GCSE Mathematics
Higher 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

HIGHER – Unit 1: Number

Topic	Objective	MW	☹	😐	☺
1.1 Number problems and reasoning	Work out the total number of ways of performing a series of tasks.	58/69			
1.2 Place value and estimating	Estimate an answer.	75/90/91			
	Use place value to answer questions.	92			
1.3 HCF and LCM	Write a number of the product of its prime factors.	78			
	Find the HCF and LCM of two numbers.	79/80			
1.4 Calculating with powers (indices)	Use powers and roots in calculations.	29/82			
	Multiply and divide using index laws.	131			
	Work out a power raised to a power.	131			
1.5 Zero, negative and fractional indices	Use negative indices.	154			
	Use fractional indices.	188			
1.6 Powers of 10 and standard form	Write a number in standard form.	83			
	Calculate with numbers in standard form.	83			
1.7 Surds	Understand the difference between rational and irrational numbers.	297a			
	Simplify a surd.	207b			
	Rationalise a denominator.	207c			

HIGHER – Unit 2: Algebra

Topic	Objective	MW	☹	😐	☺
2.1 Algebraic indices	Use the rules of indices to simplify algebraic expressions.	131			
2.2 Expanding and factorising	Expand brackets.	93/134a			
	Factorise algebraic expressions.	94			
2.3 Equations	Solve equations involving brackets and numerical fractions.	135a			
	Use equations to solve problems.	137			
2.4 Formulae	Substitute numbers into formulae.	95			

	Rearrange formulae.	136			
	Distinguish between expressions, equations, formulae and identities.	137			
2.5 Linear sequences	Find a general formula for the nth term of an arithmetic sequence.	102/103			
	Determine whether a particular number is a term of a given arithmetic sequence.	102/103			
2.6 Non-linear sequences	Solve problems using geometric sequences.	9/163			
	Work out terms in Fibonnaci-like sequences.	104			
	Find the nth term of a quadratic sequence.	213			
2.7 More expanding and factorising	Expand the product of two brackets.	134b/178			
	Use the difference of two squares.	158			
	Factorise quadratics of the form $x^2 + bx + c$.	157			

HIGHER – Unit 3: Interpreting and representing data

Topic	Objective	MW	😞	😐	🙂
3.1 Statistical diagrams 1	Construct and use back-to-back stem and leaf diagrams.	128b			
	Construct and use frequency polygons and pie charts.	128a/65a/65b			
3.2 Time series	Plot and interpret time series graphs.	153			
	Use trends to predict what might happen in the future.	153			
3.3 Scatter graphs	Plot and interpret scatter graphs.	129			
	Determine whether or not there is a linear relationship between two variables.	129			
3.4 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			
3.5 Averages and range	Decide which average is best for a set of data.	62			
	Estimate the mean and range from a grouped frequency table.	130a/130b			

	Find the modal class and the group containing the median.	130b			
3.6 Statistical diagrams 2	Construct and use two-way tables.	61			
	Choose appropriate diagrams to display data.				
	Recognise misleading graphs.				

HIGHER – Unit 4: Fractions, ratio and percentage

Topic	Objective	MW	😦	😐	😊
4.1 Fractions	Add, subtract, multiply and divide fractions and mixed numbers.	71a/71b/73/74			
	Find the reciprocal of an integer, decimal or fraction.	76			
4.2 Ratios	Write ratios in the form 1 : n or n : 1.	38			
	Compare ratios.	38			
	Find quantities using ratios.	38			
	Solve problems involving ratios.	106			
4.3 Ratio and proportion	Convert between currencies and measures.	105			
	Recognise and use direct proportion.	41/42/199			
	Solve problems involving ratios and proportion.	107			
4.4 Percentages	Work out percentage increases and decreases.	108/109/110			
	Solve real-life problems involving percentages.	108/109/110/111			
4.5 Fractions, decimals and percentages	Calculate using fractions, decimals and percentages	85			
	Convert a recurring decimal to a fraction	177/189			

HIGHER – Unit 5: Angles and trigonometry

Topic	Objective	MW	😦	😐	😊
5.1 Angle properties of triangles and quadrilaterals	Derive and use the sum of angles in a triangle and in a quadrilateral.	121/122			

Topic	Objective	MW	:(	:|	:)
	Derive and use the fact that the exterior angle of a triangle is equal to the sum of the two opposite interior angles.				
5.2 Interior angles of a polygon	Calculate the sum of the interior angles of a polygon.	123			
	Use the interior angles of polygons to solve problems.	123			
5.3 Exterior angles of a polygon	Know the sum of the exterior angles of a polygon.	123			
	Use the angles of polygons to solve problems.	123			
5.4 Pythagoras' theorem 1	Calculate the length of the hypotenuse in a right-angled triangle.	150b			
	Solve problems using Pythagoras' theorem.	150b			
5.4 Pythagoras' theorem 2	Calculate the length of a shorter side in a right-angled triangle.	150b			
	Solve problems using Pythagoras' theorem.	150b			
5.6 Trigonometry 1	Use trigonometric ratios to find lengths in a right-angled triangle.	168			
	Use trigonometric ratios to solve problems.	168			
5.7 Trigonometry 2	Use trigonometric ratios to calculate an angle in a right-angled triangle.	168			
	Find angles of elevation and angles of depression.	168			
	Use trigonometric ratios to solve problems.	168			
	Know the exact values of the sine, cosine and tangent of some angles.	173			

HIGHER – Unit 6: Graphs

Topic	Objective	MW	:(	:|	:)
6.1 Linear graphs	Find the gradient and y-intercept from a linear equation.	159b			
	Rearrange an equation into the form y = mx + c.	159b			
	Compare two graphs from their equations.	159b			
	Plot graphs with equations ax + by = c.	96/159b			

6.2 More linear graphs	Sketch graphs using the gradient and intercepts.	96/159b			
	Find the equation of a line, given its gradient and one point on the line.	159b			
	Find the gradient of a line through two points.	97/159a/159b			
6.3 Graphing rates of change	Draw and interpret distance–time graphs.	143			
	Calculate average speed from a distance–time graph.	143			
	Understand velocity–time graphs.	216a			
	Find acceleration and distance from velocity–time graphs.	216a			
6.4 Real-life graphs	Draw and interpret real-life linear graphs.	143/216a			
	Recognise direct proportion.	129			
	Draw and use a line of best fit.	129			
6.5 Line segments	Find the coordinates of the midpoint of a line segment.	133			
	Find the gradient and length of a line segment.	97			
	Find the equations of lines parallel or perpendicular to a given line.	208			
6.6 Quadratic graphs	Draw quadratic graphs.	98			
	Solve quadratic equations using graphs.	160			
	Identify the line of symmetry of a quadratic graph	160			
	Interpret quadratic graphs relating to real-life situations.				
6.7 Cubic and reciprocal graphs	Draw graphs of cubic functions.	161			
	Solve cubic equations using graphs.	161			
	Draw graphs of reciprocal functions.	161			
	Recognise a graph from its shape.	161			
6.8 More graphs	Interpret linear and non-linear real-life graphs.				
	Draw the graph of a circle.	197			

HIGHER – Unit 7: Area and volume

Topic	Objective	MW	😟	😐	🙂
7.1 Perimeter and area	Find the perimeter and area of compound shapes.	52/53/54/55			
	Recall and use the formula for the area of a trapezium.	56			
7.2 Units and accuracy	Convert between metric units of area.				
	Calculate the maximum and minimum possible values of a measurement.	132/155/206			
7.3 Prisms	Convert between metric units of volume.				
	Calculate volumes and surface areas of prisms.	114a/114b/115/119			
7.4 Circles	Calculate the area and circumference of a circle.	117/118			
	Calculate area and circumference in terms of π.				
7.5 Sectors of circles	Calculate the perimeter and area of semicircles and quarter circles.	167			
	Calculate arc lengths, angles and areas of sectors of circles.	167			
7.6 Cylinders and spheres	Calculate volume and surface area of a cylinder and a sphere.	119/169			
	Solve problems involving volumes and surface areas.				
7.7 Pyramids and cones	Calculate volume and surface area of pyramids and cones.	170/171			
	Solve problems involving pyramids and cones.	170/171			

HIGHER – Unit 8: Transformations and constructions

Topic	Objective	Tier	MW	😟	😐	🙂
8.1 3D solids	Draw plans and elevations of 3D solids.	F/H	51			
8.2 Reflection and rotation	Reflect a 2D shape in a mirror line.	F/H	48			
	Rotate a 2D shape about a centre of rotation.	F/H	49			
	Describe reflections and rotations.	F/H	48/49			

Topic	Objective		MW			
8.3 Enlargement	Enlarge shapes by fractional and negative scale factors about a centre of enlargement.	F/H H	148/181a/181b			
8.4 Transformations and combinations of transformations	Translate a shape using a vector.	F/H	50			
	Carry out and describe combinations of transformations.	F/H	182			
8.5 Bearings and scale drawings	Draw and use scales on maps and scale drawings.	F/H	124			
	Solve problems involving bearings.	F/H	124			
8.6 Constructions 1	Construct triangles using a ruler and compasses.	F/H	47			
	Construct the perpendicular bisector of a line.	F/H	146a			
	Construct the shortest distance from a point to a line using a ruler and compasses.	F/H	146b			
8.7 Constructions 2	Bisect an angle using a ruler and compasses.	F/H	145			
	Construct angles using a ruler and compasses.	F/H	46b			
	Construct shapes made from triangles using a ruler and compasses.	F/H	147			
8.8 Loci	Draw a locus.	F/H	165			
	Use loci to solve problems.	H	165			

HIGHER – Unit 9: Equations and inequalities

Topic	Objective	MW	😞	😐	😊
9.1 Solving quadratic equations 1	Find the roots of quadratic functions.	157/160			
	Rearrange and solve simple quadratic equations.	157/160			
9.2 Solving quadratic equations 2	Solve more complex quadratic equations.	192			
	Use the quadratic formula to solve a quadratic equation.	191			
9.3 Completing the square	Complete the square for a quadratic expression.	209a			
	Solve quadratic equations by completing the square.	209b			

Topic	Objective				
9.4 Solving simple simultaneous equations	Solve simple simultaneous equations.	162			
	Solve simultaneous equations for real-life situations.	162			
9.5 More simultaneous equations	Use simultaneous equations to find the equation of a straight line.	162			
	Solve linear simultaneous equations where both equations are multiplied.	162			
	Interpret real-life situations involving two unknowns and solve them.	162			
9.6 Solving linear and quadratic simultaneous equations	Solve simultaneous equations with one quadratic equation.	211			
	Use real-life situations to construct quadratic and linear equations and solve them.	211			
9.7 Solving linear inequalities	Solve inequalities and show the solution on a number line and using set notation.	138/139			

HIGHER – Unit 10: Probability

Topic	Objective	MW	😞	😐	🙂
10.1 Combined events	Use the product rule for finding the number of outcomes for two or more events.	58/69			
	List all the possible outcomes of two events in a sample space diagram.	69/126			
10.2 Mutually exclusive events	Identify mutually exclusive outcomes and events.	60			
	Find the probabilities of mutually exclusive outcomes and events.	60			
	Find the probability of an event not happening.	60			
10.3 Experimental probability	Work out the expected results for experimental and theoretical probabilities.	125			
	Compare real results with theoretical expected values to see if a game is fair.	125			
10.4 Independent events and tree diagrams	Draw and use frequency trees.	57			
	Calculate probabilities of repeated events.	151			

	Draw and use probability tree diagrams.	151			
10.5 Conditional probability	Decide if two events are independent.				
	Draw and use tree diagrams to calculate conditional probability.	175/204			
	Draw and use tree diagrams without replacement.	175			
	Use two-way tables to calculate conditional probability.	61			
10.6 Venn diagrams and set notation	Use Venn diagrams to calculate conditional probability.	185			
	Use set notation.	127a/127b			

HIGHER – Unit 11: Multiplicative reasoning

Topic	Objective	MW	😞	😐	😊
11.1 Growth and decay	Find an amount after repeated percentage changes.	108/164			
	Solve growth and decay problems.	108/164			
11.2 Compound measures	Calculate rates.	142			
	Convert between metric speed measures.	142			
	Use a formula to calculate speed and acceleration.	142			
11.3 More compound measures	Solve problems involving compound measures.	142			
11.4 Ratio and proportion	Use relationships involving ratio.	107			
	Use direct and indirect proportion.	199			

HIGHER – Unit 12: Similarity and congruence

Topic	Objective	MW	😞	😐	😊
12.1 Congruence	Show that two triangles are congruent.	12b/166			
	Know the conditions of congruence.	166			
12.2 Geometric proof and congruence	Prove shapes are congruent.	166			
	Solve problems involving congruence.	166			

12.3 Similarity	Use the ratio of corresponding sides to work out scale factors.	144			
	Find missing lengths on similar shapes.	144			
12.4 More similarity	Use similar triangles to work out lengths in real life.	144			
	Use the link between linear scale factor and area scale factor to solve problems.	144/200			
12.5 Similarity in 3D solids	Use the link between scale factors for length, area and volume to solve problems.	200			

HIGHER – Unit 13: More trigonometry

Topic	Objective	MW	●● (sad)	∙∙ (neutral)	●● (smile)
13.1 Accuracy	Understand and use upper and lower bounds in calculations involving trigonometry.				
13.2 Graph of the sine function	Understand how to find the sine of any angle.	195a			
	Know the graph of the sine function and use it to solve equations.	195a			
13.3 Graph of the cosine function	Understand how to find the cosine of any angle.	195a			
	Know the graph of the cosine function and use it to solve equations.	195a			
13.4 The tangent function	Understand how to find the tangent of any angle.	195b			
	Know the graph of the tangent function and use it to solve equations.	195b			
13.5 Calculating areas and the sine rule	Find the area of a triangle and a segment of a circle.	201/203			
	Use the sine rule to solve 2D problems.	201/203			
13.6 The cosine rule and 2D trigonometric problems	Use the cosine rule to solve 2D problems.	202			
	Solve bearings problems using trigonometry.	202			
13.7 Solving problems in 3D	Use Pythagoras' theorem in 3D.	217			
	Use trigonometry in 3D.	218			
13.8 Transforming trigonometric graphs 1	Recognise how changes in a function affect trigonometric graphs.	196b			

13.9 Transforming trigonometric graphs 2	Recognise how changes in a function affect trigonometric graphs.	196b			

HIGHER – Unit 14: Further statistics

Topic	Objective	MW	😞	😐	😊
14.1 Sampling	Understand how to take a simple random sample.	152			
	Understand how to take a stratified sample.	176			
14.2 Cumulative frequency	Draw and interpret cumulative frequency tables and diagrams.	186			
	Work out the median, quartiles and interquartile range from a cumulative frequency diagram.	186			
14.3 Box plots	Find the quartiles and the interquartile range from stem-and-leaf diagrams.	187			
	Draw and interpret box plots.	187			
14.4 Drawing histograms	Understand frequency density.	205			
	Draw histograms.	205			
14.5 Interpreting histograms	Interpret histograms.	205			
14.6 Comparing and describing populations	Compare two sets of data.				

HIGHER – Unit 15: Equations and graphs

Topic	Objective	MW	😞	😐	😊
15.1 Solving simultaneous equations graphically	Solve simultaneous equations graphically.	140/211			
15.2 Representing inequalities graphically	Represent inequalities on graphs.	198			
	Interpret graphs of inequalities.	198			
15.3 Graphs of quadratic functions	Recognise and draw quadratic functions.	98/160			
15.4 Solving quadratic equations graphically	Find approximate solutions to quadratic equations graphically	98/160			
	Solve quadratic equations using an iterative process.	180/212			

Topic	Objective	MW			
15.5 Graphs of cubic functions	Find the roots of cubic equations.	178/161			
	Sketch graphs of cubic functions.	161			
	Solve cubic equations using an iterative process.	161/180			

HIGHER – Unit 16: Circle theorems

Topic	Objective	MW	☹	😐	🙂
16.1 Radii and chords	Solve problems involving angles, triangles and circles.	183			
	Understand and use facts about chords and their distance from the centre of a circle.	183			
	Solve problems involving chords and radii.	183			
16.2 Tangents	Understand and use facts about tangents at a point and from a point.	183			
	Give reasons for angle and length calculations involving tangents.	183			
16.3 Angles in circles 1	Understand, prove and use facts about angles subtended at the centre and the circumference of circles.	184			
	Understand, prove and use facts about the angle in a semicircle being a right angle.	184			
	Find missing angles using these theorems and give reasons for answers.	183			
16.4 Angles in circles 2	Understand, prove and use facts about angles subtended at the circumference of a circle.	183/184			
	Understand, prove and use facts about cyclic quadrilaterals.	183/184			
	Prove the alternate segment theorem.	183/184			
16.5 Applying circle theorems	Solve angle problems using circle theorems.	183			
	Give reasons for angle sizes using mathematical language.	183			
	Find the equation of the tangent to a circle at a given point.	183			

HIGHER – Unit 17: More algebra

Topic	Objective	MW	😞	😐	🙂
17.1 Rearranging formulae	Change the subject of a formula where the power of the subject appears once.	136			
	Change the subject of a formula where the subject appears twice.	190			
17.2 Algebraic fractions	Add and subtract algebraic fractions.	210a			
	Multiply and divide algebraic fractions.	210a			
	Change the subject of a formula involving fractions where all the variables are in the denominators.	190			
17.3 Simplifying algebraic fractions	Simplify algebraic fractions.	210a			
17.4 More algebraic fractions	Add and subtract more complex algebraic fractions.	210a			
	Multiply and divide more complex algebraic fractions.	210a			
17.5 Surds	Simplify expressions involving surds.	207a			
	Expand expressions involving surds.	207b			
	Rationalise the denominator of a fraction.	207c			
17.6 Solving algebraic fraction equations	Solve equations that involve algebraic fractions.	210b			
17.7 Functions	Use function notation.	215			
	Find composite functions.	215			
	Find inverse functions.	214a/214b			
17.8 Proof	Prove a result using algebra.	193			

HIGHER – Unit 18: Vectors and geometric proof

Topic	Objective	MW	😞	😐	🙂
18.1 Vectors and vector notation	Understand and use vector notation.	174/219			
	Work out the magnitude of a vector.	174/219			
18.2 Vector arithmetic	Calculate using vectors and represent the solutions graphically	174/219			
	Calculate the resultant of two vectors.	174/219			
18.3 More vector arithmetic	Solve problems using vectors.	174/219			

	Use the resultant of two vectors to solve vector problems.	174/219			
18.4 Parallel vectors and collinear points	Express points as position vectors.	174/219			
	Prove lines are parallel.	174/219			
	Prove points are collinear.	174/219			
18.5 Solving geometric problems	Solve geometric problems in two dimensions using vector methods.	174/219			
	Apply vector methods for simple geometric proofs.	174/219			

HIGHER – Unit 19: Proportion and graphs

Topic	Objective	MW	😟	😐	🙂
19.1 Direct proportion	Write and use equations to solve problems involving direct proportion.	199			
19.2 More direct proportion	Write and use equations to solve problems involving direct proportion.	199			
	Solve problems involving square and cubic proportionality.	199			
19.3 Inverse proportion	Write and use equations to solve problems involving inverse proportion.	199			
	Use and recognise graphs showing inverse proportion.	199			
19.4 Exponential functions	Recognise graphs of exponential functions.	194			
	Sketch graphs of exponential functions.	194			
19.5 Non-linear graphs	Calculate the gradient of a tangent at a point.	216b			
	Estimate the area under a non-linear graph.	216a			
19.6 Translating graphs of functions	Understand the relationship between translating a graph and the change in its function notation.	196a			
19.7 Reflecting and stretching graphs of functions	Understand the effect stretching a curve parallel to one of the axes has on its function form.	196a			
	Understand the effect reflecting a curve in one of the axes has on its function form.	196a			