Higher Mathematics Skills Checklist

1.1	The Straight Line (APP)	👍	👈	👎
*	I know how to find the distance between 2 points using the Distance Formula or Pythagoras			
	I know how to find gradient from 2 points, angle (m = tan θ) and using the equation of a line			
*	I know that the gradients of parallel lines are equal			
*	I can find the equation of a straight line given 2 points or 1 point and a gradient			
*	I can find the equation of a horizontal or vertical line			
*	I can interpret all equations of a line			
	I can find the gradients of perpendicular lines using $m_1 \times m_2 = -1$			
	I can find the midpoint of 2 points			
	I can determine the equation of Altitudes, Medians and Perpendicular Bisectors			
	I can solve problems using properties of Straight Lines including intersections, concurrency and collinearity			
	I can use locus in problems			
	I understand the terms orthocentre, circumcentre and concurrency			
1.2	**Quadratics (RC)**	👍	👈	👎
*	I can determine whether a quadratic function has a maximum or minimum turning point			
*	I can complete the square and use it to find the turning of a graph			
*	I can sketch quadratic functions			
*	I can solve quadratic equations			
	I can solve quadratic inequations by sketching the graph of the function			

*	I know the discriminant is b^2-4ac			
*	I can use the discriminant to determine the nature of the roots of a quadratic equation			
*	I know if the roots of a quadratic equation are rational or irrational			
*	I can use the discriminant to find co-oefficients given the nature of the roots			
	I can form an equation with given roots			
	I can determine whether a line cuts, touches or does not meet a curve by using the discriminant			
	I know the conditions for tangency and can find the point of contact			
1.3	**Circle (APP)**	👍	👈	👎
	I know that the equation of the circle centre (a,b) and radius r is $(x-a)^2+(y-b)^2=r^2$			
	I know that $x^2 + y^2 + 2gx + 2fy + c=0$ represents a circle centre $(-g, -f)$ and radius $\sqrt{g^2+f^2-c}$ provided $g^2+f^2-c>0$			
	I can determine the radius and centre of a circle given the equation			
	I can determine the equation of a circle given the centre and radius			
	I can find the equation of a tangent to a circle			
	I can find the point of intersection of a line and a circle			
	I can find if/when a line is a tangent to a circle			
	I can determine whether 2 circles have 2, 1 or no points of intersection			
	Find the equation of a circle from 3 points (on a semi-circle)			

1.4	**Recurrence Relations (APP)**	👍	👈	👎
	I can use the notation $u_{n+1} = au_n + b$ to define a recurrence relation			
	I can evaluate previous and successive terms of a recurrence relation			
	I can state the conditions for a limit to exist $[-1 < a < 1]$			
	I can state whether a sequence will converge or diverge from its recurrence relation			
	I can evaluate the limit of a recurrence relation using $l = \frac{b}{1-a}$			
	I can solve recurrence relations to find a and b using simultaneous equations			
	I can solve recurrence relation problems written in context			
1.5	**Differentiation (APP + RC)**	👍	👈	👎
	I can use the notation $f'(x)$ and $\frac{dy}{dx}$ for a derivative			
	I can differentiate sums and differences			
	I can differentiate negative and fractional powers			
	I can express in differentiable form and differentiate			
	I can find the gradient of a point on a curve $y = f(x)$ at $x = a$			
	I can find the point on a curve given the gradient			
	I can find the equation of the tangent to a curve			
	I know the meaning of rate of change			
	I can find the rate of change of a function and use it to solve problems			

	I can find where curves are increasing and decreasing			
	I can find stationary points			
	I can determine the nature of stationary points			
	I can sketch a curve given its equation			
	I can solve problems finding greatest and least values using optimisation			
	I can find the maximum and minimum values in a closed interval			
	I can sketch the graph of a derived function			
1.6	**Integration (APP + RC)**	👍	👈	👎
	I can find the integral of $f(x) = px^n$			
	I can find the integral of sums and differences			
	I can integrate negative and fractional powers			
	I can express in integrable form and integrate			
	I can evaluate definite integrals			
	I can find the area between a curve and the x-axis			
	I know that there are no negative areas			
	I can find the area between two curves			
	I can solve differential equations			
2.1	**Polynomials (RC)**	👍	👈	👎
	I can find the remainder on dividing a polynomial by $(x-h)$			
	I can find the remainder on dividing a polynomial by $(ax+b)$			
	I can state my answer in the form $f(x) = (ax-b)Q(x)+R$			
	I can use the factor theorem to determine the			

	factors of a polynomial			
	I can determine the roots of a polynomial equation			
	I can find a polynomial's unknown coefficients using the factor theorem			
	I can find the intersection of a line and a polynomial			
	I can find if a line is a tangent to a polynomial			
	I can find the intersection of two polynomials			
	I can prove that an equation has a root between two given values and be able to improve on that			
	I can establish the equation of a polynomial from its graph or when given its roots			
2.2	**Sets and Functions (EF)**	👍	👈	👎
	I can understand and determine the domain and range of a function			
	I can obtain a formula for a composite function			
	I can evaluate a composite function			
	I can obtain a formula for the inverse of a linear function			
	I can complete the square and use it to find the turning of a graph			
	I know the general features of the exponential and logarithmic function			
	I know that the inverse function of $f(x) = a^x$ is $\log_a x$			
2.3	**Graphs and functions (EF)**	👍	👈	👎
	Sketch and annotate related graphs			
	$y = f(x) \pm a$			
	$y = f(x \pm a)$			
	$y = -f(x)$			
	$y = f(-x)$			

	$y = kf(x)$			
	$y = f(kx)$			
	Sketch and annotate related exponential and logarithmic functions			
	I can determine the equation of exponential and logarithmic functions from their graphs			
2.4	**Trigonometry: Graphs and Functions (EF)**	👍	👈	👎
*	I can identify the period and amplitude of a trigonometric function or graph			
*	I know the general features of Sine and Cosine graphs			
*	I can state the equation of a trigonometric function from its graph			
	I can convert from degrees to radians and vice versa			
*	I can determine exact values			
*	I can determine exact values in all 4 quadrants			
	I can solve problems using exact values			
	I can solve equations of the type $f(x) = g(x)$ graphically			
	I can solve trigonometric equations in a given interval			
	I can solve trigonometric equations involving compound angles			
2.5	**Addition formulae (EF)**	👍	👈	👎
	I know and can apply the addition formulae			
	I can use the addition formulae to prove trigonometric identities			
	I know and can apply the double angle formulae			
	I can apply trigonometric formulae to find the solution of a geometric problem			

	I can apply the double angle formulae to simplify trigonometric equations			
2.6	**The wave function (EF)**	👍	👈	👎
	I can solve simultaneous equations of the form $k\cos a = p, k\sin a = q$			
	I can express $a\cos x + b\sin x$ as a single function in the form $k\cos(x \pm \theta)$ or $k\sin(x \pm \theta)$			
	I can find the maximum, minimum and zeros of $a\cos x + b\sin x$ and the corresponding values of x			
	I can sketch the graph of $a\cos x + b\sin x$			
	I can solve equations of the form $a\cos x + b\sin x =$ c			
2.7	**Exponential and Logarithmic Functions (EF)**	👍	👈	👎
	I know that $a^y = x <=> \log_a x = y (a > 1, x > 0)$			
	I know that a function of the form $y = a^x$ is an exponential function to the base $a, a \neq 0$			
	I know and can use the laws of logarithms			
	I can simplify numerical expressions using the laws of logarithms eg $5\log_8 2 + \log_8 4 - \log_8 16$			
	I know that logarithms to the base e are called natural logs			
	I know $\log_e x = \ln x$			
	I can solve simple logarithmic and exponential equations			
	I can sketch associated exponential and logarithmic graphs			

	I can solve problems involving exponential growth and decay			
	I can use straight line graphs to confirm a relationship of the form $y = ax^b$ and $y = ab^x$			
2.8	**Vectors (EF)**	👍	👈	👎
*	I know that a vector is a quantity with both magnitude (size) and direction			
*	I can calculate the length of a vector			
*	I can calculate a component given two from A and B and vector AB			
	I know that a unit vector has a magnitude of 1 unit			
	I know that for parallel vectors $v = ku$			
*	I know and can apply the vectors *i*, *j* and *k*			
*	I can add, subtract and find scalar multiples of vectors			
*	I can simplify vector pathways			
*	I can interpret 2D sketches of 3D situations			
	I can determine whether 3 points are collinear in 3D			
	I can find the ratio in which one point divides 2 others			
	Given a ratio I can find or interpret the 3rd point/vector			
	I can calculate the scalar product using $a \cdot b = \|a\| \|b\| \cos\theta$			
	I can calculate the scalar product using $x_1x_2 + y_1y_2 + z_1z_2$			
	I know that if *a* and *b* are perpendicular then $a.b = 0$			
	I know that if $a.b = 0$ then *a* and *b* are perpendicular			
	I can calculate the angle between two vectors			
	I know for vectors *a*, *b* and c that $a.(b+c) = a.b + a.c$			

3.1	**Further Calculus (RC)**	👍	👈	👎
	I can differentiate $\sin x$ and $\cos x$			
	I can differentiate $(ax+b)^n$ using the chain rule			
	I can differentiate functions like $\sin 3x, \cos^3 x, \cos(2x+\frac{\pi}{3}), \sin^2 x$ using the chain rule			
	I can integrate $\sin x$ and $\cos x$			
	I can integrate $(ax+b)^n$ using the chain rule			
	I can integrate functions like $\sin 3x, \cos(2x+\frac{\pi}{3})$ using the chain rule			
3.2	**Revision of other areas of Relationships & Calculus**	👍	👈	👎

Outcomes marked * are part of the National 5 course.