> <td>Male</td> <td>82</td> <td>89</td> <td>101</td> <td>95</td> <td>92</td> </tr> <tr> <td>Female</td> <td>75</td> <td>87</td> <td>87</td> <td>99</td> <td>101</td> </tr> </tbody> </table> <p>Compare the data for the boys with the data for girls.</p> <p>2) 19 athletes complete a marathon.</p> <p>The times (in minutes) of the 10 professional athletes are: 133 134 136 139 141 143 144 145 151 158</p> <p>The times (in minutes) of the 9 amateur athletes are: 139 147 151 152 159 161 167 178 182</p> <p>Compare the times of the two groups of athletes.</p>	Year	7	8	9	10	11	Male	82	89	101	95	92	Female	75	87	87	99	101
Year	7	8	9	10	11															
Male	82	89	101	95	92															
Female	75	87	87	99	101															
	Construct scatter diagrams																			
	Describe correlation from a scatter diagram																			
	Draw a line of best fit on a scatter diagram																			
	Identify outliers on a scatter diagram																			
Chapter 4 – Properties of numbers	Know what a square number is and know by heart the first 12 square numbers	Show that it is possible to write 50 as the sum of two square numbers in two different ways.																		
	Know what a cube number is and know by heart the first 5 cube numbers	<p>Three numbers add up to 60</p> <p>The first number is a square number.</p> <p>The second number is a cube number.</p> <p>The third number is less than 10</p> <p>What could the numbers be?</p>																		
	Know what a prime number is and know the first 12 prime numbers	<p>a and b are prime numbers.</p> <p>Work out a pair of values for a and b so that $4a - b$ is prime.</p>																		

Know what a factor is	Which of the numbers 1, 6, 11, 12, 18, and 24 are factors of 24?
Know what a multiple is	Which of these numbers is not a multiple of 8 Circle your answer 24 64 94 152
Know what a common factor is	
Know what a common multiple is	
Know how to find the Highest Common Factor for 2 or more numbers, by listing all factors of these numbers	What is the Highest common factor of 12 and 18?
Know how to find the Lowest Common Multiple for 2 or more numbers using listing methods.	Envelopes are sold in packs of 18 Address labels are sold in packs of 30 Terry needs the same number of envelopes and address labels. What is the smallest number of each pack he can buy?
Know how to use factor trees to find prime factors of a number	
Write a numbers as the product of its prime factors in index form	Write 60 as the product of its prime factors. Give your answer in index form.
Find the Highest Common Factor and Lowest Common Multiple of two or more numbers using factor trees	1) Work out the Highest common factor of 72 and 160? 2) Work out the Lowest common multiple of 72 and 160?

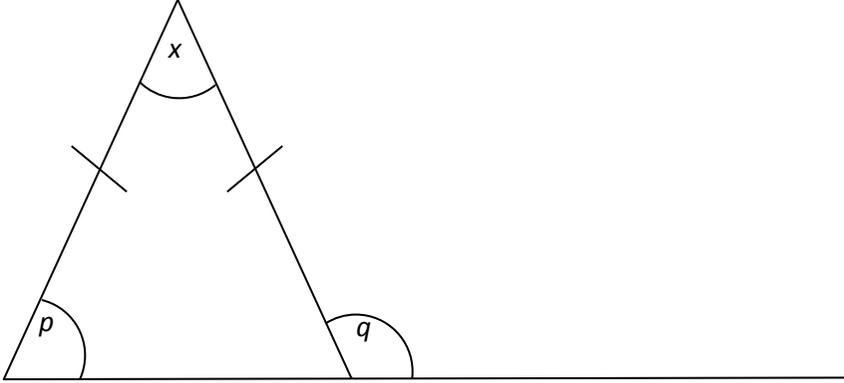
Chapter 5 – Working with Fractions	Simply fractions and find equivalent fractions	Write down a fraction between $\frac{5}{7}$ and $\frac{6}{7}$
	Compare fractions by first writing equivalent fractions	<p>1) Write these fractions in order of size, starting with the smallest.</p> $\frac{5}{6} \quad \frac{2}{3} \quad \frac{7}{9}$ <p>2) Which of these fractions $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{12}$ are greater than $\frac{2}{3}$?</p> <p>3) Which of these fractions $\frac{2}{5}$, $\frac{9}{20}$ or $\frac{7}{10}$ is closest to $\frac{1}{2}$?</p> <p>4) In an experiment to test reaction times, Alex took $\frac{1}{8}$ of a second to react and Ben took $\frac{3}{20}$ of a second to react. Who reacted quickest and by how much?</p>
	Convert improper fractions to mixed numbers	Write down an improper fraction with a value between 3 and 4
	Convert mixed numbers to improper fractions	
Calculate with non-calculator methods AND calculator methods all four operations (+, -, x, ÷) of arithmetic using positive and negative fractions (proper, improper and mixed)	<p>1) Work out $1\frac{2}{5} + \frac{3}{4}$</p> <p>2) Work out $3\frac{5}{6} - 2\frac{1}{2}$</p> <p>3) Work out $-1\frac{3}{4} + 4$</p> <p>4) Work out $2\frac{1}{2} \times 3$</p> <p>5) Work out $4 \times \frac{7}{8}$</p>	

		<p>6) Work out $\frac{6}{11} \div 3$</p> <p>7) Work out $\frac{3}{4} \times \frac{8}{9}$</p> <p>8) Write down the answer to $\frac{4}{15} \div \frac{4}{15}$</p> <p>9) Work out $8 \div \frac{2}{3}$</p> <p>10) Sally is cycling home, a distance of $6\frac{1}{3}$ miles.</p> <p>After $4\frac{3}{4}$ miles she has a puncture and has to push her bike the rest of the way home.</p> <p>How far does she push her bike?</p>
	Calculate fractions of amounts	Work out $\frac{3}{8}$ of 56
	Express one quantity as a fraction of another (including first ensuring all quantities are in the same units)	<p>1) Peter scores 64 out of 80 in a test.</p> <p>Write this score as a fraction in its simplest form.</p> <p>2) In a class of 32 students, 15 are boys.</p> <p>What fraction of the class are girls?</p> <p>3) In an examination the average mark was 54</p> <p>Bel's mark as a fraction of the average mark was $\frac{3}{2}$</p> <p>Work out Bel's mark.</p>

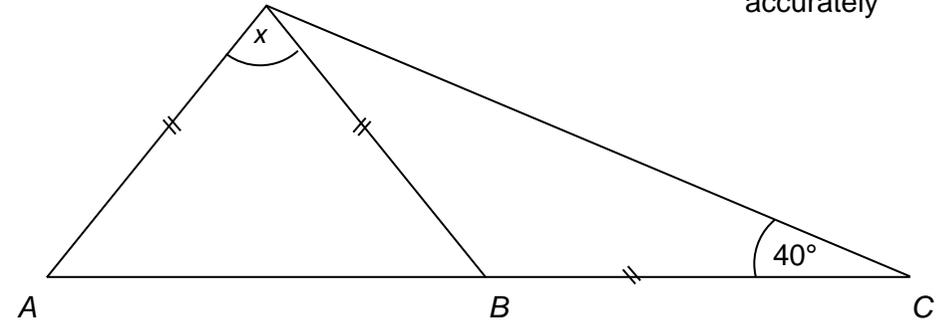
Chapter 6 – Working with decimals	Know the place value of a digit in a number (integer or decimal)	1) Write down the place value of 8 in the answer to 2850×10 2) Write down the place value of 8 in the answer to $28 \div 1000$
	Use place value to convert a decimal as a fraction	Write 0.28 as a fraction in its simplest terms.
	Order fractions and decimals by writing everything as decimals	1) Which of these is closest to $\frac{1}{3}$? 0.35 $\frac{3}{10}$ 0.29 $\frac{1}{2}$ 2) Put these numbers in ascending order. $\frac{3}{4}$ 0.83 $\frac{4}{5}$ $\frac{13}{20}$ 3) Write 4.2, 4.02, 4.203 and 4.23 in ascending order.
	Calculate with non-calculator methods AND calculator methods all four operations (+, -, \times , \div) of arithmetic using positive and negative decimals	1) Work out 45.6×0.06 without a calculator 2) Work our $45.6 \div 0.06$ without a calculator

Chapter 7 – Basic Algebra	Use and interpret algebraic notation, including: ab in place of $a \times b$ $3y$ in place of $y + y + y$ or 3 times y a^2 in place of $a \times a$ a^3 in place of $a \times a \times a$ a^2b in place of $a \times a \times b$ $\frac{x}{y}$ instead of $x \div y$	
	Form algebraic expressions and equations from worded descriptions or from geometric problems	<ol style="list-style-type: none"> 1) Write an expression for the number that is six times smaller than n. 2) $\pounds x$ is shared equally between seven people. How much does each person receive? 3) Write an expression for the total cost of six apples at a pence each and ten pears at b pence each. 4) Write down an equation for two bananas at h pence each and three grapefruit at k pence each when the total cost is $\pounds 1.36$ 5) Chloe is x years old. Her sister is three years older. Her brother is twice her age. The sum of their ages is 67 years. <ol style="list-style-type: none"> a) Write an expression, in terms of x, for her sister's age. b) Form an equation in x to work out Chloe's age. 6) Two angles have a difference of 30° Together they form a straight line. The smaller angle is x° <ol style="list-style-type: none"> a) Write down an expression for the larger angle, in terms of x. b) Work out the value of x.
	Substitute positive and negative values into expressions or formulae	When $a = 5$, $b = -7$ and $c = 8$, work out the value of $\frac{a(b + 3)}{c}$
	Simplify algebraic expressions by collecting like terms	1) Simplify $3x + 5 - x - 4$

	2) Simplify $3a - 2b + 5a + 9b$
Simplify simple terms that are multiplied together	1) Simplify $(3x)(4x)$ 2) Simplify $(3a)(4b)(2b)$
Simplify simple terms that are divided by each other	Simplify $\frac{18x}{3}$
Expand single brackets and simplify	1) Expand and simplify $3(a - 4) + 2(2a + 5)$ 2) Expand and simplify $2(3x - 5) + 3(5x + 7)$ 3) The expression $7(x + 4) - 3(x - 2)$ simplifies to $a(2x + b)$ Work out the values of a and b . 4) Show that $3(a - 4) + 2(2a + 5) + 9$ and $7(a + 1)$ are equivalent.
Factorise an expression (add brackets) by factorising out the Highest Common Factor	1) Factorise $6w - 8y$ 2) Factorise $12x^2 + 8x$ 3) Factorise $15xy^2 - 2x^2y$

<p>Chapter 8 – Properties of polygons and 3D shapes</p>	<p>Know the names of common triangles</p> <p>Know the properties of common triangles (e.g. about lengths and angles and interior angle sum)</p>	<p>1) Given that one angle in an isosceles triangle is 70°, show that there are two possible solutions for the other angles.</p> <p>2) Given that one angle in an isosceles triangle is 90°, show that there can only be one solution for the other angles</p> <p>3) The diagram shows an isosceles triangle.</p>  <p>a) If $x = 30^\circ$, work out the value of p.</p> <p>b) If $q = 100^\circ$, work out the value of x.</p> <p>c) Write down the value of q in terms of x and p.</p> <p>4) The angles of a triangle are $2x$, $x + 30$ and $x + 70$ Work out the value of x.</p> <p>5) In the diagram below ABC is a straight line Work out x.</p>
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Not drawn accurately



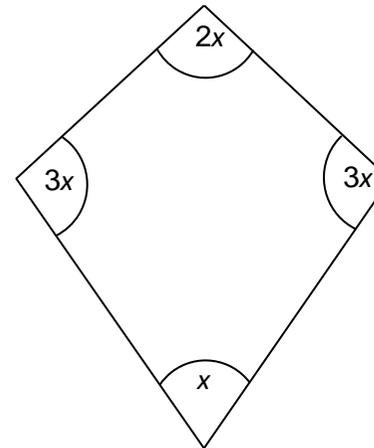
Know the names of common quadrilaterals

Know the properties of common quadrilaterals (e.g. about length, angles, parallel lines, diagonals and interior angle sum)

1) Two of the angles in a parallelogram are x and $(x - 32^\circ)$

Work out the size of the larger angle.

2) In this quadrilateral the angles are x , $2x$, $3x$ and $3x$ as shown.

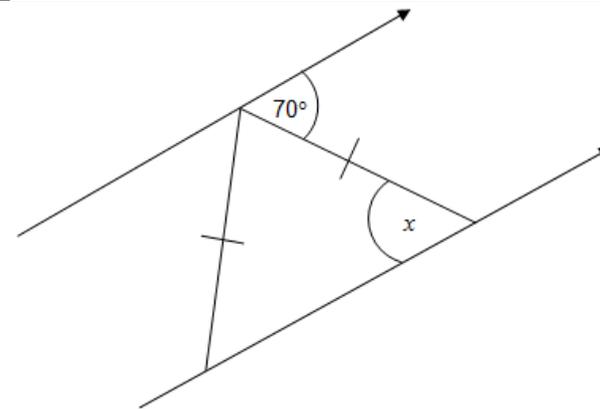


a) What name is given to this shape?

b) Show that the shape has two acute and two obtuse angles.

		<p>3) Ben is describing a shape.</p> <ul style="list-style-type: none"> • It has four sides • The sides are all the same length • It is not a square. <p>a) What shape is Ben describing? b) Write down another fact about this shape.</p>
	Know the names of other common polygons (pentagon up to decagon)	
	Know the names of common 3D shapes and know their properties (e.g. number of vertices, edges, faces and how to draw sketches of them)	
	Identify and describe line symmetry in plane figures	<p>A shape has three lines of symmetry. All sides are the same length. Write down the name of the shape.</p>
	Identify and describe rotational symmetry in plane figures	Draw a shape with two lines of symmetry and rotational symmetry of order 2
Chapter 9 – Angles	Know angle properties for a straight line	Explain why angles of 99° and 91° do not fit together to make a straight line.
	Know angle properties about a point	<p>There are three angles at a point. One is acute, one is obtuse and one is reflex. Write down one possible set of three angles.</p>
	Know what vertically opposite angles are and know they are equal	

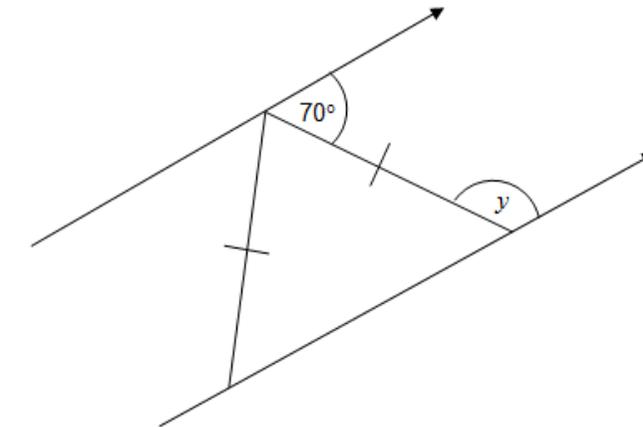
Know what alternate angles are and know they are equal



Work angle x . Explain your answer.

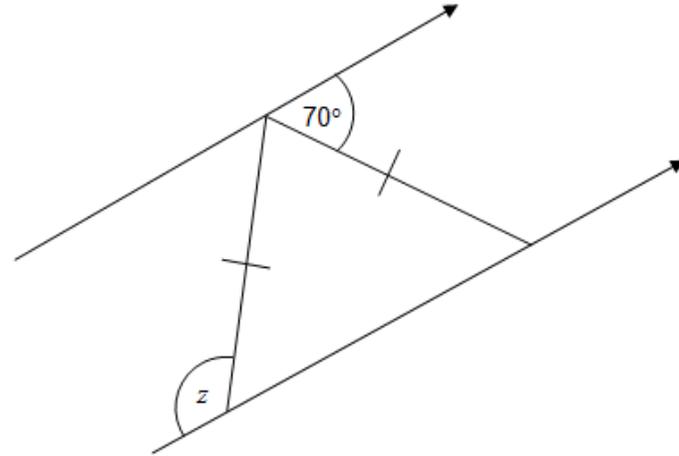
Know what corresponding angles are and know they are equal

Know what co-interior angles are and that they sum to 180°



Work out angle y . Explain your answer.

Solve problems of missing angles by using these angles facts

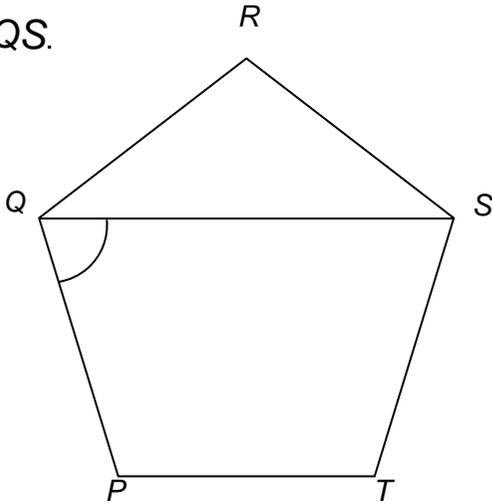


Work out angle z . Explain your answer.

Calculate the interior angle sum of polygons

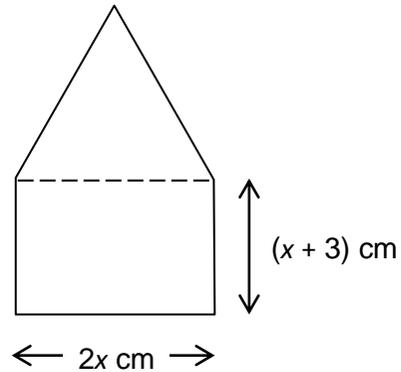
What is the interior angle sum of a polygon with 11 sides?

Know the exterior angle sum of polygons is 360°

	Calculate the value of one interior angle in a regular polygon	<p>1) Work out the size of each interior angle of a regular hexagon</p> <p>2) The pentagon $PQRST$ has sides of equal length. The line QS is drawn. Work out the size of angle PQS.</p> 
	Calculate the value of one exterior angle in a regular polygon	<p>The exterior angle of a regular polygon has size 30°</p> <p>How many sides does the polygon have?</p>
Chapter 10 – Perimeter	Calculate the perimeter of simple shapes	
	Calculate missing lengths if some lengths and the perimeter are known	
	Calculate the perimeter of composite shapes by first determining any missing lengths on a shape	

Form expressions and equations for the perimeter of a shape

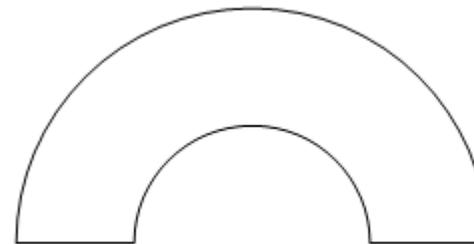
A shape is made by joining an equilateral triangle to a rectangle.
Write an expression for the perimeter of the shape.



Know and use a formula (either $C = \pi D$ or $C = 2\pi r$) for the circumference of a circle.

Hence, also find the perimeter of a semi-circle and a quarter circle.

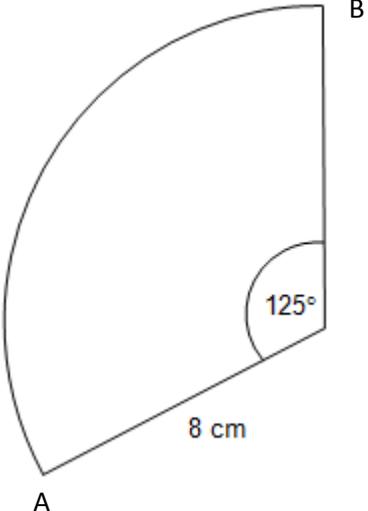
- 1) Work out the perimeter of a semicircle of diameter 8 cm
- 2) The circumference of a circle of radius 4 cm is equal to the perimeter of a square.
Work out the length of one side of the square.
- 3) The diagram shows a shape made from two semicircles with the same centre.
The outer radius is 10 cm
The inner radius is 6 cm

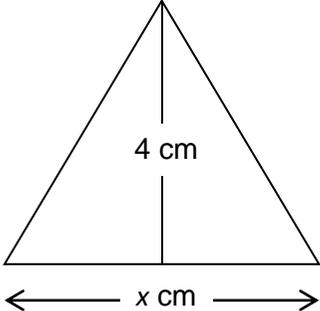
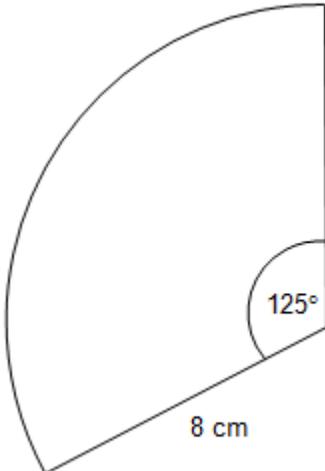


Work out the perimeter of the shape.

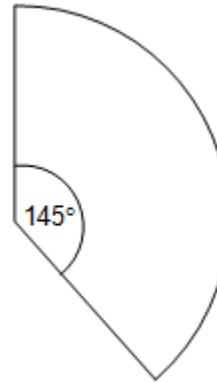
Use the formula for circumference to calculate r or D when C is known

The circumference of a circle is 30cm. Work out the radius.

	<p>Calculate the arc length of a given sector</p>	 <p>a) Work out the length of the arc.</p> <p>b) Work out the perimeter of the entire sector.</p>
<p>Chapter 11 – Area</p>	<p>Know and use the formulae for calculating the area of rectangles, triangles, parallelograms and trapeziums</p>	<p>1) The area of a triangle = 24 cm^2 The base of the triangle is 8 cm</p> <p>Work out the height of the triangle.</p> <p>2) The perimeter of a rectangle is 30 cm The length of the rectangle is double the width.</p> <p>Work out the area of the rectangle.</p>

		<p>3) The area of the rectangle is equal to the area of the triangle. Work out the value of x.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>$2(x - 5)$ cm</p>  </div> <div style="text-align: center;">  </div> </div>
	<p>Calculate the total area of composite shapes formed using these four shapes</p>	
	<p>Know and use the formula ($A = \pi r^2$) for the area of a circle. Hence, also find the area of a semi-circle or quarter of a circle.</p>	<p>Which is greater, the area of a quarter-circle of radius 10 cm or the area of a semicircle of radius 5 cm? Show how you decide.</p>
	<p>Use the formula for area of a circle to calculate r or D when A is known</p>	<p>The area of a circle is 50cm^2. Work out the radius.</p>
	<p>Calculate the area of a given sector</p>	<p>1) The diagram shows a sector of a circle.</p> <div style="text-align: center;">  </div> <p>Work out the area.</p>

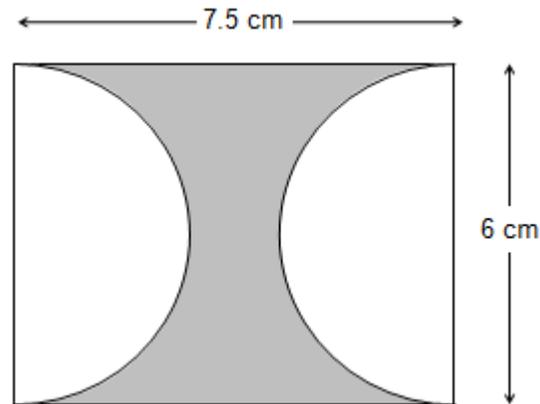
- 2) The diagram shows a sector of a circle.
The arc length is 24 cm



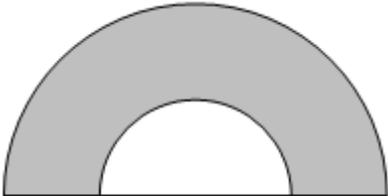
Work out the radius.

Recognise that the area of some composite shapes can be found by subtracting known areas from a larger shape

- 1) A rectangle has two semicircles drawn inside it as shown.



Work out the area of the shaded region. Give your answer in terms of π .

		<p>2) The following diagram shows two semicircles of radius 5 cm and 10 cm</p>  <p>Work out the shaded area.</p>
Chapter 12 – Rounding and Estimation	Round values to the nearest 10, 100 or 1000	
	Round values to a specified number of decimal places	<p>120 people take their driving test in a week. 71 pass. Work out the percentage of those who pass. Give your answer to one decimal place.</p>
	Round values to a specified number of significant figures	<p>1127 people pass their driving test in 39 weeks. Calculate the mean number of students who pass in one week. Give your answer to one significant figure.</p>
	Truncate values to a specified number of places	
	Round to one significant figure in order to estimate answers to more complex calculations without using a calculator	Estimate the value of 6.3^4
	Use inequalities and identify the lower and upper bounds for measurements	<p>A rectangle has a length of 3.4 cm The length is given to 1 decimal place. Use inequalities to write down the error interval due to rounding.</p>
Chapter 13 - Percentages	Convert between fractions, decimals and percentages with and without a calculator	<p>1) Write 35% as a) a decimal b) a fraction in its simplest form.</p> <p>2) Write the fraction $\frac{7}{8}$ as a decimal.</p> <p>3) Write $\frac{11}{4}$ as a decimal.</p>

	<p>Calculate percentages of amounts with and without a calculator</p>	<p>1) Work out 62% of £70</p> <p>2) Helen earns £8000 per year She pays 20% income tax on this amount. How much income tax does she pay each month?</p> <p>3) In a school there are 600 students and 50 teachers. 15% of the students are left-handed. 12% of the teachers are left-handed. How many left-handed students and teachers are there altogether?</p> <p>4) Circle the calculations that would find 45% of 400</p> <p>0.45×400 $\frac{1}{45} \times 400$ $\frac{45}{100} \times 400$ $\frac{400}{4} \times 5$</p> <p>5) The cash price of a leather sofa is £700 Credit terms are a 20% deposit plus 24 monthly payments of £25 Calculate the difference between the cash price and the credit price.</p>
	<p>Express a quantity as a percentage of another</p>	<p>20 people out of 50 like the colour pink. What percentage like the colour pink?</p>
	<p>Calculate percentage increase and decrease</p>	<p>1) Chris earns £285 per week. He gets a 6% pay rise. How much per week does he earn now?</p> <p>2) Paving slabs cost £3.20 each. A supplier offers '20% off when you spend more than £300'. How much will it cost to buy 100 paving slabs?</p>

		<p>3) Before a storm, a pond held 36 000 litres of water. After the storm, the volume of the pond increased by 12% How many litres of water does the pond hold after the storm?</p> <p>4) The mean price of four train tickets is £25 All prices are increased by 10% What is the total cost of the four tickets after the price increase?</p> <p>5) A car increases in speed from 50 mph to 70 mph. Work out the percentage increase.</p>
	Calculate the original amount given the value after an increase or decrease	<p>The value of my car has decreased by 15% of the price I paid one year ago. It is now valued at £17 340 How much did I pay for the car one year ago?</p>
Chapter 14 – Powers and Roots	Write a series of numbers multiplied together in index form	<p>Write 64 as</p> <p>a) a square of an integer b) the cube of an integer.</p>
	Use a calculator for index notation	<p>1) Work out the value of $2^6 \times 3^2$</p> <p>2) Tim says that $\sqrt{13^2 - 12^2}$ is greater than $\sqrt[3]{11^2 + 2^2}$ Is he correct? You must show your working.</p> <p>3) Work out $\frac{4^3 \times 10^6}{2^5}$</p>
	Understand zero and negative indices	
	Apply the laws of indices for multiplying and dividing, and for powers of indices	<p>1) $7^5 \times 7^3$ as a single power of 7</p> <p>2) $9^{12} \div 9^5$ as a single power of 9</p> <p>3) $(2^5)^3$ as a single power of 2</p>

		<p>4) Amy writes that $6^{10} \div 6^2 = 6^5$ Explain what Amy has done wrong.</p> <p>5) Simplify $x^2 \times x^4$</p> <p>6) Simplify $x^{16} \div x^4$</p> <p>7) Simplify fully $\frac{x^5 \times x^7}{x^4}$</p>
	Calculate square and cubed roots of a number without a calculator when starting with known square or cubed numbers	Write down the values of $\sqrt{49}$, $\sqrt[3]{125}$, $\sqrt{2^3 + 2^3}$
	Calculate square and cubed roots of any number with a calculator	
	Estimate the square or cubed root of a number by considering known square or cubed roots	<p>1) Estimate the square root of 43</p> <p>2) Between which two integers does the square root of 150 lie?</p> <p>3) Between which two integers does the cube root of 100 lie?</p>
Chapter 15 – Standard Form	Convert numbers to and from standard form	<p>1) Write in standard form</p> <p>a) 379.4</p> <p>b) 0.0712</p> <p>2) Write as ordinary numbers</p> <p>a) 2.65×10^5</p> <p>b) 7.08×10^{-3}</p> <p>3) Write one quarter of a million in standard form</p>
	Use a scientific calculator for standard form calculations	
	Multiply and divide numbers in standard form with and without the use of a calculator	<p>1) Work out the value of the following. Give your answer in standard form.</p> <p>$(2.8 \times 10^9) \div (4 \times 10^5)$</p>

		2) Solve $(2.4 \times 10^7)x = 1.44 \times 10^9$ Give your answer in standard form.
	Add and subtract numbers in standard form	
Chapter 16 – Further algebra	Know what a quadratic expression is	
	Expand the product of two brackets to get a quadratic expression	Expand and simplify $(3a - 2b)(2a + b)$
	Factorise quadratic expressions of the form $x^2 + bx + c$	Factorise $x^2 - 7x + 10$
	Factorise quadratic expressions that are the difference of two squares ($a^2 - b^2$)	Factorise a) $y^2 - 9$ b) $k^2 - m^2$
	Form algebraic expressions (including quadratic) from worded descriptions or from geometric problems	
Chapter 17 – Equations	Solve linear equations where the variable is only on one side of the equals sign	Solve $4x - 11 = 3$
	Solve linear equations where the variable is on both side of the equals sign	1) Solve $4x - 1 = x + 4$ 2) Solve $5x - 4 = 2(x + 1)$
	Solve linear equations where the answer is a fraction or where the equation includes fractions in it	
	Understand that identities are equations for which there are an infinite number of solutions as they are true for all values x can take	
	Solve quadratic equations of the form $x^2 + bx + c = 0$	Solve $x^2 - 7x + 10 = 0$
	Understand that different types of equations have a different possible number of solutions	
	Solve linear simultaneous equations	1) Solve the simultaneous equations $2x + 3y = 7$ $x + 3y = 2$ You must show your working. Do not use trial and improvement.

		<p>2)</p> $x + y = 25$ $x - y = 4$ <p>Work out the values of x and y. You must show your working. Do not use trial and improvement.</p> <p>3) The cost of three adult tickets and two child tickets is £73 The cost of two adult tickets and five child tickets is £89 Work out the cost of an adult ticket and the cost of a child ticket.</p> <p>4) The sum of two numbers is 25 The difference between the numbers is 4 Work out the two numbers.</p>
	Read and interpret graphs in various contexts	
	Use graphs to find approximate solutions to equations and simultaneous equations	
Chapter 18 – Functions and Sequences	Identify a term-to-term rule	
	Generate terms of a sequence from a term-to-term rule	
	Generate terms of a sequence from a position-to-term rule	<p>1) Write down the first three terms of a sequence where the nth term is given by $n^2 + 4$</p> <p>2) The nth term of a sequence is given by $2n + 5$</p> <ol style="list-style-type: none"> Write down the first three terms. Work out the 100th term. Which term has a value of 95? <p>3) The nth term of a sequence is $\frac{7 - n}{n^2 + 1}$</p> <ol style="list-style-type: none"> Which term in the sequence is the first one with a negative value? Work out the value of this term.

Find the n th term of a linear sequence

1) Write down an expression for the n th term of the following sequence.

3 7 11 15

2) a) Write down an expression for the n th term of following the sequence.

5 8 11 14

b) Explain why 61 cannot be a term in this sequence.

3) A linear sequence starts

$a + b$ $a + 4b$ $a + 7b$ $a + 10b$

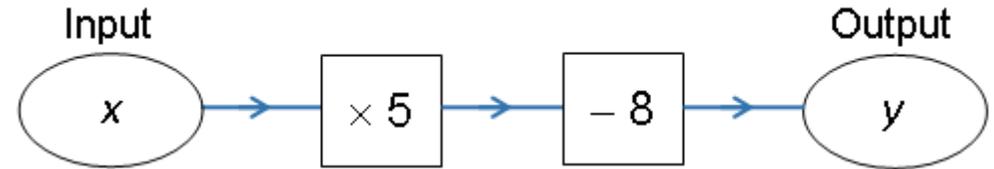
The 4th and 7th terms have values 44 and 62

a) Work out the values of a and b .

b) Work out the n th term

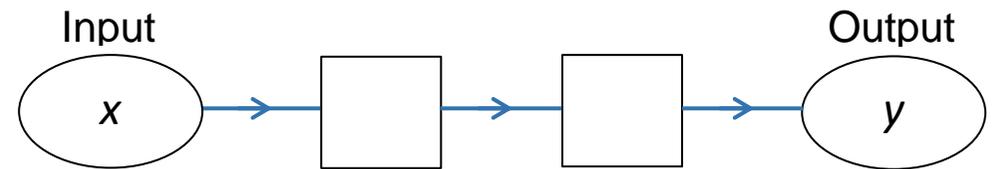
Interpret expressions as functions with inputs and outputs

1)



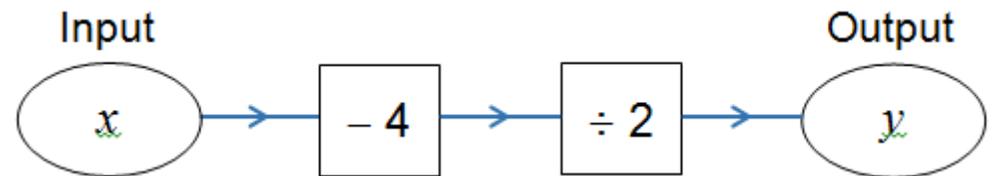
Write down the output y as an expression in terms of x .

2)



Complete the number machine so that $y = 3x + 7$

3)



- a) Work out the output when the input is 1
- b) Work out the input when the output is 5

Identify special sequences

Write down the next **two** terms in the following quadratic sequence.

7 10 15 22

	Understand what an arithmetic progression is and solve problems with it	An arithmetic progression starts $3 + 2a$, $3 + 4a$, $3 + 6a$ If the fifth term is 73, work out the value of a .
	Find the n th term of quadratic sequences	Work out the formula for the n th term of the quadratic sequence 5 11 19 29