Mathematics and Numeracy

Higher Checklist

Content that is for GCSE Mathematics only is highlighted in green.

	Course Content	Hegarty clip	R	A	G
9	**Unit 1: Number**				
	• Add, subtract, multiply, and divide	18,19,21,22			
	• Multiply / divide by multiples of 10	15,16			
	• Add, subtract, multiply, and divide negative numbers	39,40,42,43			
	• Order directed numbers	37			
	• BIDMAS / BODMAS	24,44			
	• Use of inverse operations	7,8,38			
	Unit 2: Types of number and use of index notation				
	• Odds, evens, multiples, factors, primes, squares, cubes, and reciprocals.	25,26,27,28,33,99,100,			
	• Indices – writing in index form	102			
	• Find vales of indices, eg. 6^3	103			
	• Multiply and divide index numbers	105,106			
	• Zero index	103			
	• Negative and fractional indices	104			
	• Powers and roots	101			
	• Use a calculator for powers and roots	107-110			
	• Prime factors in index form	29,30			
	• Use prime factors to make a perfect square and find square roots, HCF, and LCM.	32,35,36			

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	Course Content	Hegarty clip	R	A	G
9	**Unit 3: Decimals**				
	• Place value and order decimals	45,46			
	• Add and subtract whole numbers and decimals	47			
	• Multiply and divide whole numbers and decimals by a decimal number	48,49,50			
	Unit 4: Round to an appropriate degree of accuracy				
	• Round to any given number of decimal places	56			
	• Round to any given number of significant figures	130			
	• Estimate answers	131			
	• Know when to round up or down as appropriate	132			
	• Round an answer to a reasonable degree of accuracy considering the context	131,132			
	• Recognise limitations on the accuracy of data and measurements	131,132,			
	• Knowledge of rounding to an appropriate degree of accuracy	131,132			
	Unit 5: Fractions				
	• Equivalent fractions, top heavy to mixed & vice versa	57,58,59,61,63,64			
	• Ordering fractions	60			
	• Fractions of quantities	77			
	• One number as a fraction of another	62			
	• 4 rules of fractions	65,66,68,69,70,71			
	• Calculate fractional changes (increase & decrease)	79			
	• Problems involving fractions	80			

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	Course Content	Hegarty clip	R	A	G
9	**Unit 6: Ratio and proportion**				
	• Simplify ratios	328,329			
	• Use ratios to find unknown quantities eg as in scale diagrams or maps	331-337 739-742			
	• Division in a given ratio	332-334			
	• Number based direct/inverse proportion	339,340,341 343-347			
	• Recognise and interpret graphs that illustrate direct and inverse proportion	342,348			
	Unit 7: Units				
	• Metric conversions for length, weight & capacity	691-704			
	• Convert between metric & imperial units	705,706			
	• Time	709,710,711			
	Unit 8: Percentages				
	• Percentages of quantities with & without a calculator	84,85,86,87			
	• One number as a percentage of another with & without a calculator	97			
	• Percentage increase/decrease	88,90			
	• Use of multipliers for increase & decrease	89			
	• Profit/loss as a percentage of the original	90			
	• Simple/compound interest including depreciation	91,93.94			
	• Repeated proportional changes (use of formula $P \times (1 \pm r/100)^n$)	92,94,95			
	• Finding the original quantity	96,			

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	Course Content	Hegarty clip	R	A	G
9	**Unit 9: Fractions, decimals, ratios, and percentages**				
	• Interchange between fractions, decimals, percentages & ratios	52,55,73-76,82,83			
	• Use equivalences between decimals, fractions, ratios & percentages	52,55,73-76,82,83			
	• Order & compare sizes of fractions, decimals, ratios & percentages	52,55,73-76,82,83			
	• Recognise that recurring decimals are exact fractions	53,54			
	• Recognise that some exact fractions are recurring decimals	53,54			
	Unit 10: Everyday Maths				
	• Exchange rates & commissions	707,708			
	• TV schedules				
	• Bus and rail timetables				
	• Holiday bookings				
	• Distance charts	422,423,424			
	• Best buys	763- 772			
	• Personal and household finance including fuel and other bills	750,751,752,753,754,			
	• Hire purchase				
	• Discount & VAT	758			
	• Tax	756			
	• Wages and salaries	755			
	• Loan repayments, Mortgages				
	• Budgeting	757			
	• Enterprise, saving and borrowing	757			
	• Investing and use of AER and APR	xxxx			

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	Course Content	Hegarty clip	R	A	G
9	**Unit 11: Simplifying in Algebra**				
	• Directed numbers	38,39,			
	• Collect like terms (add & subtract)	156,157			
	• Multiply & divide, including rules of indices	158,159,174,175			
	• Remove/expand brackets	160,161			
	• Remove/expand touching brackets	162,163,164			
	• Remove/expand brackets such as $(x + 3)^2$	165			
	• Function machines				
	• Write algebraic expressions for worded problems	153			
	• Distinguish in meaning between equations, formulae, **identities**, and expressions	154,155			
	• Form, simplify expressions involving sums, differences, products & powers	221			
	Unit 12: Standard form				
	• Interpret numbers written in standard form	121,			
	• Change numbers into standard form	122			
	• Change from standard form to normal numbers	123			
	• Non calculator methods for standard form	125,126,127			
	• Use the calculator (EXP button) for standard form problems	128			
	• Problems involving standard form				

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	Course Content	Hegarty clip	R	A	G
9	**Unit 13: Drawing angles and angle facts**				
	• Understand that angles are part of a turn				
	• Name and recognise angles	455,456			
	• Estimate, draw and measure angles, including reflex angles	457,458,459,460,461,			
	• Use of correct notation	456			
	• Basic angle facts	477,478,812,813,814,479,480			
	• Properties of triangles and quadrilaterals	484,823,824,825,826			
	• Angles in triangles and quadrilaterals	485,486,487,560			
	• Angles in parallel lines	481,482,483			
	• Interior and exterior angles of polygons	561,562,563,564			
	• Use angle facts for tessellating shapes				
	• **Unit 14: Constructions**				
	• Construct triangles and 2-D shapes accurately	683			
	• Draw plans and elevations of any 3-D solid	837-844			
	• Using a ruler and a pair of compasses to do constructions:				
	○ Bisect a given line	660			
	○ Bisect a given angle	661			
	○ Construct angles of 60°, 30°, 90°, and 45°	664,665			

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	Course Content	Hegarty clip	R	A	G
9	**Unit 15: Locus/loci**				
	• Find the path of a point under given criteria	674			
	• 4 main loci:				
	○ Fixed distance from a point	674			
	○ Fixed distance from a line	674			
	○ Equidistant from 2 points	674			
	○ Equidistant from 2 lines which meet at a point	674			
	• Identify regions satisfied by the criteria of the locus	675,676,678			
	• Loci questions involving inequalities	679			
	Unit 16: Substitution in Algebra				
	• Function machines				
	• Substitution of positive & negative whole numbers, fractions & decimals into simple formulae expressed in words or symbols	780-787			
	Unit 17: Solve linear equations with whole number and fractional coefficients				
	• Solve linear equations including brackets	178,179,180,181,182 ,184,185,186			
	• Solve equations with fractions that have only numbers as denominators Eg. $\frac{x-2}{2} - \frac{2x-1}{3} = 1$	187			
	• Form & solve equations	176			
	• Form & solve linear equations in solving problems set in real-life contexts	188,189			
	Unit 18: Pythagoras' Theorem				
	• Find the hypotenuse	498			
	• Find a shorter side	499			
	• Test for right angled triangles	497			
	• Problems involving Pythagoras' Theorem	503,504			

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	Course Content	Hegarty clip	R	A	G
9	**Unit 19: Congruent shapes**				
	• Identify congruent shapes	680,681			
	• Understand and use SSS, SAS, ASA, RHS conditions to prove the congruence of triangles using formal arguments	682-690			
	Unit 20: Bearings and scale drawings				
	• Compass directions				
	• Understand & use (draw & measure) 3-figure bearings	492-496			
	• Understand scales written in various forms eg 1cm represents 500m or 1:500	869			
	• Interpret & construct scale drawings	870,871			
	• Use & interpret maps				
	• Problems involving bearings & scale diagrams	496			
	Unit 21: Simultaneous equations				
	• Solve simultaneous equations algebraically by the method of elimination	190-193			
	• Problems – form & then solve simultaneous equations	194-195			
	Unit 22: Straight line graphs				
	• Plot coordinates & set up x & y axes	199			
	• Draw, interpret, recognise & sketch the graphs of $x = a, y = b, y = ax + b$	205			
	• Tables of values & drawing linear graphs of type $y = ax + b$	206,207			
	• Gradients of parallel lines	201-204			
	• The gradient(m) & y-intercept(c)	201-204			
	• Find the equation of the line, using $y = mx + c$, when given either the points on the line or given the line	206-217			
	• Identify equations of lines parallel or perpendicular to a given line to satisfy given conditions	214,215,216			
	• Solve simultaneous equations graphically	218,219			
	• Find the coordinates of the mid-point of a line	200			

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	Course Content	Hegarty clip	R	A	G
9	**Unit 23: Averages/representing data**				
	• Find mean, median & mode from a frequency table	404-410			
	• Estimate the mean, find the median & modal class from a grouped frequency table	414-418			
	• Draw grouped frequency diagrams				
	• Draw frequency polygons	441			
	• Comparison of 2 distributions	413			

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	Course Content	Hegarty clip	R	A	G
10	**Unit 24: Cumulative frequency**				
	• Complete a cumulative frequency table	402,403			
	• Draw a cumulative frequency diagram	437-439			
	• Find the median, upper/lower quartiles & interquartile range from the diagram	438,439, 411,412			
	• Answer questions based on graph (less/more than)	438,439			
	• Comparison of 2 or more distributions	438,439			
	Unit 25: Box and whisker plots				
	• Produce box & whisker plots.	434,435,436			
	• Use box & whisker plots to compare distributions.	440			
	Unit 26: Construct and interpret graphs in everyday life				
	• Construct, use & interpret conversion graphs	712,713			
	• Construct, use & interpret graphs that describe real-life situations	874,875			
	• Interpret graphical representation used in the media and recognise that some graphs may be misleading	894,895			

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	Course Content	Hegarty clip	R	A	G
10	**Unit 27: Perimeter, area, volume, and density**				
	• Find perimeters of shapes	548-552			
	• Find areas of shapes	553-559			
	• Parts of a circle	592			
	• Find the circumference & area of circles	534-543			
	• Problems involving the above to include inverse problems & semicircles etc.				
	• Surface area of cubes, cuboids, prisms, pyramids, cylinders, cones, and spheres	584,585,586			
	• Volume of cubes, cuboids, prisms, pyramids, cylinders, cones, and spheres	567-577, 579-583			
	• Problems involving density, mass & volume	732,733			
	Unit 28: Dimensions of formulae				
	• Considerations of dimensions in order to determine between perimeter (1D), area (2D) & volume (3D)				
	Unit 29: Compound measures				
	• Use speed = distance ÷ time	716-724			
	• Use of miles per gallon	738			
	• Use of density	725-733			
	• Use of population density	738			
	Unit 30: Distance/Velocity-time graphs				
	• Construct and interpret travel graph	874-878			
	• Use speed = distance ÷ time based on graph	875-879			
	• Velocity/time, distance/time graphs	880,883,886			
	• Find velocities and time from graph	886			
	• Find acceleration by drawing tangents	881,882			
	• Construct and use tangents to curves to estimate rates of change for non-linear functions, and use appropriate compound measures to express results, including finding velocity in distance-time graphs and acceleration in velocity-time graphs	888,890			
	• Distance travelled (area under graph)	884,885			
	• Interpret the meaning of the area under a graph, including the area under velocity-time graphs and graphs in other practical and **financial contexts**	896			

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	Course Content	Hegarty clip	R	A	G
10	**Unit 31: Trigonometry**				
	• Label the sides of a right-angled triangle	508			
	• Sine, cosine & tangent formulae	508			
	• Use of SOHCAHTOA	509			
	• Calculate the length of sides	509,510			
	• Calculate the size of angles	511,512			
	• Angles of elevation & depression	515			
	• Problems involving Trigonometry & Pythagoras' Theorem, including the use of bearings	513,514			
	• Use trigonometry and Pythagoras' Theorem in 3D shapes	854-861			
	Unit 32: Transformations				
	• Revision of coordinates	199			
	• Reflection of 2D shapes in ○ x – axis, y – axis, y = a, x = a, y = +/- x	639-641			
	• Rotational symmetry & order	648,649			
	• Rotate about a given point clockwise/anticlockwise through a given angle	648,649			
	• Translation (under a given column vector)	637,638			
	• Enlarge a shape from a given scale factor	642			
	• Enlarge a shape from a given centre of enlargement	642			
	• Use of positive, negative & fractional scale factors	643-647			
	• Find the centre of enlargement	651			
	• Transform shapes using 2 successive transformations	656			
	• Describe the transformation(s) that a shape has gone through	650-654			

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	Course Content	Hegarty clip	R	A	G
10	**Unit 33: Algebra - factorising**				
	• Factorise common factors	221,222			
	• Factorise the difference of two squares	235,234			
	• Factorise simple quadratics eg $x^2 + 7x + 12$	223,224			
	• Factorise harder quadratics eg $2x^2 - 7x - 4$	225-228			
	Unit 34: Solve quadratic equations				
	• Solve quadratic equations by factorising first using				
	a. common factors	230-232			
	b. difference of two squares	235-238			
	c. quadratics (including harder ones which have a coefficient of $x^2 \geq 2$	233			
	• Solve quadratic equations using the formula	241,242			
	• Form and solve quadratic equations	245			
	Unit 35: Trial and improvement				
	• Solve a range of quadratic & cubic equations by trial & improvement methods. Answers correct to 1dp (& 2dp)	321			
	Unit 36: Change the subject of a formula				
	• Change the subject of a formula when the subject appears in one term	280,281,282,283			
	• Change the subject of a formula when the subject appears in more than one term	284,285,286			
	Unit 37: Draw accurately and interpret pie charts				
	• Draw pie charts by calculating angle size	427			
	• Calculate angles from percentages on chart	428			
	• Extract information from pie charts	427			
	• Find frequencies from given angles on pie charts	429			

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	Course Content	Hegarty clip	R	A	G
10	**Unit 38: Questionnaires**				
	• Design, criticise questions on questionnaires to include 'fairness' & 'bias'	399,400			
	• Test hypotheses, taking into account the limitations of the data available				
	• Specify the data needed and consider potential sampling methods.	394			
	Unit 39: Sampling				
	• Systematic sampling	395			
	• Random sampling	395			
	• Stratified sampling	396-398			
	• Consider the effect of sample size and other factors that affect the reliability of conclusions drawn	394			
	Unit 40: Scatter diagrams				
	• Set up axes for scatter graphs	453			
	• Plot points	453			
	• Types of correlation	453			
	• Draw the line of best fit by eye	454			
	• Draw the line of best fit through the mean point if it is given	454			
	• Obtain information from scatter graphs	454			
	Unit 41: Sequences				
	• Recognise & continue sequences (to include the difference method)	196,197			
	• Generate a sequence from a given nth term (linear & non-linear)	198,249			
	• Find the nth term of a linear or quadratic sequence from numbers or diagrams	247,248,249			

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	Course Content	Hegarty clip	R	A	G
10	**Unit 42: Probability**				
	• Definition of probability	349,350			
	• Calculate theoretical probabilities using scale 0-1	350, 351,352,			
	• Use of P(event not occurring) = 1 – P(event occurs)	353			
	• List all possible outcomes	358,359			
	• Possibility space diagrams & calculate probabilities	358,359			
	• Estimate the probability of an event as the proportion of times it has occurred	356			
	• Relative frequency	356			
	• The AND & OR rules	360			
	• Probability trees	361,362			
	• Conditional probability (not replaced)	364-367			
	• Solve problems with or without tree diagrams				
	Unit 43: Venn diagrams				
	• Understand and use Venn diagrams to solve problems	370,371,			
	• Understand and interpret set notation	378,383-391			

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	Course Content	Hegarty clip	R	A	G
11	**Unit 44: Histograms**				
	• Construction of histograms with unequal class widths	446			
	• Frequency density	442			
	• Find the frequency from a histogram	442			
	• Problems involving histograms	444			
	• Interpret histograms with unequal class widths	443,447,448,449			
	• Interpret histograms representing distributions with reference to mean and dispersion	448,449			

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	Course Content	Hegarty clip	R	A	G
11	**Unit 45: Inequalities and regions**				
	• Concept of an inequality	265,			
	• Symbols used	266			
	• The number line & representation of inequalities	267,268			
	• Solve linear inequality equations, including fractional ones	269,270,271			
	• Solve linear double inequality equations	272			
	• Regions – graphical solution to inequalities	273-275			
	• State the coordinates within a region	276			
	Unit 46: Variation				
	• Direct variation	339-341,343-345			
	• Inverse variation	342,346,347			
	• Link with graphical representation and find the value of k (and other constants where necessary) from a table of information and a graph	348			
	• Construct and use equations that describe direct and inverse proportion				
	• Recognise and interpret graphs that illustrate direct and indirect proportion	348			
	Unit 47: Non right-angled triangles				
	• Introduction to cosine rule	526-530			
	• Introduction to sine rule	520-525			
	• Areas of non-right angled triangles using $\frac{1}{2}absinC$	516-519			
	• Problems involving the above, including the use of bearings	531			
	• Use in the 2D and 3D shapes	863			

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	Course Content	Hegarty clip	R	A	G
11	**Unit 48: Arcs, sectors, and segments**				
	• Parts of a circle	592			
	• Lengths of arcs	544,545			
	• Area of sectors	546,547			
	• Area of segments				
	• Problems involving the above including reverse problems				
	Unit 49: Similar shapes				
	• Understand & use mathematical similarity, knowing that angles remain unchanged & that sides are in the same ratio	608,611			
	• Use the knowledge that for 2 similar 2D or 3D shapes one is an enlargement of the other	609,610,618			
	• Use the knowledge that in similar shapes corresponding dimensions are in the same ratio	610,611,612,613,614			
	• Prove that shapes are similar by looking at corresponding sides	610,611,612,613,614			
	• Find the lengths of missing sides using scale factors and the ratio of corresponding sides	610,611,612,613,614			
	• Understand and use the relationship between surface areas of similar shapes and volumes of similar 3D solids	615-621			
	• Recap volume of 3D shapes where similar shapes need to be used in order to find volumes or areas	567-577, 579-583			
	Unit 50: Error approximation/limits of accuracy				
	• Upper & lower bounds	137			
	• Upper & lower bounds used in calculations (+ -)	138,139			
	• Use of min,min & max,max for +/-	774,775,776,777			
	• Use of min,min & max,max for x/÷	774,775,776,777			
	• Percentage errors				

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	Course Content	Hegarty clip	R	A	G
11	**Unit 51: Circle theorems**				
	• Angle subtended at centre is twice one at circumference	594			
	• Angle subtended at the circumference in a semicircle is a right angle	595			
	• Angles in the same segment are equal (angles that are at the circumference and are subtended from the same arc)	596			
	• Opposite angles in a cyclic quadrilateral add to 180˚	597,603			
	• Tangent at any point to the circle is perpendicular to the radius	599			
	• Tangents from one point outside the circle are equal in length	600			
	• A line drawn from the radius to a chord at 90˚ bisects the chord	601			
	• Alternate segment theorem	598			
	• Understand and construct geometrical proofs using circle theorems	816-820			
	• Use of equal radii and tangents to create isosceles triangles	605			
	Unit 52: Algebraic Fractions				
	• Simplify algebraic fractions (may have to factorise too)	172			
	• Recap solving equations with numbers only in the denominator	187			
	• Solve equations with letters in denominator leading to solving a quadratic equation either by factorising or by using the formula	229,244			

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	Course Content	Hegarty clip	R	A	G
11	**Unit 53: Curved algebraic graphs**				
	• Tables of values & plotting points	251			
	• Draw, interpret, recognise & sketch graphs of $y = ax^2 + b, y = \frac{a}{x}, y = ax^3$	298-302			
	• Draw & interpret quadratic and cubic graphs $(y = ax^2 + bx + c, y = ax^3 + b)$	298-302			
	• Draw and interpret graphs of $y = ax + b + \frac{c}{x}$ with x not equal to 0, $y = ax^3 + bx^2 + cx + d, y = k^x$ for integer values of x and simple positive values of k	298-302			
	• Draw and interpret graphs when y is given implicitly in terms of x	257			
	• Solve equations using graphs (by drawing lines such as $y = 3$)	260			
	• Find the gradient at a point on algebraic graph	889			
	• Area under graph using trapezium rule	891-893			
	Unit 54: Trigonometric graphs				
	• Draw, sketch and know the behaviour of the graphs $y = sin\varphi$ $y = cos\varphi$ $y = tan\varphi$	303,304,305			
	• Solution of trigonometric graphs, eg of the form $5sin\varphi = 2$	306			
	Unit 55: Rational and Irrational numbers				
	• Distinguish between rational and irrational numbers				
	• Recap fractions as recurring decimals	53,54			
	• Recurring decimals as fractions	53,54			
	• Manipulate surds	111-117			
	• Use surds and π in exact calculations	118,119			
	• Simplify numerical expressions involving surds	118,119			

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	Course Content	Hegarty clip	R	A	G
11	**Unit 56: Graph sketching**				
	• Basic quadratic, cubic, reciprocal & exponential graphs	257,299,300,302			
	• Understand & use function notation	288,289			
	• Interpret & apply the transformation of functions in the context of their graphical representation, including $y = f(x + a), y = f(kx), y = kf(x), y = f(x) + a, y = -f(x)$, to $y = f(x)$	307-312			
	• Sketch the graph of functions from other functions such as $f(x)$ Eg. $y = f(x + a), y = f(kx), y = kf(x), y = f(x) + a, y = -f(x)$	313,293,294			