Topic: 1 Expression and Formulae

Learning Outcomes and Scaffolding	SPARXS Ref	Edexcel Ref
11.1.1 Understand the process of manipulating formulae or equations to change the subject, to include cases where the subject may appear twice or a power of the subject occurs	X737 X389	2.3, A(H)
π Make r the subject of: $v = \frac{4}{3}\pi r^3$		
π Make a the subject of: $3a + 5 = \frac{4-a}{r}$		
π Make l the subject of: $T = 2\pi\sqrt{\frac{l}{g}}$		

Topic: 2 Algebraic Manipulation

Learning Outcomes and Scaffolding	SPARXS Ref	Edexcel Ref
11.2.1 Complete the square for a given quadratic expression	X944	2.2, D(H)
π Write $2x^2 + 6x - 1$ in the form $a(x + b)^2 + c$		
11.2.2 Use algebra to support and construct proofs	X377	2.2, E(H)
π Be able to prove odd and even by expressing as $2n$ and $2n + 1$		
π Understand how to construct proofs about consecutive numbers algebraically		
π Understand how to prove a value is a factor or a multiple		

Topic: 3 Degree of Accuracy

Learning Outcomes and Scaffolding	SPARXS Ref	Edexcel Ref
11.3.1 Identify upper and lower bounds where values are given to a degree of accuracy	X851	1.8, C(F)
11.3.2 Use estimation to evaluate approximations to numerical calculations	X219	1.8, D(F)
π By rounding to 1 significant figure		
11.3.3 Solve problems using upper and lower bounds where values are given to a degree of accuracy	X616	1.8, A(H)
π Know how to find the maximum and minimum of a calculation involving $+, -, \times$ & $\div$		
π Use bounds in area and volume calculations to calculate minimum and maximum values		

Topic: 4 Trigonometry and Pythagoras' Theorem

Learning Outcomes and Scaffolding		SPARXS Ref	Edexcel Ref
11.4.1	Understand and use sine, cosine and tangent of obtuse angles	X316, X153, X327	4.8, A(H)
11.4.2	Understand and use angles of elevation and depression	X518	4.8, B(H)
11.4.3	Understand and use the sine and cosine rules for any triangle	X290, X196	4.8, C(H)
11.4.4	Use Pythagoras' Theorem in three dimensions	X822	4.8, D(H)
11.4.5	Understand and use the formula $\frac{1}{2}absin\,C$ for the area of a triangle	X697	4.8, E(H)
11.4.6	Apply trigonometrical methods to solve problems in 3 dimensions, including finding the angle between a line and a plane	X440	4.8, F(H)

Topic: 5 Quadratic Equations

Learning Outcomes and Scaffolding		SPARXS Ref	Edexcel Ref
11.5.1	solve quadratic equations by factorisation (limited to $x^2 + bx + c$)	X620	2.7, A(F)
11.5.2	solve quadratic equations by factorisation	X683	2.7, A(H)
	π $x(3x-2)=5$		
	π $2x^2-3x+1=0$		
11.5.3	solve quadratic equations by using the quadratic formula or completing the square	X203, X463	2.7, B(H)
11.5.4	form and solve quadratic equations from data given in a context	X172	2.7, C(H)
11.5.5	solve simultaneous equations in two unknowns, one equation being linear and the other being quadratic	X987	2.7, D(H)
	π $y=2x-11$ and $x^2+y^2=25$		
	π $y=11x-2$ and $y=5x^2$		

Topic: 6 Sequences

Learning Outcomes and Scaffolding		SPARXS Ref	Edexcel Ref
11.6.1	Use linear expressions to describe the n^{th} term of an arithmetic sequence	X989	3.1, C(F)
11.6.2	Understand and use common difference (d) and first term (a) in an arithmetic sequence		3.1, A(H)
	π Example: given the 2nd term is 7 and the 5th term is 19, find a and d		
11.6.3	Know and use nth term: $U_n = a + (n-1)d$		3.1, B(H)
11.6.4	Find the sum of the first n terms of an arithmetic series: $S_n = \frac{n}{2}(2a + (n-1)d)$	X850	3.1, C(H)
	π Example: given $4 + 7 + 10 + 13 + \cdots$ find the sum of the first 50 terms		

Topic: 7 Vectors

Learning Outcomes and Scaffolding		SPARXS Ref	Edexcel Ref
11.7.1	Understand that a vector has both magnitude and direction	X958	5.1, A(H)
11.7.2	Understand and use vector notation including column vectors	X954	5.1, B(H)
	π Both $\overrightarrow{OA}$ and $\boldsymbol{a}$ to be used		
11.7.3	Multiply vectors by scalar quantities		5.1, C(H)
11.7.4	Add and subtract vectors	X984	5.1, D(H)
11.7.5	Calculate the modulus (magnitude) of a vector	X958	5.1, E(H)
	π Find the magnitude of $\begin{pmatrix} 5 \\ -3 \end{pmatrix}$		
11.7.6	Find the resultant of two or more vectors	X984	5.1, F(H)
	π Example: $\overrightarrow{OA} = 3\boldsymbol{a}$, $\overrightarrow{AB} = 2\boldsymbol{b}$ and $\overrightarrow{BC} = \boldsymbol{c}$, find $\overrightarrow{OC}$ and $\overrightarrow{CA}$		
11.7.7	Apply vector methods for simple geometrical proofs	X907	5.1, G(H)
	π Prove that three points are colinear		
	π Prove that two vectors are parallel		

Topic: 8 Function Notation

Learning Outcomes and Scaffolding		SPARXS Ref	Edexcel Ref
11.8.1	Understand the concept that a function is a mapping between elements of two sets		3.2, A(H)
11.8.2	Use function notations of the form $f(x) = \ldots$ and $f : x \to \ldots$	X226	3.2, B(H)
11.8.3	Understand the terms 'domain' and 'range' and which values may need to be excluded from the domain	X547	3.2, C(H)
11.8.4	Understand and find the composite function $f(g(x))$ and the inverse function f^{-1}	X309, X945	3.2, D(H)

Topic: 9 Graphs

Learning Outcomes and Scaffolding		SPARXS Ref	Edexcel Ref
11.9.1	Recognise, plot and draw graphs with equation: $y = Ax^3 + Bx^2 + Cx + D$ in which:	X886	3.3, A(H)
	(i) the constants are integers and some could be zero		
	(ii) the letters x and y can be replaced with any other two letters		
11.9.2	Recognise, plot and draw graphs with equation: $y = Ax^3 + Bx^2 + Cx + D + \frac{E}{x} + \frac{F}{x^2}$ in which:	X268	3.3, A(H)
	(i) the constants are numerical and at least three of them are zero		
	(ii) the letters x and y can be replaced with any other two letters		
11.9.3	Recognise, plot and draw graphs with equation: $y = \sin x$, $y = \cos x$, $y = \tan x$ for angles of any size (in degrees)	X471	3.3, A(H)
11.9.4	Apply to the graph of $y = f(x)$, the transformations $y = f(x) + a, y = f(ax), y = f(x + a), y = af(x)$ for linear, quadratic, sine and cosine functions	X759	3.3, B(H)

11.9.5	Interpret and analyse transformations of functions and write the functions algebraically	X759	3.3, C(H)
11.9.6	Find the gradients of non-linear graphs by estimating from the tangent	X324	3.3, D(H)
11.9.7	Find the intersection points of two graphs, one linear (y_1) and one non-linear (y_2), and recognise that the solutions correspond to the solutions of $y_1 - y_2 = 0$	X862	3.3, E(H)
11.9.8	Calculate the gradient of a straight line given the coordinates of two points	X563	3.3, F(H)
11.9.9	Find the equation of a straight line parallel to a given line; find the equation of a straight line perpendicular to a given line	X238	3.3, G(H)

Topic: 10 Quadratic Inequalities

Learning Outcomes and Scaffolding		SPARXS Ref	Edexcel Ref
11.10.1	Solve quadratic inequalities in one unknown and represent the solution set on a number line	X214	2.8, A(H)

Topic: 11 Calculus

Learning Outcomes and Scaffolding		SPARXS Ref	Edexcel Ref
11.11.1	Understand the concept of a variable rate of change		3.4, A(H)
11.11.2	Differentiate integer powers of x	X354	3.4, B(H)
11.11.3	Determine gradients, rates of change, stationary points, turning points (maxima and minima) by differentiation and relate these to graphs	X715	3.4, C(H)
11.11.4	Distinguish between maxima and minima by considering the general shape of the graph only	X715	3.4, D(H)
11.11.5	Apply calculus to linear kinematics and to other simple practical problems	X301	3.4, E(H)