Key Results Quiz - Maths

For each question, you need to write out the relevant mathematical result or formula from memory.
You will gain a point for each correct answer, and lose a point for each incorrect answer!

Do I have to do this without my textbook?
Yes! – this exercise is designed to prepare you for your exams, so don't use your notes, don't look at anyone else's answers, and don't rely on your textbook!

Is it ok if the formula is right but written differently?
Yes! – although there are often standard conventions for common results, as long as your result is mathematically valid and useable, you'll still get the mark.

Can I use different variable names?
Yes! – provided the meaning is clear. If you use non-standard variable names, you may need to state the meaning of each variable to get the mark.

If I can't remember it, can I just work it out?
Yes! – you're welcome to derive results if you know how, although not all results are easily provable, and there won't be time to do this for every single one!

Can I use my calculator to help?
Yes! – since you'll have your calculator in the exam, feel free to use it to check your results where possible, although you won't have time to test every single one!

If it's provided in the formula book, can I skip it?
Yes! – if you know that you can look it up in the exam, just write 'formula book' or 'FB' and you still get a point.

Maths:

	Pure Year 1	Pure Year 2	Applied Year 1	Applied Year 2
Correct ($+1$):				
Incorrect (-1):				
Blank (0):				
Total:	(max 38)	(max 58)	(max 18)	(max 11)

Pure Year 1

1	What is meant by $a^{\frac{1}{n}}$?	
2	What is meant by a^{-n}?	
3	What is the 'difference of two squares'?	
4	What is the discriminant condition for a quadratic equation to have real roots?	
5	What is the result of translating $y = f(x)$ by $\begin{pmatrix} a \\ b \end{pmatrix}$?	
6	What is the result of stretching $y = f(x)$ vertically by scale factor k?	
7	What is the result of stretching $y = f(x)$ horizontally by scale factor k?	
8	What is the formula for the gradient of a line segment between two points?	
9	What is the formula for the equation of a straight line with known gradient passing through a known point?	
10	What rule describes the connection between the gradients of parallel lines?	
11	What rule describes the connection between the gradients of perpendicular lines?	
12	What method is used for finding the distance between two points?	
13	What method is used for finding the midpoint between two points?	
14	What is the formula for the equation of a circle with known centre and radius?	
15	What is the factor theorem?	
16	What is the formula for the expansion of a binomial (two-term expression) raised to a positive integer power?	
17	What is the cosine rule?	
18	What is the sine rule?	
19	What is Pythagoras' theorem?	

20	What are the right-angled trigonometry results?	
21	What is the formula for the area of a triangle with known base and perpendicular height?	
22	What is the formula for the area of a triangle with known pair of sides and included angle?	
23	What are the symmetries and period of the $sine$ function?	
24	What are the symmetries and period of the $cosine$ function?	
25	What are the symmetries and period of the $tangent$ function?	
26	What is the so-called 'Pythagorean identity' linking $\sin\theta$ and $\cos\theta$?	
27	What trigonometric identity links $\sin\theta$, $\cos\theta$ and $\tan\theta$?	
28	What rule would you use to calculate the vector $\overrightarrow{AB}$ in terms of the position vetors of A and B, $\overrightarrow{OA}$ and $\overrightarrow{OB}$?	
29	What result must be true for two vectors to be parallel?	
30	What method would you use to find the magnitude of a $2D$ vector?	
31	What is the 'first principles' formula for the gradient function, $f'(x)$, of a curve $f(x)$?	
32	What is the rule for differentiating a power of x?	
33	What is the second derivative test for stationary points?	
34	What is the rule for integrating powers of x, and for which powers is it valid?	
35	What is the rule for differentiating the exponential function e^{kx}?	
36	What is the rule for dealing with the sum of two logarithms?	
37	What is the rule for dealing with the difference between two logarithms?	
38	What is the rule for dealing with a multiple of a logarithm?	

Pure Year 2

1	What is the formula for the n^{th} term of an arithmetic series?	
2	What is the formula for the sum of the first n terms of an arithmetic series?	
3	What is the formula for the n^{th} term of a geometric series?	
4	What is the formula for the sum of the first n terms of a geometric series?	
5	What is the formula for the sum to infinity of a geometric series, and when is it valid?	
6	What is the definition of a periodic sequence?	
7	What is the formula for the expansion of a binomial (two-term expression) raised to a rational power, and when is it valid?	
8	What are the symmetries and period of the $sine$ function, in radians?	
9	What are the symmetries and period of the $cosine$ function, in radians?	
10	What are the symmetries and period of the $tangent$ function, in radians?	
11	What is the formula for the length of the arc of a circle?	
12	What is the formula for the area of a sector of a circle?	
13	What method is used to find the area of a segment of a circle?	
14	What formula gives the approximate value of $\sin\theta$ when θ is small and in radians?	
15	What formula gives the approximate value of $\cos\theta$ when θ is small and in radians?	
16	What formula gives the approximate value of $\tan\theta$ when θ is small and in radians?	
17	What is the definition of $\sec\theta$?	
18	What is the definition of $\text{cosec}\,\theta$?	
19	What is the definition of $\cot\theta$?	

20	What is the domain and range of the function $f(x) = \tan x$?	
21	What is the domain and range of the function $f(x) = \sec x$?	
22	What is the domain and range of the function $f(x) = \operatorname{cosec} x$?	
23	What is the domain and range of the function $f(x) = \cot x$?	
24	Which trigonometric identity involves $\tan^2 \theta$ and $\sec^2 \theta$?	
25	Which trigonometric identity involves $\operatorname{cosec}^2 \theta$ and $\cot^2 \theta$?	
26	What is the compound angle formula for $\sin(A \pm B)$?	
27	What is the compound angle formula for $\cos(A \pm B)$?	
28	What is the compound angle formula for $\tan(A \pm B)$?	
29	What is the double angle formula for $\sin 2\theta$?	
30	What is the double angle formula for $\cos 2\theta$?	
31	What trigonometric identity links $\cos^2 \theta$ with $\cos 2\theta$?	
32	When $a \sin \theta + b \cos \theta$ is rewritten in the form $R \sin(\theta \pm \alpha)$ or $R \cos(\theta \pm \alpha)$, what formula gives the value of R?	
33	What is the rule for differentiating $\sin(kx)$?	
34	What is the rule for differentiating $\cos(kx)$?	
35	What is the rule for differentiating $\tan(kx)$?	
36	What is the rule for differentiating $\sec(kx)$?	
37	What is the rule for differentiating $\operatorname{cosec}(kx)$?	
38	What is the rule for differentiating $\cot(kx)$?	

39	What is the rule for differentiating e^{kx}?	
40	What is the rule for differentiating $\ln(kx)$?	
41	What is the rule for differentiating a^x?	
42	What is the rule for differentiating $f\big(g(x)\big)$?	
43	What is the rule for differentiating $f(x)g(x)$?	
44	What is the rule for differentiating $\frac{f(x)}{g(x)}$?	
45	What is the definition of a point of inflection of $f(x)$?	
46	What is the Newton-Raphson formula for approximating roots of a function?	
47	What is the rule for integrating $\sin(kx)$?	
48	What is the rule for integrating $\cos(kx)$?	
49	What is the rule for integrating $\tan(kx)$?	
50	What is the rule for integrating $\sec(kx)$?	
51	What is the rule for integrating $\operatorname{cosec}(kx)$?	
52	What is the rule for integrating $\cot(kx)$?	
53	What is the rule for integrating $\sec^2(kx)$?	
54	What is the rule for integrating $\operatorname{cosec}^2(kx)$?	
55	What is the rule for integrating $\cot^2(kx)$?	
56	What is the rule for integrating $\tan^2(kx)$?	
57	What is the formula for integration by parts?	
58	What is the trapezium rule for approximating an integral?	

Applied Year 1

1	What is the formula for the mean value of a data set?	
2	What is the formula for the standard deviation of a data set?	
3	What method is used to find the lower quartile of a set of data?	
4	What formula connects class width and frequency for a histogram?	
5	What formula connects $P(A \cap B)$ to $P(A)$ and $P(B)$, for any events A and B?	
6	What formula or rule applies specifically to mutually exclusive events?	
7	What formula or rule applies exclusively to independent events?	
8	What property of a velocity-time graph relates to the acceleration?	
9	What property of a velocity-time graph relates to the displacement?	
10	Which of the constant acceleration equations links u, v, a and t?	
11	Which of the constant acceleration equations links s, u, a and t?	
12	Which of the constant acceleration equations links s, u, v and t?	
13	Which of the constant acceleration equations links s, u, v and a?	
14	What is the formula for the weight of an object?	
15	What is the formula for Newton's second law, relating forces to motion?	
16	What is the relationship between velocity and displacement, in terms of calculus?	
17	What is the relationship between acceleration and velocity, in terms of calculus?	
18	What is the relationship between acceleration and displacement, in terms of calculus?	

Applied Year 2

1	What is the formula for the conditional probability $P(A\|B)$?	
2	When a binomial distribution is approximated by a normal distribution, how are the values of μ and σ determined?	
3	When a sample is taken from a normally distributed population, what is the distribution of the sample means?	
4	What is the formula for calculating the magnitude of the moment of a force about a given point?	
5	What are the conditions for equilibrium for a rigid body?	
6	How would you determine the horizontal component of a force which acts at a certain angle to the horizontal?	
7	How would you determine the vertical component of a force which acts at a certain angle to the horizontal?	
8	What is the formula governing the magnitude of the frictional force that may act on a body in contact with a rough surface?	
9	Under what conditions would the frictional force act at its maximum?	
10	What method is required for dealing with the horizontal motion of a projectile?	
11	What method is required for dealing with the vertical motion of a projectile?	

SOLUTIONS Key Results Quiz SOLUTIONS

Pure Year 1

1	What is meant by $a^{\frac{1}{n}}$?	$a^{\frac{1}{n}} = \sqrt[n]{a}$
2	What is meant by a^{-n}?	$a^{-n} = \frac{1}{a^n}$
3	What is the 'difference of two squares'?	$a^2 - b^2 = (a+b)(a-b)$
4	What is the discriminant condition for a quadratic equation to have real roots?	$b^2 - 4ac \geq 0$
5	What is the result of translating $y = f(x)$ by $\begin{pmatrix} a \\ b \end{pmatrix}$?	$y = f(x-a) + b$
6	What is the result of stretching $y = f(x)$ vertically by scale factor k?	$y = kf(x)$
7	What is the result of stretching $y = f(x)$ horizontally by scale factor k?	$y = f\left(\frac{x}{k}\right)$
8	What is the formula for the gradient of a line segment between two points?	$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$
9	What is the formula for the equation of a straight line with known gradient passing through a known point?	$y - y_1 = m(x - x_1)$
10	What rule describes the connection between the gradients of parallel lines?	$m_1 = m_2$
11	What rule describes the connection between the gradients of perpendicular lines?	$m_1 m_2 = -1$
12	What method is used for finding the distance between two points?	$Pythagoras:\ d = \sqrt{(\Delta x)^2 + (\Delta y)^2}$ $or:\ d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
13	What method is used for finding the midpoint between two points?	$M:\ \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
14	What is the formula for the equation of a circle with known centre and radius?	$(x-a)^2 + (y-b)^2 = r^2$ With centre (a, b) and radius r.
15	What is the factor theorem?	If a is a root of $f(x)$ (ie $f(a) = 0$), then $(x - a)$ is a factor of $f(x)$.
16	What is the formula for the expansion of a binomial (two-term expression) raised to a positive integer power?	*In the formula book:* $(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \ldots + \binom{n}{r}a^{n-r}b^r + \ldots + b^n \quad (n \in \mathbb{N})$
17	What is the cosine rule?	$a^2 = b^2 + c^2 - 2bc\cos A$
18	What is the sine rule?	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
19	What is Pythagoras' theorem?	$a^2 + b^2 = c^2$

20	What are the right-angled trigonometry results?	$\sin\theta = \frac{opp}{hyp} \quad \cos\theta = \frac{adj}{hyp} \quad \tan\theta = \frac{opp}{adj}$
21	What is the formula for the area of a triangle with known base and perpendicular height?	$Area = \frac{1}{2}bh$
22	What is the formula for the area of a triangle with known pair of sides and included angle?	$Area = \frac{1}{2}ab\sin C$
23	What are the symmetries and period of the $sine$ function?	$\sin(\theta) = \sin(\theta + 360)$ $\sin(\theta) = \sin(180 - \theta)$
24	What are the symmetries and period of the $cosine$ function?	$\cos(\theta) = \cos(\theta + 360)$ $\cos(\theta) = \cos(-\theta)\ or \cos(360 - \theta)$
25	What are the symmetries and period of the $tangent$ function?	$\tan(\theta) = \tan(\theta + 180)$
26	What is the so-called 'Pythagorean identity' linking $\sin\theta$ and $\cos\theta$?	$\cos^2\theta + \sin^2\theta \equiv 1$
27	What trigonometric identity links $\sin\theta$, $\cos\theta$ and $\tan\theta$?	$\tan\theta \equiv \frac{\sin\theta}{\cos\theta}$
28	What rule would you use to calculate the vector $\overrightarrow{AB}$ in terms of the position vetors of A and B, $\overrightarrow{OA}$ and $\overrightarrow{OB}$?	$\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA}$
29	What result must be true for two vectors to be parallel?	$\boldsymbol{u} = k\boldsymbol{v}$
30	What method would you use to find the magnitude of a $2D$ vector?	$Pythagoras: \left\lvert\binom{a}{b}\right\rvert = \sqrt{a^2 + b^2}$
31	What is the 'first principles' formula for the gradient function, $f'(x)$, of a curve $f(x)$?	In the formula book: $f'(x) = \lim_{h\to 0}\frac{f(x+h) - f(x)}{h}$
32	What is the rule for differentiating a power of x?	$y = x^n \implies \frac{dy}{dx} = nx^{n-1}$
33	What is the second derivative test for stationary points?	$f''(x) < 0 \implies Local\ Maximum$ $f''(x) > 0 \implies Local\ Minimum$
34	What is the rule for integrating powers of x, and for which powers is it valid?	$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C\ \ for\ n \neq -1$
35	What is the rule for differentiating the exponential function e^{kx}?	$y = e^{kx} \implies \frac{dy}{dx} = ke^{kx}$
36	What is the rule for dealing with the sum of two logarithms?	$\log_a A + \log_a B = \log_a(AB)$
37	What is the rule for dealing with the difference between two logarithms?	$\log_a A - \log_a B = \log_a\left(\frac{A}{B}\right)$
38	What is the rule for dealing with a multiple of a logarithm?	$n\log_a A = \log_a(A^n)$

Pure Year 2

1	What is the formula for the n^{th} term of an arithmetic series?	$u_n = a + (n-1)d$
2	What is the formula for the sum of the first n terms of an arithmetic series?	In the formula book: $S_n = \frac{1}{2}n(a+l) = \frac{1}{2}n[2a+(n-1)d]$
3	What is the formula for the n^{th} term of a geometric series?	$u_n = ar^{n-1}$
4	What is the formula for the sum of the first n terms of a geometric series?	In the formula book: $S_n = \frac{a(1-r^n)}{1-r}$
5	What is the formula for the sum to infinity of a geometric series, and when is it valid?	In the formula book: $S_\infty = \frac{a}{1-r}$ for $\lvert r\rvert < 1$
6	What is the definition of a periodic sequence?	A sequence which repeats cyclically (ie $u_{k+p} = u_k$ for all k, when the order is p)
7	What is the formula for the expansion of a binomial (two-term expression) raised to a rational power, and when is it valid?	In the formula book: $(1+x)^n = 1 + nx + \frac{n(n-1)}{1\times 2}x^2 + \ldots + \frac{n(n-1)\ldots(n-r+1)}{1\times 2\times\ldots\times r}x^r + \ldots$ $(\lvert x\rvert < 1, n \in \mathbb{R})$
8	What are the symmetries and period of the *sine* function, in radians?	$\sin(\theta) = \sin(\theta + 2\pi)$ $\sin(\theta) = \sin(\pi - \theta)$
9	What are the symmetries and period of the *cosine* function, in radians?	$\cos(\theta) = \cos(\theta + 2\pi)$ $\cos(\theta) = \cos(-\theta)$ *or* $\cos(2\pi - \theta)$
10	What are the symmetries and period of the *tangent* function, in radians?	$\tan(\theta) = \tan(\theta + \pi)$
11	What is the formula for the length of the arc of a circle?	$l = r\theta$
12	What is the formula for the area of a sector of a circle?	$A = \frac{1}{2}r^2\theta$
13	What method is used to find the area of a segment of a circle?	Sector minus triangle, ie: $A = \frac{1}{2}r^2\theta - \frac{1}{2}r^2\sin\theta$
14	What formula gives the approximate value of $\sin\theta$ when θ is small and in radians?	In the formula book: $\sin\theta \approx \theta$
15	What formula gives the approximate value of $\cos\theta$ when θ is small and in radians?	In the formula book: $\cos\theta \approx 1 - \frac{\theta^2}{2}$
16	What formula gives the approximate value of $\tan\theta$ when θ is small and in radians?	In the formula book: $\tan\theta \approx \theta$

17	What is the definition of $\sec\theta$?	$\sec\theta \equiv \frac{1}{\cos\theta}$
18	What is the definition of $\operatorname{cosec}\theta$?	$\operatorname{cosec}\theta \equiv \frac{1}{\sin\theta}$
19	What is the definition of $\cot\theta$?	$\cot\theta \equiv \frac{1}{\tan\theta} \equiv \frac{\cos\theta}{\sin\theta}$
20	What is the domain and range of the function $f(x) = \tan x$?	Domain: $x \neq \frac{\pi}{2} + k\pi$ Range: $\tan x \in \mathbb{R}$
21	What is the domain and range of the function $f(x) = \sec x$?	Domain: $x \neq \frac{\pi}{2} + k\pi$ Range: $\sec x \leq -1 \; or \; \sec x \geq 1$
22	What is the domain and range of the function $f(x) = \operatorname{cosec} x$?	Domain: $x \neq k\pi$ Range: $\operatorname{cosec} x \leq -1 \; or \; \operatorname{cosec} x \geq 1$
23	What is the domain and range of the function $f(x) = \cot x$?	Domain: $x \neq k\pi$ Range: $\cot x \in \mathbb{R}$
24	Which trigonometric identity involves $\tan^2\theta$ and $\sec^2\theta$?	$1 + \tan^2\theta \equiv \sec^2\theta$
25	Which trigonometric identity involves $\operatorname{cosec}^2\theta$ and $\cot^2\theta$?	$1 + \cot^2\theta \equiv \operatorname{cosec}^2\theta$
26	What is the compound angle formula for $\sin(A \pm B)$?	In the formula book: $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$
27	What is the compound angle formula for $\cos(A \pm B)$?	In the formula book: $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$
28	What is the compound angle formula for $\tan(A \pm B)$?	In the formula book: $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$
29	What is the double angle formula for $\sin 2\theta$?	$\sin 2\theta \equiv 2\sin\theta\cos\theta$ Note: can be derived from the compound angle formula in the formula book.
30	What is the double angle formula for $\cos 2\theta$?	$\cos 2\theta \equiv \cos^2\theta - \sin^2\theta$ Note: can be derived from the compound angle formula in the formula book.
31	What trigonometric identity links $\cos^2\theta$ with $\cos 2\theta$?	$\cos 2\theta \equiv 2\cos^2\theta - 1$
32	When $a\sin\theta + b\cos\theta$ is rewritten in the form $R\sin(\theta \pm \alpha)$ or $R\cos(\theta \pm \alpha)$, what formula gives the value of R?	$R^2 = a^2 + b^2$
33	What is the rule for differentiating $\sin(kx)$?	$y = \sin(kx) \implies \frac{dy}{dx} = k\cos(kx)$
34	What is the rule for differentiating $\cos(kx)$?	$y = \cos(kx) \implies \frac{dy}{dx} = -k\sin(kx)$

35	What is the rule for differentiating $\tan(kx)$?	In the formula book: $\mathbf{f(x)}$: $\tan kx$ $\mathbf{f'(x)}$: $k\sec^2 kx$
36	What is the rule for differentiating $\sec(kx)$?	In the formula book: $\mathbf{f(x)}$: $\sec kx$ $\mathbf{f'(x)}$: $k\sec kx\tan kx$
37	What is the rule for differentiating $\operatorname{cosec}(kx)$?	In the formula book: $\mathbf{f(x)}$: $\operatorname{cosec} kx$ $\mathbf{f'(x)}$: $-k\operatorname{cosec} kx\cot kx$
38	What is the rule for differentiating $\cot(kx)$?	In the formula book: $\mathbf{f(x)}$: $\cot kx$ $\mathbf{f'(x)}$: $-k\operatorname{cosec}^2 kx$
39	What is the rule for differentiating e^{kx}?	$y = e^{kx} \Rightarrow \frac{dy}{dx} = ke^{kx}$
40	What is the rule for differentiating $\ln(kx)$?	$y = \ln(kx) \Rightarrow \frac{dy}{dx} = \frac{1}{x}$
41	What is the rule for differentiating a^x?	$y = a^x \Rightarrow (\ln a)a^x$ Note: can be derived via this result from the formula book: $e^{x\ln a} = a^x$
42	What is the rule for differentiating $f(g(x))$?	$y = f(g(x)) \Rightarrow \frac{dy}{dx} = f'(g(x))g'(x)$
43	What is the rule for differentiating $f(x)g(x)$?	$y = f(x)g(x) \Rightarrow \frac{dy}{dx} = f(x)g'(x) + f'(x)g(x)$
44	What is the rule for differentiating $\frac{f(x)}{g(x)}$?	In the formula book: $\mathbf{f(x)}$: $\frac{f(x)}{g(x)}$ $\mathbf{f'(x)}$: $\frac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2}$
45	What is the definition of a point of inflection of $f(x)$?	$f(x)$ has a point of inflection whenever $f''(x)$ changes sign.
46	What is the Newton-Raphson formula for approximating roots of a function?	In the formula book: $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$
47	What is the rule for integrating $\sin(kx)$?	$\int \sin(kx)\,dx = -\frac{\cos(kx)}{k} + C$
48	What is the rule for integrating $\cos(kx)$?	$\int \cos(kx)\,dx = \frac{\sin(kx)}{k} + C$
49	What is the rule for integrating $\tan(kx)$?	In the formula book: $\mathbf{f(x)}$: $\tan kx$ $\int \mathbf{f(x)}\,\mathbf{dx}$: $\frac{1}{k}\ln\lvert\sec kx\rvert$

50	What is the rule for integrating $\sec(kx)$?	In the formula book: $\mathbf{f}(x)$ $\quad$ $\int \mathbf{f}(x)\,\mathrm{d}x$ $\sec kx$ $\quad$ $\frac{1}{k}\ln\lvert\sec kx+\tan kx\rvert$
51	What is the rule for integrating $\operatorname{cosec}(kx)$?	In the formula book: $\mathbf{f}(x)$ $\quad$ $\int \mathbf{f}(x)\,\mathrm{d}x$ $\operatorname{cosec} kx$ $\quad$ $-\frac{1}{k}\ln\lvert\operatorname{cosec} kx+\cot kx\rvert$
52	What is the rule for integrating $\cot(kx)$?	In the formula book: $\mathbf{f}(x)$ $\quad$ $\int \mathbf{f}(x)\,\mathrm{d}x$ $\cot kx$ $\quad$ $\frac{1}{k}\ln\lvert\sin kx\rvert$
53	What is the rule for integrating $\sec^2(kx)$?	In the formula book: $\mathbf{f}(x)$ $\quad$ $\int \mathbf{f}(x)\,\mathrm{d}x$ $\sec^2 kx$ $\quad$ $\frac{1}{k}\tan kx$
54	What is the rule for integrating $\operatorname{cosec}^2(kx)$?	In the formula book: $\mathbf{f}(x)$ $\quad$ $\mathbf{f'}(x)$ $\cot kx$ $\quad$ $-k\operatorname{cosec}^2 kx$
55	What is the rule for integrating $\cot^2(kx)$?	Rewrite as $\operatorname{cosec}^2(kx)-1$ and use the $\operatorname{cosec}^2(kx)$ result from the formula book.
56	What is the rule for integrating $\tan^2(kx)$?	Rewrite as $\sec^2(kx)-1$ and use the $\sec^2(kx)$ result from the formula book.
57	What is the formula for integration by parts?	In the formula book: $\int u\frac{\mathrm{d}v}{\mathrm{d}x}\,\mathrm{d}x = uv - \int v\frac{\mathrm{d}u}{\mathrm{d}x}\,\mathrm{d}x$
58	What is the trapezium rule for approximating an integral?	In the formula book: $\int_a^b y\,\mathrm{d}x \approx \frac{1}{2}h\{(y_0+y_n)+2(y_1+y_2+\ldots+y_{n-1})\}$, where $h=\frac{b-a}{n}$

Applied Year 1

1	What is the formula for the mean value of a data set?	$\bar{x} = \frac{\Sigma x}{n}$
2	What is the formula for the standard deviation of a data set?	In the formula book: Standard deviation $= \sqrt{\frac{S_{xx}}{n}}$ or $\sqrt{\frac{\sum x^2}{n} - \bar{x}^2}$
3	What method is used to find the lower quartile of a set of data?	Sort the data into ascending order, then use $\frac{n}{4}$ to identify the value $\frac{1}{4}$ of the way through.
4	What formula connects class width and frequency for a histogram?	$Frequency = Class\ Width \times Frequency\ Density$
5	What formula connects $P(A \cap B)$ to $P(A)$ and $P(B)$, for any events A and B?	In the formula book: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
6	What formula or rule applies specifically to mutually exclusive events?	$P(A \cap B) = 0$ Or, equivalently, $P(A \cup B) = P(A) + P(B)$
7	What formula or rule applies exclusively to independent events?	In the formula book: For independent events A and B, $P(B \mid A) = P(B)$ $P(A \mid B) = P(A)$ $P(A \cap B) = P(A)\,P(B)$
8	What property of a velocity-time graph relates to the acceleration?	The gradient gives the acceleration.
9	What property of a velocity-time graph relates to the displacement?	The area gives the displacement.
10	Which of the constant acceleration equations links u, v, a and t?	In the formula book: $v = u + at$
11	Which of the constant acceleration equations links s, u, a and t?	In the formula book: $s = ut + \frac{1}{2}at^2$
12	Which of the constant acceleration equations links s, u, v and t?	In the formula book: $s = \frac{1}{2}(u + v)t$
13	Which of the constant acceleration equations links s, u, v and a?	In the formula book: $v^2 = u^2 + 2as$
14	What is the formula for the weight of an object?	$W = mg$
15	What is the formula for Newton's second law, relating forces to motion?	$F = ma$
16	What is the relationship between velocity and displacement, in terms of calculus?	$v = \frac{dx}{dt}$ or $x = \int v\,dt$
17	What is the relationship between acceleration and velocity, in terms of calculus?	$a = \frac{dv}{dt}$ or $v = \int a\,dt$

18	What is the relationship between acceleration and displacement, in terms of calculus?	$a = \frac{d^2x}{dt^2} \quad or \quad x = \int \left(\int a \, dt \right) dt$

Applied Year 2

1	What is the formula for the conditional probability $P(A\|B)$?	In the formula book: $\mathrm{P}(A \cap B) = \mathrm{P}(A)\mathrm{P}(B \mid A)$
2	When a binomial distribution is approximated by a normal distribution, how are the values of μ and σ determined?	In the formula book: Distribution of X | Mean | Variance Binomial $\mathrm{B}(n, p)$ | np | $np(1-p)$
3	When a sample is taken from a normally distributed population, what is the distribution of the sample means?	$\bar{X} \sim N\left(\mu, \left(\frac{\sigma}{\sqrt{n}}\right)^2\right)$ Note: this links to the formula book result: For a random sample of n observations from $\mathrm{N}(\mu, \sigma^2)$ $\frac{\bar{X} - \mu}{\sigma / \sqrt{n}} \sim \mathrm{N}(0, 1)$
4	What is the formula for calculating the magnitude of the moment of a force about a given point?	$Moment = Perpendicular\ force \times distance$
5	What are the conditions for equilibrium for a rigid body?	$Net\ force = 0$ $Net\ moment = 0$ (may include: at rest)
6	How would you determine the horizontal component of a force which acts at a certain angle to the horizontal?	$F \cos\theta$
7	How would you determine the vertical component of a force which acts at a certain angle to the horizontal?	$F \sin\theta$
8	What is the formula governing the magnitude of the frictional force that may act on a body in contact with a rough surface?	$F_r \leq \mu R \quad or \quad F_{r_{\max}} = \mu R$
9	Under what conditions would the frictional force act at its maximum?	When the object is in motion, or when the object is in limiting equilibrium (on the point of moving).
10	What method is required for dealing with the horizontal motion of a projectile?	$speed = \frac{distance}{time}$
11	What method is required for dealing with the vertical motion of a projectile?	Constant acceleration equations (provided in the formula book)