

GCSE Mathematics 2018-2019

Foundation Tier



This booklet lists every objective that you could be tested on in your GCSE exams.




To keep track of how well you have done, you need to self-assess your understanding of each objective once you have learnt it in lesson or practiced it for homework.

You should also use this booklet as a revision guide to help you prepare for each assessment.




Tips for revision

- Pick an objective that you did not understand. Eg. You ticked ☹️ or 😊
- Watch the mathswatch clip associated with this objective, pausing to answer the in clip questions
- Answer some interactive questions on mathswatch to get instant feedback
- Repeat this process
- Ask other students in your form
- Attend maths drop-in session




FOUNDATION – Unit 1: Number

Topic	Objective	MW			
1.1 Calculations	Use priority of operations with positive and negative numbers.	75			
	Simplify calculations by cancelling.				
	Use inverse operations.	21			
1.2 Decimal numbers	Round to a given number of decimal place.	32			
	Multiply and divide decimal numbers.	66/67			
1.3 Place value	Write decimal numbers of millions.				
	Round to a given number of significant figures.	90			
	Estimate answers to calculations.	91			
	Use one calculation to find the answer to another.	92			
1.4 Factors and multiples	Recognise 2-digit prime numbers.	28			
	Find factors and multiples of numbers.	28			
	Find common factors and common multiples of two numbers.	79/80			
	Find the HCF and LCM of two numbers by listing.	79/80			
1.5 Squares, cubes and roots	Find square roots and cube roots.	81			
	Recognise powers of 2, 3, 4 and 5.	29/82			
	Understand surd notation on a calculator.	207a			
1.6 Index notation	Use index notation for powers of 10	29			
	Use index notation in calculations	29			
	Use the laws of indices	131			
1.7 Prime factors	Write a number as the product of its prime factors.	78			
	Use prime factor decomposition and Venn diagrams to find the HCF and LCM.	79/80			

FOUNDATION – Unit 2: Algebra




Topic	Objective	MW			
2.1 Algebraic expressions	Use correct algebraic notation.	33/34/35			
	Write and simplify expressions.				
2.2 Simplifying expressions	Use the index laws.	131			
	Multiply and divide expressions.	131			
2.3 Substitution	Substitute numbers into expressions.	95			
2.4 Formulae	Recognise the difference between a formula and an expression.	137			
	Substitute numbers into a simple formula.	95/137			
2.5 Expanding brackets	Expand brackets.	93/134a			
	Simplify expressions with brackets.	134a			
	Substitute numbers into expressions with brackets and powers.	95			
2.6 Factorising	Recognise factors of algebraic terms.				
	Factorise algebraic expressions.	94			
	Use the identity symbol \equiv and the not equals symbol \neq	137			
2.7 Using expressions and formulae	Write expressions and simple formulae to solve problems.	137			
	Use maths and science formulae.	137			

FOUNDATION – Unit 3: Graphs, tables and charts

Topic	Objective	MW			
3.1 Frequency tables	Designing tables and data collection sheets.	15			
	Reading data from tables.	15			
3.2 Two-way tables	Use data from tables.	61			
	Design and use two-way tables.	61			
3.3 Representing data	Draw and interpret comparative and composite bar charts.	15			
	Interpret and compare data shown in bar charts, line graphs and histograms.	15/64/65a			




3.4 Time series	Plot and interpret time series graphs.	153			
	Use trends to predict what might happen in the future.	153			
3.5 Stem and leaf diagrams	Construct and interpret stem and leaf and back-to-back stem and leaf diagrams.	128b			
3.6 Pie charts	Draw and interpret pie charts.	128a			
3.7 Scatter graphs	Plot and interpret scatter graphs.	129			
	Determine whether or not there is a relationship between sets of data.	129			
3.8 Line of best fit	Draw a line of best fit on a scatter graph.	129			
	Use the line of best fit to predict values.	129			

FOUNDATION – Unit 4: Fractions and percentages

Topic	Objective	MW			
4.1 Working with fractions	Compare fractions	24/25/26/70			
	Add and subtract fractions	71a/71b			
	Use fractions to solve problems	71a/71b			
4.2 Operations with fractions	Find a fraction of a quantity or measurement	72			
	Use fractions to solve problems				
4.3 Multiplying fractions	Multiply whole numbers, fractions and mixed numbers.	73			
	Simplify calculations by cancelling.	73			
4.4 Dividing fractions	Divide a whole number by a fraction.	74			
	Divide a fraction by a whole number or a fraction.	74			
4.5 Fractions and decimals	Convert fractions to decimals and vice versa.	84/85			
	Use decimals to find quantities.				
	Write one number as a fraction of another.				
4.6 Fractions and percentages	Convert percentages to fractions and vice versa.	84/85			
	Write one number as a percentage of another.	88/89			




4.7 Calculating percentages 1	Convert percentages to decimals and vice versa.	84/85			
	Find a percentage of a quantity.	86/87			
	Use percentages to solve problems.	111			
	Calculate simple interest.	111			
4.8 Calculating percentages 2	Calculate percentage increases and decreases.	108			
	Use percentages in real-life situations.	108			
	Calculate VAT (value added tax).	108			

FOUNDATION – Unit 5: Equations, inequalities and sequences




Topic	Objective	MW			
5.1 Solving equations 1	Understand and use inverse equations.	135a			
	Rearrange simple linear equations.	136			
	Solve simple linear equations.	135a			
5.2 Solving equations 2	Solve two-step equations	135a			
5.3 Solving equations with brackets	Solve linear equations with brackets.	135a			
	Solve equations with unknowns on both sides.	135a			
5.4 Introducing inequalities	Use correct notation to show inclusive and exclusive inequalities.	138/139			
	Solve simple linear inequalities.	138/139			
	Write down whole numbers which satisfy an inequality.	138/139			
	Represent inequalities on a number line.	138/139			
5.5 More inequalities	Solve two-sided inequalities.	138/139			
5.6 More formulae	Substitute values into formulae and solve equations.	95			
	Change the subject of a formula.	136			
	Know the difference between an expression, an equation, a formula and an identity.	137			
5.7 Generating sequences	Recognise and extend sequences.	37/104/141			

5.8 Using the nth term of a sequence	Use the nth term to generate terms of a sequence.	102/103			
	Find the nth term of an arithmetic sequence.	102/103			

FOUNDATION – Unit 6: Angles




Topic	Objective	MW			
6.1 Properties of shapes	Solve geometric problems using side and angle properties of quadrilaterals.	13/45			
	Identify congruent shapes.	12b			
6.2 Angles in parallel lines	Understand and use the angle properties of parallel lines.	120			
	Find missing angles using corresponding and alternate angles.	120			
6.3 Angles in triangles	Solve angle problems in triangles.	121/122			
	Understand angle proofs about triangles.				
6.4 Exterior and interior angles	Calculate the interior and exterior angles of regular polygons.	123			
6.5 More exterior and interior angles	Calculate the interior and exterior angles of polygons.	123			
	Explain why some polygons fit together and some others do not	12a			
6.6 Geometrical patterns	Solve angle problems using equations.	120/121/ 122/135b			
	Solve geometrical problems showing reasoning.				

FOUNDATION – Unit 7: Averages and range




Topic	Objective	MW			
7.1 Mean and range	Calculate the mean from a list and from a frequency table.	62/130a			
	Compare sets of data using the mean and range.	62/130a			
7.2 Mode, median and range	Find the mode, median and range from a stem and leaf diagram.	128b			
	Identify outliers.				
	Estimate the range from a grouped frequency table.	130b			

7.3 Types of average	Recognise the advantages and disadvantages of each type of average.	62			
	Find the modal class.	130b			
	Find the median from a frequency table.	130b			
7.4 Estimating the mean	Estimate the mean of grouped data.	130b			
7.5 Sampling	Understand the need for sampling.	152			
	Understand how to avoid bias.	152			




FOUNDATION – Unit 8: Perimeter, area and volume 1

Topic	Objective	MW			
8.1 Rectangles, parallelograms and triangles	Calculate the perimeter and area of rectangles, parallelograms and triangles.	52/53/54/55			
	Estimate lengths, areas and costs.				
	Calculate a missing length, given the area.	52/53/54/55			
8.2 Trapezia and changing units	Calculate the area and perimeter of trapezia.	56			
	Find the height of a trapezium given its area.	56			
	Convert between area measures.				
8.3 Area of compound shapes	Calculate the perimeter and area of shapes made from triangles and rectangles.	52/53/54/55/56			
	Calculate areas in hectares, and convert between ha and m ² .				
8.4 Surface area of 3D solids	Calculate the surface area of a cuboid.	114a			
	Calculate the surface area of a prism.	114b			
8.5 Volume of prisms	Calculate the volume of a cuboid.	115			
	Calculate the volume of a prism.	119			
8.6 More volume and surface area	Solve problems involving surface area and volume.	114a/114b/115/119			
	Convert between measures of volume.				

FOUNDATION – Unit 9: Graphs




Topic	Objective	MW			
9.1 Coordinates	Find the midpoint of a line segment.	133			
	Recognise, name and plot straight-line graphs parallel to the axes.				
9.2 Linear graphs	Generate and plot coordinates from a rule.	96			
	Plot straight-line graphs from tables of values.	96			
	Draw graphs to represent relationships.	96			
9.3 Gradient	Find the gradient of a line.	97			
	Identify and interpret the gradient from an equation.	97			
	Understand that parallel lines have the same gradient.	97/159b			
9.4 $y = mx + c$	Understand what m and c represent in $y = mx + c$.	159a/159b			
	Find the equations of straight-line graphs.	159a/159b			
	Sketch graphs given the values of m and c .	159a/159b			
9.5 Real-life graphs	Draw and interpret graphs from real data.				
9.6 Distance-time graphs	Use distance–time graphs to solve problems.	143			
	Draw distance–time graphs.	143			
	Interpret rate of change graphs.				
9.7 More real-life graphs	Draw and interpret a range of graphs.	143			
	Understand when predictions are reliable.	143			

FOUNDATION – Unit 10: Transformations

Topic	Objective	MW			
10.1 Translation	Translate a shape on a coordinate grid.	50			
	Use a column vector to describe a translation.	50			



10.2 Reflection	Draw a reflection of a shape in a mirror line.	48			
	Draw reflections on a coordinate grid.	48			
	Describe reflections on a coordinate grid.	48			
10.3 Rotation	Rotate a shape on a coordinate grid.	49			
	Describe a rotation.	49			
10.4 Enlargement	Enlarge a shape by a scale factor.	148			
	Enlarge a shape using a centre of enlargement.	148			
10.5 Describing enlargements	Identify the scale factor of an enlargement.	148			
	Find the centre of enlargement.	148			
	Describe an enlargement.	148			
10.6 Combining transformations	Transform shapes using more than one transformation.	182			
	Describe combined transformations of shapes on a grid.	182			

FOUNDATION – Unit 11: Ratio and proportion

Topic	Objective	MW			
11.1 Writing ratios	Use ratio notation.	38			
	Write a ratio in its simplest form.	38			
	Solve problems using ratios.	38			
11.2 Using ratios 1	Solve simple problems using ratios.	38			
11.3 Ratios and measures	Use ratios to convert between units.	38			
	Write and use ratios for shapes and their enlargements.	38			
11.4 Using ratios 2	Divide a quantity into 2 parts in a given ratio.	106			
	Divide a quantity into 3 parts in a given ratio.	106			
	Solve word problems using ratios.	106			
11.5 Comparing using ratios	Use ratios involving decimals.	38			
	Compare ratios.	38			
	Solve ratio and proportion problems.	38			




11.6 Using proportion	Use the unitary method to solve proportion problems.	39/42			
	Solve proportion problems in words.	39/42			
	Work out which product is better value for money.	39/42			
11.7 Proportion and graphs	Recognise and use direct proportion on a graph.	107			
	Understand the link between the unit ratio and the gradient.	107			
11.8 Proportion problems	Recognise different types of proportion.	42			
	Solve word problems involving direct and inverse proportion.	42			

FOUNDATION – Unit 12: Right-angled triangles

Topic	Objective	MW			
12.1 Pythagoras' theorem 1	Understand Pythagoras' theorem.	150b			
	Calculate the length of the hypotenuse in a right-angled triangle.	150b			
	Solve problems using Pythagoras' theorem.	150b			
12.2 Pythagoras' theorem 2	Calculate the length of a line segment AB.	150b			
	Calculate the length of a shorter side in a right-angled triangle.	150b			
12.3 Trigonometry: the sine ratio 1	Understand and recall the sine ratio in right-angled triangles.	168			
	Use the sine ratio to calculate the length of a side in a right-angled triangle.	168			
	Use the sine ratio to solve problems.	168			
12.4 Trigonometry: the sine ratio 2	Use the sine ratio to calculate an angle in a right-angled triangle.	168			
	Use the sine ratio to solve problems.	168			
12.5 Trigonometry: the cosine ratio	Understand and recall the cosine ratio in right-angled triangles.	168			
	Use the cosine ratio to calculate the length of a side in a right-angled triangle.	168			




	Use the cosine ratio to calculate an angle in a right-angled triangle.	168			
	Use the cosine ratio to solve problems.	168			
12.6 Trigonometry: the tangent ratio	Understand and recall the tangent ratio in right-angled triangles.	168			
	Use the tangent ratio to calculate the length of a side in a right-angled triangle	168			
	Use the tangent ratio to calculate an angle in a right-angled triangle.	168			
	Solve problems using an angle of elevation or depression.	168			
12.7 Finding lengths and angles using trigonometry	Understand and recall trigonometric ratios in right-angled triangles.	168			
	Use trigonometric ratios to solve problems.	168			
	Know the exact values of the sine, cosine and tangent of some angles.	168			

FOUNDATION – Unit 13: Probability




Topic	Objective	MW			
13.1 Calculating probability	Calculate simple probabilities from equally likely events.	14/59			
	Understand mutually exclusive and exhaustive outcomes	60			
13.2 Two events	Use two-way tables to record the outcomes from two events.	61			
	Work out probabilities from sample space diagrams.	69/126			
13.3 Experimental probability	Find and interpret probabilities based on experimental data.	125			
	Make predictions from experimental data.	125			
13.4 Venn diagrams	Use Venn diagrams to work out probabilities.	185			
	Understand the language of sets and Venn diagrams.	127a/127b			
13.5 Tree diagrams	Use frequency trees and tree diagrams.	57/175			
	Work out probabilities using tree diagrams.	175			
	Understand independent events.	175			

13.6 More tree diagrams	Understand when events are not independent.	204			
	Solve probability problems involving events that are not independent.	204			

FOUNDATION – Unit 14: Multiplicative reasoning




Topic	Objective	MW			
14.1 Percentages	Calculate a percentage profit or loss.	109			
	Express a given number as a percentage of another in more complex situations.	88/89			
	Find the original amount given the final amount after a percentage increase or decrease	110			
14.2 Growth and decay	Find an amount after repeated percentage change.	86/87/108/164			
	Solve growth and decay problems.	108/164			
14.3 Compound measures	Solve problems involving compound measures.	142			
14.4 Distance, speed and time	Convert between metric speed measures.	112			
	Calculate average speed, distance and time.	142			
	Use formulae to calculate speed and acceleration.	142			
14.5 Direct and inverse proportion	Use ratio and proportion in measures and conversions.	199			
	Use inverse proportions.	199			

FOUNDATION – Unit 15: Constructions, loci and bearings




Topic	Objective	MW			
15.1 3D solids	Recognise 3D shapes and their properties.				
	Describe 3D shapes using the correct mathematical words.				
	Understand the 2D shapes that make up 3D objects.				
15.2 Plans and elevations	Identify and sketch planes of symmetry of 3D shapes.				

	Understand and draw plans and elevations of 3D shapes.	51			
	Sketch 3D shapes based on their plans and elevations.	51			
15.3 Accurate drawings 1	Make accurate drawings of triangles using a ruler, protractor and compasses.	47/147			
	Identify SSS, ASA, SAS and RHS triangles as unique from a given description.	166			
	Identify congruent triangles	166			
15.4 Scale drawings and maps	Draw diagrams to scale.	38			
	Correctly interpret scales in real-life contexts.	38			
	Use scales on maps and diagrams to work out lengths and distances.	38			
	Know when to use exact measurements and estimations on scale drawings and maps.	38			
	Draw lengths and distances correctly on given scale drawings.	38			
15.5 Accurate drawings 2	Accurately draw angles and 2D shapes using a ruler, protractor and compasses.	47/147			
	Construct a polygon inside a circle.				
	Recognise nets and make accurate drawings of nets of common 3D objects.	44			
15.6 Constructions	Draw accurately using rulers and compasses.	145/146a/146b			
	Bisect angles and lines using rulers and compasses.	145/146a/146b			
15.7 Loci and regions	Draw loci for the path of points that follow a given rule.	165			
	Identify regions bounded by loci to solve practical problems.	165			
15.8 Bearings	Find and use three-figure bearings.	124			
	Use angles at parallel lines to work out bearings.	124			
	Solve problems involving bearings and scale diagrams.	124			

FOUNDATION – Unit 16: Quadratic equations and graphs




Topic	Objective	MW			
16.1 Expanding double brackets	Multiply double brackets.	134b			
	Recognise quadratic expressions.	134b			
	Square single brackets.	134b			
16.2 Plotting quadratic graphs	Plot graphs of quadratic functions.	98			
	Recognise a quadratic function.	98			
	Use quadratic graphs to solve problems.	98			
16.3 Using quadratic graphs	Solve quadratic equations $ax^2 + bx + c = 0$ using a graph.	98/160			
	Solve quadratic equations $ax^2 + bx + c = k$ using a graph.	98/160			
16.4 Factorising quadratic expressions	Factorising quadratic expressions	157/158			
16.5 Solving quadratic equations algebraically	Solving quadratic expressions algebraically	157/158			

FOUNDATION – Unit 17: Perimeter, area and volume 2




Topic	Objective	MW			
17.1 Circumference of a circle 1	Calculate the circumference of a circle.	118			
	Solve problems involving the circumference of a circle.	118			
17.2 Circumference of a circle 2	Calculate the circumference and radius of a circle.	118			
	Work out percentage error intervals.	155			
17.3 Area of a circle	Work out the area of a circle.	117			
	Work out the radius or diameter of a circle.	117			
	Solve problems involving the area of a circle.	117			
	Give answers in terms of π .	117			
17.4 Semicircles and sectors	Understand and use maths language for circles and perimeters.	117/167			
	Work out areas of semicircles and quarter circle and perimeters.	117/167			

	Solve problems involving sectors of circles.	117/167			
17.5 Composite 2D shapes and cylinders	Solve problems involving areas and perimeters of 2D shapes.	117/118/119			
	Work out the volume and surface area of cylinders.	117/118/119			
17.6 Pyramids and cones	Work out the volume of a pyramid.	170			
	Work out the surface area of a pyramid.	170			
	Work out the volume of a cone.	171			
	Work out the surface area of a cone.	171			
17.7 Spheres and composite solids	Work out the volume of a sphere.	169			
	Work out the surface area of a sphere.	169			
	Work out the volume and surface area of composite solids.	119/170/171/169			




FOUNDATION – Unit 18: Fractions, indices and standard form

Topic	Objective	MW			
18.1 Multiplying and dividing fractions	Multiply and divide mixed numbers and fractions.	73/74			
18.2 The laws of indices	To know and use the laws of indices.	131			
18.3 Writing large numbers in standard form	Write large numbers in standard form.	83			
	Convert large numbers from standard form into ordinary numbers.	83			
18.4 Writing small numbers in standard form	Write small numbers in standard form.	83			
	Convert numbers from standard form with negative powers of ordinary numbers	83			
18.5 Calculating with standard form	To multiply and divide numbers in standard form.	83			
	To add and subtract numbers in standard form.	83			

FOUNDATION – Unit 19: Congruence, similarity and vectors

Topic	Objective	MW			
19.1 Similarity and enlargement	Understand similarity.	144			
	Use similarity to solve angle problems.	144			
19.2 More similarity	Find the scale factor of an enlargement.	144			
	Use similarity to solve problems.	144			
19.3 Using similarity	Understand the similarity of regular polygons.	144			
	Calculate perimeters of similar shapes.	144			
19.4 Congruence 1	Recognise congruent shapes.	12b/166			
	Use congruence to work out unknown angles.	12b/166			
19.5 Congruence 2	Use congruence to work out unknown sides.	12b/166			
19.6 Vectors 1	Add and subtract vectors.	174			
	Find the resultant of two vectors.	174			
19.7 Vectors 2	Subtract vectors.	174			
	Find multiples of a vector.	174			

FOUNDATION – Unit 20: More algebra

Topic	Objective	MW			
20.1 Graphs of cubic and reciprocal functions	Draw and interpret graphs of cubic functions.	161			
	Draw and interpret graphs of $y = 1/x$.	161			
20.2 Non-linear graphs	Draw and interpret non-linear graphs to solve problems.				
20.3 Solving simultaneous equations graphically	Solve simultaneous equations by drawing a graph.	140			
	Write and solve simultaneous equations.	140			
20.4 Solving simultaneous equations algebraically	Solve simultaneous equations algebraically.	162			
20.5 Rearranging formulae	Change the subject of a formula.	136			

20.6 Proof	Identify expressions, equations, formulae and identities.	137			
	Prove results using algebra.				