STUDY FORMULA BOOKLET

Edexcel A Level Maths and Further Maths formulae and statistical tables

The Edexcel booklet gives pure, mechanics and statistics formulae and every statistical table for Maths and Further Maths. The quadratic formula, sine rule and double angles are not printed.

IN THE BOOKLET printed in the official booklet LEARN IT not printed: students must recall it

Based on the official **Pearson Edexcel Level 3 Advanced Subsidiary and Advanced GCE in Mathematics and Further Mathematics: Mathematical Formulae and Statistical Tables, Issue 1, July 2017 (P54458A)**, with what to learn and exam tips added by CuratedPrep.

Introduction: which sections are yours

One booklet serves four courses. A Maths student uses sections 1 or 2 only. A Further Maths student uses section 3 or 4 and may also need the A Level Maths formulae in section 2. A Mechanics or Statistics paper may need formulae from the Pure sections of the same qualification.

Which section serves which course Section 1 AS Maths (8MA0), section 2 A Level Maths (9MA0), section 3 AS Further Maths (8FM0), section 4 A Level Further Maths (9FM0).	Sections 1 and 2: Maths; 3 and 4: Further Maths	IN THE BOOKLET

AS Maths (8MA0) pure: Mensuration

This is section 1 of the booklet. Used by AS Mathematics 8MA0 students.

Surface area of a sphere r is the radius.	$A = 4\pi r^2$	IN THE BOOKLET
Curved surface area of a cone r is the radius of the base.	$A = \pi r \times \text{slant height}$	IN THE BOOKLET

AS Maths pure: Binomial series

Binomial expansion, positive integer n	$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \cdots + \binom{n}{r}a^{n-r}b^r + \cdots + b^n \quad (n \in \mathbb{N})$	IN THE BOOKLET
Binomial coefficient	$\binom{n}{r} = {}^nC_r = \frac{n!}{r!\,(n-r)!}$	IN THE BOOKLET

AS Maths pure: Logarithms and exponentials

Change of base	$\log_a x = \frac{\log_b x}{\log_b a}$	IN THE BOOKLET
Exponential form of a power	$e^{x \ln a} = a^x$	IN THE BOOKLET

AS Maths pure: Differentiation

Differentiation from first principles	$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$	IN THE BOOKLET

AS Maths statistics: Probability

Complement	$P(A') = 1 - P(A)$	IN THE BOOKLET

AS Maths statistics: Standard deviation

Statistical tables required for AS Maths: binomial cumulative distribution function and random numbers (see the tables at the end).

Standard deviation	$\text{Standard deviation} = \sqrt{\text{Variance}}$	IN THE BOOKLET
Interquartile range	$\text{IQR} = Q_3 - Q_1$	IN THE BOOKLET
Sxx For a set of n values x1, x2, ..., xn.	$S_{xx} = \sum(x_i - \bar{x})^2 = \sum x_i^2 - \frac{(\sum x_i)^2}{n}$	IN THE BOOKLET
Standard deviation from Sxx	$\text{Standard deviation} = \sqrt{\frac{S_{xx}}{n}}$ or $\sqrt{\frac{\sum x^2}{n} - \bar{x}^2}$	IN THE BOOKLET

AS Maths mechanics: Kinematics

Velocity from initial velocity Constant acceleration, motion in a straight line.	$v = u + at$	IN THE BOOKLET
Displacement from initial velocity	$s = ut + \frac{1}{2}at^2$	IN THE BOOKLET
Displacement from final velocity	$s = vt - \frac{1}{2}at^2$	IN THE BOOKLET
Velocity without time	$v^2 = u^2 + 2as$	IN THE BOOKLET
Displacement from average velocity	$s = \frac{1}{2}(u + v)t$	IN THE BOOKLET

A Level Maths (9MA0) pure: Mensuration

This is section 2 of the booklet. Used by A Level Mathematics 9MA0 students.

Surface area of a sphere r is the radius.	$A = 4\pi r^2$	IN THE BOOKLET
Curved surface area of a cone r is the radius of the base.	$A = \pi r \times \text{slant height}$	IN THE BOOKLET

A Level Maths pure: Arithmetic series

Sum of n terms a is the first term, l the last term, d the common difference.	$S_n = \frac{1}{2}n(a + l) = \frac{1}{2}n[2a + (n-1)d]$	IN THE BOOKLET

A Level Maths pure: Binomial series

Binomial expansion, positive integer n	$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \cdots + \binom{n}{r}a^{n-r}b^r + \cdots + b^n \quad (n \in \mathbb{N})$	IN THE BOOKLET
Binomial coefficient	$\binom{n}{r} = {}^nC_r = \frac{n!}{r!\,(n-r)!}$	IN THE BOOKLET
Binomial expansion, any n For (a + bx)^n, take out the constant factor first so the bracket starts with 1.	$(1+x)^n = 1 + nx + \frac{n(n-1)}{1 \times 2}x^2 + \cdots + \frac{n(n-1)\ldots(n-r+1)}{1 \times 2 \times \cdots \times r}x^r + \ldots \quad (\lvert x\rvert < 1,\ n \in \mathbb{R})$	IN THE BOOKLET

A Level Maths pure: Logarithms and exponentials

Change of base	$\log_a x = \dfrac{\log_b x}{\log_b a}$	IN THE BOOKLET
Exponential form of a power	$e^{x \ln a} = a^x$	IN THE BOOKLET

A Level Maths pure: Geometric series

Sum of n terms a is the first term, r the common ratio.	$S_n = \dfrac{a(1 - r^n)}{1 - r}$	IN THE BOOKLET
Sum to infinity	$S_\infty = \dfrac{a}{1 - r} \quad \text{for } \lvert r \rvert < 1$	IN THE BOOKLET

A Level Maths pure: Trigonometric identities

sin of a sum or difference	$\sin(A \pm B) \equiv \sin A \cos B \pm \cos A \sin B$	IN THE BOOKLET
cos of a sum or difference The sign changes between the two sides.	$\cos(A \pm B) \equiv \cos A \cos B \mp \sin A \sin B$	IN THE BOOKLET
tan of a sum or difference The sign changes between the two sides.	$\tan(A \pm B) \equiv \dfrac{\tan A \pm \tan B}{1 \mp \tan A \tan B} \quad \left(A \pm B \neq \left(k + \frac{1}{2}\right)\pi\right)$	IN THE BOOKLET
Sum of sines	$\sin A + \sin B = 2 \sin \dfrac{A + B}{2} \cos \dfrac{A - B}{2}$	IN THE BOOKLET
Difference of sines	$\sin A - \sin B = 2 \cos \dfrac{A + B}{2} \sin \dfrac{A - B}{2}$	IN THE BOOKLET
Sum of cosines	$\cos A + \cos B = 2 \cos \dfrac{A + B}{2} \cos \dfrac{A - B}{2}$	IN THE BOOKLET
Difference of cosines	$\cos A - \cos B = -2 \sin \dfrac{A + B}{2} \sin \dfrac{A - B}{2}$	IN THE BOOKLET

A Level Maths pure: Small angle approximations

Small angle approximations θ is measured in radians.	$\sin\theta \approx \theta, \quad \cos\theta \approx 1 - \dfrac{\theta^2}{2}, \quad \tan\theta \approx \theta$	IN THE BOOKLET

A Level Maths pure: Differentiation

Differentiation from first principles	$f'(x) = \lim_{h \to 0} \dfrac{f(x + h) - f(x)}{h}$	IN THE BOOKLET
Derivative of tan kx	$\dfrac{d}{dx}(\tan kx) = k \sec^2 kx$	IN THE BOOKLET
Derivative of sec kx	$\dfrac{d}{dx}(\sec kx) = k \sec kx \tan kx$	IN THE BOOKLET
Derivative of cot kx	$\dfrac{d}{dx}(\cot kx) = -k \operatorname{cosec}^2 kx$	IN THE BOOKLET
Derivative of cosec kx	$\dfrac{d}{dx}(\operatorname{cosec} kx) = -k \operatorname{cosec} kx \cot kx$	IN THE BOOKLET
Quotient rule	$\dfrac{d}{dx}\left(\dfrac{f(x)}{g(x)}\right) = \dfrac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2}$	IN THE BOOKLET

A Level Maths pure: Integration (+ constant)

The booklet gives each result without the constant; add + c when you integrate.

Integral of sec squared kx	$\int \sec^2 kx\,dx = \frac{1}{k}\tan kx$	IN THE BOOKLET
Integral of tan kx	$\int \tan kx\,dx = \frac{1}{k}\ln\lvert\sec kx\rvert$	IN THE BOOKLET
Integral of cot kx	$\int \cot kx\,dx = \frac{1}{k}\ln\lvert\sin kx\rvert$	IN THE BOOKLET
Integral of cosec kx The two forms are equal.	$\int \operatorname{cosec} kx\,dx = -\frac{1}{k}\ln\lvert\operatorname{cosec} kx + \cot kx\rvert = \frac{1}{k}\ln\left\lvert\tan\left(\frac{1}{2}kx\right)\right\rvert$	IN THE BOOKLET
Integral of sec kx The two forms are equal.	$\int \sec kx\,dx = \frac{1}{k}\ln\lvert\sec kx + \tan kx\rvert = \frac{1}{k}\ln\left\lvert\tan\left(\frac{1}{2}kx + \frac{1}{4}\pi\right)\right\rvert$	IN THE BOOKLET
Integration by parts	$\int u\frac{dv}{dx}\,dx = uv - \int v\frac{du}{dx}\,dx$	IN THE BOOKLET

A Level Maths pure: Numerical methods

Trapezium rule n is the number of strips, so there are n + 1 ordinates.	$\int_a^b y\,dx \approx \frac{1}{2}h\{(y_0 + y_n) + 2(y_1 + y_2 + \cdots + y_{n-1})\}, \quad h = \frac{b-a}{n}$	IN THE BOOKLET
Newton-Raphson iteration For solving f(x) = 0.	$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$	IN THE BOOKLET

A Level Maths statistics: Probability

Complement	$P(A') = 1 - P(A)$	IN THE BOOKLET
Addition rule	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	IN THE BOOKLET
Multiplication rule	$P(A \cap B) = P(A)\,P(B \mid A)$	IN THE BOOKLET
Conditional probability (Bayes form)	$P(A \mid B) = \frac{P(B \mid A)P(A)}{P(B \mid A)P(A) + P(B \mid A')P(A')}$	IN THE BOOKLET
Independent events A and B	$P(B \mid A) = P(B), \quad P(A \mid B) = P(A), \quad P(A \cap B) = P(A)P(B)$	IN THE BOOKLET

A Level Maths statistics: Standard deviation

Standard deviation	$\text{Standard deviation} = \sqrt{\text{Variance}}$	IN THE BOOKLET
Interquartile range	$\text{IQR} = Q_3 - Q_1$	IN THE BOOKLET
Sxx For a set of n values x1, x2, ..., xn.	$S_{xx} = \sum(x_i - \bar{x})^2 = \sum x_i^2 - \frac{(\sum x_i)^2}{n}$	IN THE BOOKLET
Standard deviation from Sxx	$\text{Standard deviation} = \sqrt{\frac{S_{xx}}{n}} \text{ or } \sqrt{\frac{\sum x^2}{n} - \bar{x}^2}$	IN THE BOOKLET

A Level Maths statistics: Discrete distributions

Binomial B(n, p): probability	$P(X = x) = \binom{n}{x}p^x(1-p)^{n-x}$	IN THE BOOKLET

Binomial B(n, p): mean	np	IN THE BOOKLET
Binomial B(n, p): variance	$np(1-p)$	IN THE BOOKLET

A Level Maths statistics: Sampling distributions

Statistical tables required for A Level Maths: binomial cumulative distribution function, percentage points of the normal distribution, critical values for the product moment correlation coefficient and random numbers.

Standardised sample mean For a random sample of n observations from N(μ, σ²).	$\frac{\bar{X}-\mu}{\sigma/\sqrt{n}} \sim N(0,1)$	IN THE BOOKLET

A Level Maths mechanics: Kinematics

Velocity from initial velocity Constant acceleration, motion in a straight line.	$v = u + at$	IN THE BOOKLET
Displacement from initial velocity	$s = ut + \frac{1}{2}at^2$	IN THE BOOKLET
Displacement from final velocity	$s = vt - \frac{1}{2}at^2$	IN THE BOOKLET
Velocity without time	$v^2 = u^2 + 2as$	IN THE BOOKLET
Displacement from average velocity	$s = \frac{1}{2}(u+v)t$	IN THE BOOKLET

AS Further Maths (8FM0) pure: Summations

This is section 3 of the booklet. Used by AS Further Mathematics 8FM0 students, who may also need the A Level Maths formulae in section 2.

Sum of squares	$\sum_{r=1}^{n} r^2 = \frac{1}{6}n(n+1)(2n+1)$	IN THE BOOKLET
Sum of cubes	$\sum_{r=1}^{n} r^3 = \frac{1}{4}n^2(n+1)^2$	IN THE BOOKLET

AS Further Maths pure: Matrix transformations

Anticlockwise rotation through θ about O	$\begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix}$	IN THE BOOKLET
Reflection in the line y = (tan θ)x	$\begin{pmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & -\cos 2\theta \end{pmatrix}$	IN THE BOOKLET

AS Further Maths pure: Area of a sector

Area of a sector (polar coordinates)	$A = \frac{1}{2}\int r^2\,d\theta$	IN THE BOOKLET

AS Further Maths pure: Maclaurin's and Taylor's series

Maclaurin and Taylor series	$f(x) = f(0) + xf'(0) + \frac{x^2}{2!}f''(0) + \cdots + \frac{x^r}{r!}f^{(r)}(0) + \ldots$	IN THE BOOKLET
Series for e^x Valid for all x.	$e^x = \exp(x) = 1 + x + \frac{x^2}{2!} + \cdots + \frac{x^r}{r!} + \ldots$	IN THE BOOKLET

Series for ln(1 + x) Valid for -1 < x ≤ 1.	$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \cdots + (-1)^{r+1}\frac{x^r}{r} + \ldots$	IN THE BOOKLET
Series for sin x Valid for all x; x in radians.	$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots + (-1)^r \frac{x^{2r+1}}{(2r+1)!} + \ldots$	IN THE BOOKLET
Series for cos x Valid for all x; x in radians.	$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \cdots + (-1)^r \frac{x^{2r}}{(2r)!} + \ldots$	IN THE BOOKLET
Series for arctan x Valid for -1 ≤ x ≤ 1.	$\arctan x = x - \frac{x^3}{3} + \frac{x^5}{5} - \cdots + (-1)^r \frac{x^{2r+1}}{2r+1} + \ldots$	IN THE BOOKLET

AS Further Maths pure: Vectors

Vector product	$\mathbf{a} \times \mathbf{b} = \lvert\mathbf{a}\rvert\lvert\mathbf{b}\rvert \sin\theta\, \hat{\mathbf{n}} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix} = \begin{pmatrix} a_2b_3 - a_3b_2 \\ a_3b_1 - a_1b_3 \\ a_1b_2 - a_2b_1 \end{pmatrix}$	IN THE BOOKLET
Scalar triple product	$\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c}) = \begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix} = \mathbf{b} \cdot (\mathbf{c} \times \mathbf{a}) = \mathbf{c} \cdot (\mathbf{a} \times \mathbf{b})$	IN THE BOOKLET
Cartesian equation of a line The line passes through A with position vector a = a1 i + a2 j + a3 k and has direction vector b = b1 i + b2 j + b3 k.	$\frac{x - a_1}{b_1} = \frac{y - a_2}{b_2} = \frac{z - a_3}{b_3} \; (= \lambda)$	IN THE BOOKLET
Cartesian equation of a plane The plane passes through A and has normal vector n = n1 i + n2 j + n3 k.	$n_1x + n_2y + n_3z + d = 0 \quad \text{where } d = -\mathbf{a} \cdot \mathbf{n}$	IN THE BOOKLET
Plane through three points A, B, C A, B and C are non-collinear.	$\mathbf{r} = \mathbf{a} + \lambda(\mathbf{b} - \mathbf{a}) + \mu(\mathbf{c} - \mathbf{a}) = (1 - \lambda - \mu)\mathbf{a} + \lambda\mathbf{b} + \mu\mathbf{c}$	IN THE BOOKLET
Plane parallel to b and c The plane passes through the point with position vector a.	$\mathbf{r} = \mathbf{a} + s\mathbf{b} + t\mathbf{c}$	IN THE BOOKLET
Perpendicular distance from a point to a plane Distance of (α, β, γ) from n1 x + n2 y + n3 z + d = 0.	$\frac{\lvert n_1\alpha + n_2\beta + n_3\gamma + d\rvert}{\sqrt{n_1^2 + n_2^2 + n_3^2}}$	IN THE BOOKLET

AS Further Maths pure: Hyperbolic functions

Hyperbolic identity	$\cosh^2 x - \sinh^2 x = 1$	IN THE BOOKLET
sinh 2x	$\sinh 2x = 2\sinh x \cosh x$	IN THE BOOKLET
cosh 2x	$\cosh 2x = \cosh^2 x + \sinh^2 x$	IN THE BOOKLET
Inverse cosh	$\operatorname{arcosh} x = \ln\{x + \sqrt{x^2 - 1}\} \quad (x \geqslant 1)$	IN THE BOOKLET
Inverse sinh	$\operatorname{arsinh} x = \ln\{x + \sqrt{x^2 + 1}\}$	IN THE BOOKLET
Inverse tanh	$\operatorname{artanh} x = \frac{1}{2}\ln\left(\frac{1+x}{1-x}\right) \quad (\lvert x\rvert < 1)$	IN THE BOOKLET

AS Further Maths pure: Differentiation

Derivative of arcsin x	$\frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1 - x^2}}$	IN THE BOOKLET
Derivative of arccos x	$\frac{d}{dx}(\arccos x) = -\frac{1}{\sqrt{1 - x^2}}$	IN THE BOOKLET

Derivative of arctan x	$\frac{d}{dx}(\arctan x) = \frac{1}{1+x^2}$	IN THE BOOKLET
Derivative of sinh x	$\frac{d}{dx}(\sinh x) = \cosh x$	IN THE BOOKLET
Derivative of cosh x	$\frac{d}{dx}(\cosh x) = \sinh x$	IN THE BOOKLET
Derivative of tanh x	$\frac{d}{dx}(\tanh x) = \operatorname{sech}^2 x$	IN THE BOOKLET
Derivative of arsinh x	$\frac{d}{dx}(\operatorname{arsinh} x) = \frac{1}{\sqrt{1+x^2}}$	IN THE BOOKLET
Derivative of arcosh x	$\frac{d}{dx}(\operatorname{arcosh} x) = \frac{1}{\sqrt{x^2-1}}$	IN THE BOOKLET
Derivative of artanh x	$\frac{d}{dx}(\operatorname{artanh} x) = \frac{1}{1-x^2}$	IN THE BOOKLET

AS Further Maths pure: Integration (+ constant; a > 0 where relevant)

Add the constant of integration; a > 0 where relevant.

Integral of sinh x	$\int \sinh x\,dx = \cosh x$	IN THE BOOKLET
Integral of cosh x	$\int \cosh x\,dx = \sinh x$	IN THE BOOKLET
Integral of tanh x	$\int \tanh x\,dx = \ln\cosh x$	IN THE BOOKLET
Integral giving arcsin	$\int \frac{1}{\sqrt{a^2-x^2}}\,dx = \arcsin\left(\frac{x}{a}\right) \quad (\lvert x\rvert < a)$	IN THE BOOKLET
Integral giving arctan	$\int \frac{1}{a^2+x^2}\,dx = \frac{1}{a}\arctan\left(\frac{x}{a}\right)$	IN THE BOOKLET
Integral giving arcosh The two forms are equal.	$\int \frac{1}{\sqrt{x^2-a^2}}\,dx = \operatorname{arcosh}\left(\frac{x}{a}\right) \text{ or } \ln\{x+\sqrt{x^2-a^2}\} \quad (x > a)$	IN THE BOOKLET
Integral giving arsinh The two forms are equal.	$\int \frac{1}{\sqrt{a^2+x^2}}\,dx = \operatorname{arsinh}\left(\frac{x}{a}\right) \text{ or } \ln\{x+\sqrt{x^2+a^2}\}$	IN THE BOOKLET
Integral of 1/(a² − x²)	$\int \frac{1}{a^2-x^2}\,dx = \frac{1}{2a}\ln\left\lvert\frac{a+x}{a-x}\right\rvert = \frac{1}{a}\operatorname{artanh}\left(\frac{x}{a}\right) \quad (\lvert x\rvert < a)$	IN THE BOOKLET
Integral of 1/(x² − a²)	$\int \frac{1}{x^2-a^2}\,dx = \frac{1}{2a}\ln\left\lvert\frac{x-a}{x+a}\right\rvert$	IN THE BOOKLET

AS Further Maths statistics: Discrete distributions

Expectation (mean) For a discrete random variable X taking values xi with probabilities P(X = xi).	$E(X) = \mu = \sum x_i\,P(X = x_i)$	IN THE BOOKLET
Variance	$\operatorname{Var}(X) = \sigma^2 = \sum(x_i-\mu)^2 P(X=x_i) = \sum x_i^2\,P(X=x_i) - \mu^2$	IN THE BOOKLET

AS Further Maths statistics: Standard discrete distributions

Binomial B(n, p): probability	$P(X = x) = \binom{n}{x}p^x(1-p)^{n-x}$	IN THE BOOKLET
Binomial B(n, p): mean	np	IN THE BOOKLET

Binomial B(n, p): variance	$np(1-p)$	IN THE BOOKLET
Poisson Po(λ): probability	$P(X=x)=e^{-\lambda}\dfrac{\lambda^x}{x!}$	IN THE BOOKLET
Poisson Po(λ): mean	λ	IN THE BOOKLET
Poisson Po(λ): variance	λ	IN THE BOOKLET

AS Further Maths statistics: Continuous distributions

Expectation (mean) For a continuous random variable X having probability density function f.	$E(X)=\mu=\int x\,f(x)\,dx$	IN THE BOOKLET
Variance	$\mathrm{Var}(X)=\sigma^2=\int(x-\mu)^2 f(x)\,dx=\int x^2 f(x)\,dx-\mu^2$	IN THE BOOKLET
Expectation of a function g(X)	$E(g(X))=\int g(x)\,f(x)\,dx$	IN THE BOOKLET
Cumulative distribution function	$F(x_0)=P(X\leqslant x_0)=\int_{-\infty}^{x_0} f(t)\,dt$	IN THE BOOKLET

AS Further Maths statistics: Standard continuous distributions

Normal N(μ, σ²): p.d.f.	$f(x)=\dfrac{1}{\sigma\sqrt{2\pi}}e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$	IN THE BOOKLET
Normal N(μ, σ²): mean	μ	IN THE BOOKLET
Normal N(μ, σ²): variance	σ^2	IN THE BOOKLET
Uniform on [a, b]: p.d.f.	$f(x)=\dfrac{1}{b-a}$	IN THE BOOKLET
Uniform on [a, b]: mean	$\frac{1}{2}(a+b)$	IN THE BOOKLET
Uniform on [a, b]: variance	$\frac{1}{12}(b-a)^2$	IN THE BOOKLET

AS Further Maths statistics: Correlation and regression

Sxx For a set of n pairs of values (xi, yi).	$S_{xx}=\sum(x_i-\bar{x})^2=\sum x_i^2-\dfrac{(\sum x_i)^2}{n}$	IN THE BOOKLET
Syy	$S_{yy}=\sum(y_i-\bar{y})^2=\sum y_i^2-\dfrac{(\sum y_i)^2}{n}$	IN THE BOOKLET
Sxy	$S_{xy}=\sum(x_i-\bar{x})(y_i-\bar{y})=\sum x_iy_i-\dfrac{(\sum x_i)(\sum y_i)}{n}$	IN THE BOOKLET
Product moment correlation coefficient	$r=\dfrac{S_{xy}}{\sqrt{S_{xx}S_{yy}}}=\dfrac{\sum(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{\{\sum(x_i-\bar{x})^2\}\{\sum(y_i-\bar{y})^2\}}}=\dfrac{\sum x_iy_i-\frac{(\sum x_i)(\sum y_i)}{n}}{\sqrt{\left(\sum x_i^2-\frac{(\sum x_i)^2}{n}\right)\left(\sum y_i^2-\frac{(\sum y_i)^2}{n}\right)}}$	IN THE BOOKLET
Regression coefficient of y on x	$b=\dfrac{S_{xy}}{S_{xx}}=\dfrac{\sum(x_i-\bar{x})(y_i-\bar{y})}{\sum(x_i-\bar{x})^2}$	IN THE BOOKLET
Least squares regression line of y on x	$y=a+bx\quad\text{where } a=\bar{y}-b\bar{x}$	IN THE BOOKLET

Residual sum of squares (RSS)	$\mathrm{RSS} = S_{yy} - \dfrac{(S_{xy})^2}{S_{xx}} = S_{yy}(1 - r^2)$	IN THE BOOKLET
Spearman's rank correlation coefficient d is the difference between the two ranks of each pair.	$r_s = 1 - \dfrac{6\sum d^2}{n(n^2-1)}$	IN THE BOOKLET

AS Further Maths statistics: Non-parametric tests

Statistical tables required for AS Further Maths: binomial and Poisson cumulative distribution functions, percentage points of the chi-squared distribution, critical values for product moment and Spearman's coefficients, and random numbers.

Goodness-of-fit test and contingency tables O is the observed and E the expected frequency. nu is the number of degrees of freedom.	$\sum \dfrac{(O_i - E_i)^2}{E_i} \sim \chi^2_\nu$	IN THE BOOKLET

AS Further Maths mechanics: Centres of mass

Triangular lamina For uniform bodies.	$\frac{2}{3}$ along the median from the vertex	IN THE BOOKLET
Circular arc, radius r, angle at centre 2α For uniform bodies.	$\dfrac{r\sin\alpha}{\alpha}$ from the centre	IN THE BOOKLET
Sector of a circle, radius r, angle at centre 2α For uniform bodies.	$\dfrac{2r\sin\alpha}{3\alpha}$ from the centre	IN THE BOOKLET

A Level Further Maths (9FM0) pure: Summations

This is section 4 of the booklet. Used by A Level Further Mathematics 9FM0 students, who may also need the A Level Maths formulae in section 2.

Sum of squares	$\sum_{r=1}^{n} r^2 = \frac{1}{6}n(n+1)(2n+1)$	IN THE BOOKLET
Sum of cubes	$\sum_{r=1}^{n} r^3 = \frac{1}{4}n^2(n+1)^2$	IN THE BOOKLET

A Level Further Maths pure: Matrix transformations

Anticlockwise rotation through θ about O	$\begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix}$	IN THE BOOKLET
Reflection in the line y = (tan θ)x	$\begin{pmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & -\cos 2\theta \end{pmatrix}$	IN THE BOOKLET

A Level Further Maths pure: Area of a sector

Area of a sector (polar coordinates)	$A = \frac{1}{2}\int r^2\,d\theta$	IN THE BOOKLET

A Level Further Maths pure: Complex numbers

de Moivre's theorem	$\{r(\cos\theta + i\sin\theta)\}^n = r^n(\cos n\theta + i\sin n\theta)$	IN THE BOOKLET
Roots of unity	$z^n = 1$ has roots $z = e^{\frac{2\pi k i}{n}}$, $k = 0, 1, 2, \ldots, n-1$	IN THE BOOKLET

A Level Further Maths pure: Maclaurin's and Taylor's series

Maclaurin and Taylor series	$f(x) = f(0) + xf'(0) + \frac{x^2}{2!}f''(0) + \cdots + \frac{x^r}{r!}f^{(r)}(0) + \ldots$	IN THE BOOKLET
Series for e^x Valid for all x.	$e^x = \exp(x) = 1 + x + \frac{x^2}{2!} + \cdots + \frac{x^r}{r!} + \ldots$	IN THE BOOKLET
Series for ln(1 + x) Valid for -1 < x ≤ 1.	$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \cdots + (-1)^{r+1}\frac{x^r}{r} + \ldots$	IN THE BOOKLET
Series for sin x Valid for all x; x in radians.	$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots + (-1)^r\frac{x^{2r+1}}{(2r+1)!} + \ldots$	IN THE BOOKLET
Series for cos x Valid for all x; x in radians.	$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \cdots + (-1)^r\frac{x^{2r}}{(2r)!} + \ldots$	IN THE BOOKLET
Series for arctan x Valid for -1 ≤ x ≤ 1.	$\arctan x = x - \frac{x^3}{3} + \frac{x^5}{5} - \cdots + (-1)^r\frac{x^{2r+1}}{2r+1} + \ldots$	IN THE BOOKLET

A Level Further Maths pure: Vectors

Vector product	$\mathbf{a} \times \mathbf{b} = \lvert\mathbf{a}\rvert\lvert\mathbf{b}\rvert \sin\theta\, \hat{\mathbf{n}} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix} = \begin{pmatrix} a_2b_3 - a_3b_2 \\ a_3b_1 - a_1b_3 \\ a_1b_2 - a_2b_1 \end{pmatrix}$	IN THE BOOKLET
Scalar triple product	$\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c}) = \begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix} = \mathbf{b} \cdot (\mathbf{c} \times \mathbf{a}) = \mathbf{c} \cdot (\mathbf{a} \times \mathbf{b})$	IN THE BOOKLET
Cartesian equation of a line The line passes through A with position vector a = a1 i + a2 j + a3 k and has direction vector b = b1 i + b2 j + b3 k.	$\frac{x - a_1}{b_1} = \frac{y - a_2}{b_2} = \frac{z - a_3}{b_3} \; (= \lambda)$	IN THE BOOKLET
Cartesian equation of a plane The plane passes through A and has normal vector n = n1 i + n2 j + n3 k.	$n_1x + n_2y + n_3z + d = 0 \quad \text{where } d = -\mathbf{a} \cdot \mathbf{n}$	IN THE BOOKLET
Plane through three points A, B, C A, B and C are non-collinear.	$\mathbf{r} = \mathbf{a} + \lambda(\mathbf{b} - \mathbf{a}) + \mu(\mathbf{c} - \mathbf{a}) = (1 - \lambda - \mu)\mathbf{a} + \lambda\mathbf{b} + \mu\mathbf{c}$	IN THE BOOKLET
Plane parallel to b and c The plane passes through the point with position vector a.	$\mathbf{r} = \mathbf{a} + s\mathbf{b} + t\mathbf{c}$	IN THE BOOKLET
Perpendicular distance from a point to a plane Distance of (α, β, γ) from n1 x + n2 y + n3 z + d = 0.	$\frac{\lvert n_1\alpha + n_2\beta + n_3\gamma + d\rvert}{\sqrt{n_1^2 + n_2^2 + n_3^2}}$	IN THE BOOKLET

A Level Further Maths pure: Hyperbolic functions

Hyperbolic identity	$\cosh^2 x - \sinh^2 x = 1$	IN THE BOOKLET
sinh 2x	$\sinh 2x = 2\sinh x \cosh x$	IN THE BOOKLET
cosh 2x	$\cosh 2x = \cosh^2 x + \sinh^2 x$	IN THE BOOKLET
Inverse cosh	$\operatorname{arcosh} x = \ln\{x + \sqrt{x^2 - 1}\} \quad (x \geqslant 1)$	IN THE BOOKLET
Inverse sinh	$\operatorname{arsinh} x = \ln\{x + \sqrt{x^2 + 1}\}$	IN THE BOOKLET
Inverse tanh	$\operatorname{artanh} x = \frac{1}{2}\ln\left(\frac{1+x}{1-x}\right) \quad (\lvert x\rvert < 1)$	IN THE BOOKLET

Conics

Printed in section 4, A Level Further Maths pure. a, b and c are constants; e is the eccentricity.

	Ellipse	Parabola	Hyperbola	Rectangular hyperbola
Standard form	$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$	$y^2=4ax$	$\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$	$xy=c^2$
Parametric form	$(a\cos\theta,\ b\sin\theta)$	$(at^2,\ 2at)$	$(a\sec\theta,\ b\tan\theta)$ or $(\pm a\cosh\theta,\ b\sinh\theta)$	$\left(ct,\ \frac{c}{t}\right)$
Eccentricity	$e<1,\ b^2=a^2(1-e^2)$	$e=1$	$e>1,\ b^2=a^2(e^2-1)$	$e=\sqrt{2}$
Foci	$(\pm ae,\ 0)$	$(a,\ 0)$	$(\pm ae,\ 0)$	$(\pm\sqrt{2}c,\ \pm\sqrt{2}c)$
Directrices	$x=\pm\frac{a}{e}$	$x=-a$	$x=\pm\frac{a}{e}$	$x+y=\pm\sqrt{2}c$
Asymptotes	none	none	$\frac{x}{a}=\pm\frac{y}{b}$	$x=0,\ y=0$

A Level Further Maths pure: Differentiation

Derivative of arcsin x	$\frac{d}{dx}(\arcsin x)=\frac{1}{\sqrt{1-x^2}}$	IN THE BOOKLET
Derivative of arccos x	$\frac{d}{dx}(\arccos x)=-\frac{1}{\sqrt{1-x^2}}$	IN THE BOOKLET
Derivative of arctan x	$\frac{d}{dx}(\arctan x)=\frac{1}{1+x^2}$	IN THE BOOKLET
Derivative of sinh x	$\frac{d}{dx}(\sinh x)=\cosh x$	IN THE BOOKLET
Derivative of cosh x	$\frac{d}{dx}(\cosh x)=\sinh x$	IN THE BOOKLET
Derivative of tanh x	$\frac{d}{dx}(\tanh x)=\operatorname{sech}^2 x$	IN THE BOOKLET
Derivative of arsinh x	$\frac{d}{dx}(\operatorname{arsinh} x)=\frac{1}{\sqrt{1+x^2}}$	IN THE BOOKLET
Derivative of arcosh x	$\frac{d}{dx}(\operatorname{arcosh} x)=\frac{1}{\sqrt{x^2-1}}$	IN THE BOOKLET
Derivative of artanh x	$\frac{d}{dx}(\operatorname{artanh} x)=\frac{1}{1-x^2}$	IN THE BOOKLET

A Level Further Maths pure: Integration (+ constant; a > 0 where relevant)

Add the constant of integration; a > 0 where relevant.

Integral of sinh x	$\int \sinh x\,dx=\cosh x$	IN THE BOOKLET
Integral of cosh x	$\int \cosh x\,dx=\sinh x$	IN THE BOOKLET
Integral of tanh x	$\int \tanh x\,dx=\ln\cosh x$	IN THE BOOKLET
Integral giving arcsin	$\int \frac{1}{\sqrt{a^2-x^2}}\,dx=\arcsin\left(\frac{x}{a}\right)\quad(\lvert x\rvert<a)$	IN THE BOOKLET
Integral giving arctan	$\int \frac{1}{a^2+x^2}\,dx=\frac{1}{a}\arctan\left(\frac{x}{a}\right)$	IN THE BOOKLET
Integral giving arcosh The two forms are equal.	$\int \frac{1}{\sqrt{x^2-a^2}}\,dx=\operatorname{arcosh}\left(\frac{x}{a}\right)$ or $\ln\{x+\sqrt{x^2-a^2}\}\quad(x>a)$	IN THE BOOKLET

Integral giving arsinh The two forms are equal.	$\int \frac{1}{\sqrt{a^2+x^2}}\,dx = \operatorname{arsinh}\left(\frac{x}{a}\right) \text{ or } \ln\{x+\sqrt{x^2+a^2}\}$	IN THE BOOKLET
Integral of 1/(a² − x²)	$\int \frac{1}{a^2-x^2}\,dx = \frac{1}{2a}\ln\left\lvert\frac{a+x}{a-x}\right\rvert = \frac{1}{a}\operatorname{artanh}\left(\frac{x}{a}\right) \quad (\lvert x\rvert < a)$	IN THE BOOKLET
Integral of 1/(x² − a²)	$\int \frac{1}{x^2-a^2}\,dx = \frac{1}{2a}\ln\left\lvert\frac{x-a}{x+a}\right\rvert$	IN THE BOOKLET

A Level Further Maths pure: Arc length

Arc length, cartesian coordinates	$s = \int \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$	IN THE BOOKLET
Arc length, parametric form	$s = \int \sqrt{\left(\frac{dx}{dt}\right)^2+\left(\frac{dy}{dt}\right)^2}\,dt$	IN THE BOOKLET
Arc length, polar form	$s = \int \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\,d\theta$	IN THE BOOKLET

A Level Further Maths pure: Surface area of revolution

Surface area of revolution, cartesian coordinates Rotation about the x-axis.	$s_x = 2\pi\int y\sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$	IN THE BOOKLET
Surface area of revolution, parametric form Rotation about the x-axis.	$s_x = 2\pi\int y\sqrt{\left(\frac{dx}{dt}\right)^2+\left(\frac{dy}{dt}\right)^2}\,dt$	IN THE BOOKLET
Surface area of revolution, polar form Rotation about the x-axis.	$s_x = 2\pi\int r\sin\theta\sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\,d\theta$	IN THE BOOKLET

A Level Further Maths statistics: Discrete distributions

Expectation (mean) For a discrete random variable X taking values xi with probabilities P(X = xi).	$E(X) = \mu = \sum x_i\,P(X=x_i)$	IN THE BOOKLET
Variance	$\operatorname{Var}(X) = \sigma^2 = \sum(x_i-\mu)^2P(X=x_i) = \sum x_i^2\,P(X=x_i) - \mu^2$	IN THE BOOKLET
Expectation of a function g(X)	$E(g(X)) = \sum g(x_i)\,P(X=x_i)$	IN THE BOOKLET
Probability generating function (p.g.f.)	$G_X(t) = E(t^X)$	IN THE BOOKLET
Mean and variance from the p.g.f.	$E(X) = G_X'(1), \quad \operatorname{Var}(X) = G_X''(1)+G_X'(1)-[G_X'(1)]^2$	IN THE BOOKLET
Sum of independent variables X and Y must be independent.	$Z = X+Y: \quad G_Z(t) = G_X(t)\times G_Y(t)$	IN THE BOOKLET

A Level Further Maths statistics: Standard discrete distributions

Binomial B(n, p): probability	$P(X=x) = \binom{n}{x}p^x(1-p)^{n-x}$	IN THE BOOKLET
Binomial B(n, p): mean	np	IN THE BOOKLET

Binomial B(n, p): variance	$np(1-p)$	IN THE BOOKLET
Binomial B(n, p): p.g.f.	$(1-p+pt)^n$	IN THE BOOKLET
Poisson Po(λ): probability	$P(X=x)=e^{-\lambda}\dfrac{\lambda^x}{x!}$	IN THE BOOKLET
Poisson Po(λ): mean	λ	IN THE BOOKLET
Poisson Po(λ): variance	λ	IN THE BOOKLET
Poisson Po(λ): p.g.f.	$e^{\lambda(t-1)}$	IN THE BOOKLET
Geometric Geo(p): probability On x = 1, 2, ...	$P(X=x)=p(1-p)^{x-1}$	IN THE BOOKLET
Geometric Geo(p): mean	$\dfrac{1}{p}$	IN THE BOOKLET
Geometric Geo(p): variance	$\dfrac{1-p}{p^2}$	IN THE BOOKLET
Geometric Geo(p): p.g.f.	$\dfrac{pt}{1-(1-p)t}$	IN THE BOOKLET
Negative binomial: probability On x = r, r + 1, ...	$P(X=x)=\dbinom{x-1}{r-1}p^r(1-p)^{x-r}$	IN THE BOOKLET
Negative binomial: mean	$\dfrac{r}{p}$	IN THE BOOKLET
Negative binomial: variance	$\dfrac{r(1-p)}{p^2}$	IN THE BOOKLET
Negative binomial: p.g.f.	$\left(\dfrac{pt}{1-(1-p)t}\right)^r$	IN THE BOOKLET

A Level Further Maths statistics: Continuous distributions

Expectation (mean) For a continuous random variable X having probability density function f.	$E(X)=\mu=\displaystyle\int x\,f(x)\,dx$	IN THE BOOKLET
Variance	$\mathrm{Var}(X)=\sigma^2=\displaystyle\int(x-\mu)^2f(x)\,dx=\int x^2f(x)\,dx-\mu^2$	IN THE BOOKLET
Expectation of a function g(X)	$E(g(X))=\displaystyle\int g(x)\,f(x)\,dx$	IN THE BOOKLET
Cumulative distribution function	$F(x_0)=P(X\leqslant x_0)=\displaystyle\int_{-\infty}^{x_0}f(t)\,dt$	IN THE BOOKLET

A Level Further Maths statistics: Standard continuous distributions

Normal N(μ, σ²): p.d.f.	$f(x)=\dfrac{1}{\sigma\sqrt{2\pi}}e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$	IN THE BOOKLET
Normal N(μ, σ²): mean	μ	IN THE BOOKLET
Normal N(μ, σ²): variance	σ^2	IN THE BOOKLET
Uniform on [a, b]: p.d.f.	$f(x)=\dfrac{1}{b-a}$	IN THE BOOKLET
Uniform on [a, b]: mean	$\frac{1}{2}(a+b)$	IN THE BOOKLET
Uniform on [a, b]: variance	$\frac{1}{12}(b-a)^2$	IN THE BOOKLET

A Level Further Maths statistics: Correlation and regression

Sxx For a set of n pairs of values (xi, yi).	$S_{xx} = \sum(x_i - \bar{x})^2 = \sum x_i^2 - \frac{(\sum x_i)^2}{n}$	IN THE BOOKLET
Syy	$S_{yy} = \sum(y_i - \bar{y})^2 = \sum y_i^2 - \frac{(\sum y_i)^2}{n}$	IN THE BOOKLET
Sxy	$S_{xy} = \sum(x_i - \bar{x})(y_i - \bar{y}) = \sum x_i y_i - \frac{(\sum x_i)(\sum y_i)}{n}$	IN THE BOOKLET
Product moment correlation coefficient	$r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\{\sum(x_i - \bar{x})^2\}\{\sum(y_i - \bar{y})^2\}}} = \frac{\sum x_i y_i - \frac{(\sum x_i)(\sum y_i)}{n}}{\sqrt{\left(\sum x_i^2 - \frac{(\sum x_i)^2}{n}\right)\left(\sum y_i^2 - \frac{(\sum y_i)^2}{n}\right)}}$	IN THE BOOKLET
Regression coefficient of y on x	$b = \frac{S_{xy}}{S_{xx}} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sum(x_i - \bar{x})^2}$	IN THE BOOKLET
Least squares regression line of y on x	$y = a + bx \quad \text{where } a = \bar{y} - b\bar{x}$	IN THE BOOKLET
Residual sum of squares (RSS)	$\text{RSS} = S_{yy} - \frac{(S_{xy})^2}{S_{xx}} = S_{yy}(1 - r^2)$	IN THE BOOKLET
Spearman's rank correlation coefficient d is the difference between the two ranks of each pair.	$r_s = 1 - \frac{6\sum d^2}{n(n^2 - 1)}$	IN THE BOOKLET

A Level Further Maths statistics: Expectation algebra

Independent random variables X and Y The variance rule needs X and Y independent. The variances always add, even for aX - bY.	$E(XY) = E(X)E(Y), \quad \text{Var}(aX \pm bY) = a^2\,\text{Var}(X) + b^2\,\text{Var}(Y)$	IN THE BOOKLET

A Level Further Maths statistics: Sampling distributions (i) tests for mean when σ is known

Sample mean as an estimator of μ For a random sample X1, X2, ..., Xn of n independent observations from a distribution having mean μ and variance σ².	$\bar{X}$ is an unbiased estimator of μ, $\quad \text{Var}(\bar{X}) = \frac{\sigma^2}{n}$	IN THE BOOKLET
Sample variance as an estimator of σ²	S^2 is an unbiased estimator of σ^2, $\quad S^2 = \frac{\sum(X_i - \bar{X})^2}{n - 1}$	IN THE BOOKLET
Standardised sample mean For a random sample of n observations from N(μ, σ²).	$\frac{\bar{X} - \mu}{\sigma/\sqrt{n}} \sim N(0, 1)$	IN THE BOOKLET
Difference of two sample means, σ known A random sample of nx observations from N(μx, σx²) and, independently, a random sample of ny observations from N(μy, σy²).	$\frac{(\bar{X} - \bar{Y}) - (\mu_x - \mu_y)}{\sqrt{\frac{\sigma_x^2}{n_x} + \frac{\sigma_y^2}{n_y}}} \sim N(0, 1)$	IN THE BOOKLET

A Level Further Maths statistics: Sampling distributions (ii) tests for variance and mean when σ is not known

Chi-squared test for a variance For a random sample of n observations from N(μ, σ²).	$\frac{(n-1)S^2}{\sigma^2} \sim \chi^2_{n-1}$	IN THE BOOKLET
t test for a mean Also valid in matched-pairs situations.	$\frac{\bar{X}-\mu}{S/\sqrt{n}} \sim t_{n-1}$	IN THE BOOKLET
F test for a ratio of variances A random sample of nx observations from N(μx, σx²) and, independently, a random sample of ny observations from N(μy, σy²).	$\frac{S_x^2/\sigma_x^2}{S_y^2/\sigma_y^2} \sim F_{n_x-1,\,n_y-1}$	IN THE BOOKLET
Pooled t test for a difference of means Used when σx² = σy² = σ² (unknown).	$\frac{(\bar{X}-\bar{Y})-(\mu_x-\mu_y)}{\sqrt{S_p^2\left(\frac{1}{n_x}+\frac{1}{n_y}\right)}} \sim t_{n_x+n_y-2}$	IN THE BOOKLET
Pooled variance	$S_p^2 = \frac{(n_x-1)S_x^2+(n_y-1)S_y^2}{n_x+n_y-2}$	IN THE BOOKLET

A Level Further Maths statistics: Non-parametric tests

Statistical tables required for A Level Further Maths: binomial and Poisson cumulative distribution functions, percentage points of the chi-squared distribution, critical values for product moment and Spearman's coefficients, random numbers, percentage points of Student's t distribution and percentage points of the F distribution.

Goodness-of-fit test and contingency tables O is the observed and E the expected frequency. nu is the number of degrees of freedom.	$\sum \frac{(O_i-E_i)^2}{E_i} \sim \chi^2_\nu$	IN THE BOOKLET

A Level Further Maths mechanics: Centres of mass

Triangular lamina For uniform bodies.	$\frac{2}{3}$ along the median from the vertex	IN THE BOOKLET
Circular arc, radius r, angle at centre 2α For uniform bodies.	$\frac{r\sin\alpha}{\alpha}$ from the centre	IN THE BOOKLET
Sector of a circle, radius r, angle at centre 2α For uniform bodies.	$\frac{2r\sin\alpha}{3\alpha}$ from the centre	IN THE BOOKLET
Solid hemisphere, radius r For uniform bodies.	$\frac{3}{8}r$ from the centre	IN THE BOOKLET
Hemispherical shell, radius r For uniform bodies.	$\frac{1}{2}r$ from the centre	IN THE BOOKLET
Solid cone or pyramid of height h For uniform bodies.	$\frac{1}{4}h$ above the base, on the line from the centre of the base to the vertex	IN THE BOOKLET
Conical shell of height h For uniform bodies.	$\frac{1}{3}h$ above the base, on the line from the centre of the base to the vertex	IN THE BOOKLET

A Level Further Maths mechanics: Motion in a circle

Transverse velocity	$v = r\dot{\theta}$	IN THE BOOKLET

Transverse acceleration	$\dot{v} = r\ddot{\theta}$	IN THE BOOKLET
Radial acceleration	$-r\dot{\theta}^2 = -\frac{v^2}{r}$	IN THE BOOKLET

Which statistical tables each course needs

The booklet lists these at the end of each qualification's section. Page numbers are the official booklet's.

Course	Tables required
AS Maths (8MA0)	Binomial cumulative distribution function (p. 29); random numbers (p. 38)
A Level Maths (9MA0)	Binomial cumulative distribution function (p. 29); percentage points of the normal distribution (p. 34); critical values for correlation coefficients, product moment (p. 37); random numbers (p. 38)
AS Further Maths (8FM0)	Binomial (p. 29) and Poisson (p. 35) cumulative distribution functions; percentage points of the chi-squared distribution (p. 36); critical values for product moment and Spearman's coefficients (p. 37); random numbers (p. 38)
A Level Further Maths (9FM0)	All of the AS Further Maths tables, plus percentage points of Student's t distribution (p. 39) and of the F distribution (p. 40)

Binomial cumulative distribution function

The tabulated value is P(X ≤ x), where X has a binomial distribution with index n and parameter p.

n = 5

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.7738	0.5905	0.4437	0.3277	0.2373	0.1681	0.1160	0.0778	0.0503	0.0312
1	0.9774	0.9185	0.8352	0.7373	0.6328	0.5282	0.4284	0.3370	0.2562	0.1875
2	0.9988	0.9914	0.9734	0.9421	0.8965	0.8369	0.7648	0.6826	0.5931	0.5000
3	1.0000	0.9995	0.9978	0.9933	0.9844	0.9692	0.9460	0.9130	0.8688	0.8125
4	1.0000	1.0000	0.9999	0.9997	0.9990	0.9976	0.9947	0.9898	0.9815	0.9688

n = 6

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.7351	0.5314	0.3771	0.2621	0.1780	0.1176	0.0754	0.0467	0.0277	0.0156
1	0.9672	0.8857	0.7765	0.6554	0.5339	0.4202	0.3191	0.2333	0.1636	0.1094
2	0.9978	0.9842	0.9527	0.9011	0.8306	0.7443	0.6471	0.5443	0.4415	0.3438
3	0.9999	0.9987	0.9941	0.9830	0.9624	0.9295	0.8826	0.8208	0.7447	0.6563
4	1.0000	0.9999	0.9996	0.9984	0.9954	0.9891	0.9777	0.9590	0.9308	0.8906
5	1.0000	1.0000	1.0000	0.9999	0.9998	0.9993	0.9982	0.9959	0.9917	0.9844

n = 7

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.6983	0.4783	0.3206	0.2097	0.1335	0.0824	0.0490	0.0280	0.0152	0.0078
1	0.9556	0.8503	0.7166	0.5767	0.4449	0.3294	0.2338	0.1586	0.1024	0.0625
2	0.9962	0.9743	0.9262	0.8520	0.7564	0.6471	0.5323	0.4199	0.3164	0.2266
3	0.9998	0.9973	0.9879	0.9667	0.9294	0.8740	0.8002	0.7102	0.6083	0.5000
4	1.0000	0.9998	0.9988	0.9953	0.9871	0.9712	0.9444	0.9037	0.8471	0.7734
5	1.0000	1.0000	0.9999	0.9996	0.9987	0.9962	0.9910	0.9812	0.9643	0.9375
6	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9994	0.9984	0.9963	0.9922

n = 8

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.6634	0.4305	0.2725	0.1678	0.1001	0.0576	0.0319	0.0168	0.0084	0.0039
1	0.9428	0.8131	0.6572	0.5033	0.3671	0.2553	0.1691	0.1064	0.0632	0.0352
2	0.9942	0.9619	0.8948	0.7969	0.6785	0.5518	0.4278	0.3154	0.2201	0.1445
3	0.9996	0.9950	0.9786	0.9437	0.8862	0.8059	0.7064	0.5941	0.4770	0.3633
4	1.0000	0.9996	0.9971	0.9896	0.9727	0.9420	0.8939	0.8263	0.7396	0.6367
5	1.0000	1.0000	0.9998	0.9988	0.9958	0.9887	0.9747	0.9502	0.9115	0.8555

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
6	1.0000	1.0000	1.0000	0.9999	0.9996	0.9987	0.9964	0.9915	0.9819	0.9648
7	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9993	0.9983	0.9961

n = 9

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.6302	0.3874	0.2316	0.1342	0.0751	0.0404	0.0207	0.0101	0.0046	0.0020
1	0.9288	0.7748	0.5995	0.4362	0.3003	0.1960	0.1211	0.0705	0.0385	0.0195
2	0.9916	0.9470	0.8591	0.7382	0.6007	0.4628	0.3373	0.2318	0.1495	0.0898
3	0.9994	0.9917	0.9661	0.9144	0.8343	0.7297	0.6089	0.4826	0.3614	0.2539
4	1.0000	0.9991	0.9944	0.9804	0.9511	0.9012	0.8283	0.7334	0.6214	0.5000
5	1.0000	0.9999	0.9994	0.9969	0.9900	0.9747	0.9464	0.9006	0.8342	0.7461
6	1.0000	1.0000	1.0000	0.9997	0.9987	0.9957	0.9888	0.9750	0.9502	0.9102
7	1.0000	1.0000	1.0000	1.0000	0.9999	0.9996	0.9986	0.9962	0.9909	0.9805
8	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9992	0.9980

n = 10

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.5987	0.3487	0.1969	0.1074	0.0563	0.0282	0.0135	0.0060	0.0025	0.0010
1	0.9139	0.7361	0.5443	0.3758	0.2440	0.1493	0.0860	0.0464	0.0233	0.0107
2	0.9885	0.9298	0.8202	0.6778	0.5256	0.3828	0.2616	0.1673	0.0996	0.0547
3	0.9990	0.9872	0.9500	0.8791	0.7759	0.6496	0.5138	0.3823	0.2660	0.1719
4	0.9999	0.9984	0.9901	0.9672	0.9219	0.8497	0.7515	0.6331	0.5044	0.3770
5	1.0000	0.9999	0.9986	0.9936	0.9803	0.9527	0.9051	0.8338	0.7384	0.6230
6	1.0000	1.0000	0.9999	0.9991	0.9965	0.9894	0.9740	0.9452	0.8980	0.8281
7	1.0000	1.0000	1.0000	0.9999	0.9996	0.9984	0.9952	0.9877	0.9726	0.9453
8	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9995	0.9983	0.9955	0.9893
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9990

n = 12

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.5404	0.2824	0.1422	0.0687	0.0317	0.0138	0.0057	0.0022	0.0008	0.0002
1	0.8816	0.6590	0.4435	0.2749	0.1584	0.0850	0.0424	0.0196	0.0083	0.0032
2	0.9804	0.8891	0.7358	0.5583	0.3907	0.2528	0.1513	0.0834	0.0421	0.0193
3	0.9978	0.9744	0.9078	0.7946	0.6488	0.4925	0.3467	0.2253	0.1345	0.0730
4	0.9998	0.9957	0.9761	0.9274	0.8424	0.7237	0.5833	0.4382	0.3044	0.1938
5	1.0000	0.9995	0.9954	0.9806	0.9456	0.8822	0.7873	0.6652	0.5269	0.3872
6	1.0000	0.9999	0.9993	0.9961	0.9857	0.9614	0.9154	0.8418	0.7393	0.6128
7	1.0000	1.0000	0.9999	0.9994	0.9972	0.9905	0.9745	0.9427	0.8883	0.8062
8	1.0000	1.0000	1.0000	0.9999	0.9996	0.9983	0.9944	0.9847	0.9644	0.9270
9	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9992	0.9972	0.9921	0.9807
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9989	0.9968
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998

n = 15

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.4633	0.2059	0.0874	0.0352	0.0134	0.0047	0.0016	0.0005	0.0001	0.0000
1	0.8290	0.5490	0.3186	0.1671	0.0802	0.0353	0.0142	0.0052	0.0017	0.0005
2	0.9638	0.8159	0.6042	0.3980	0.2361	0.1268	0.0617	0.0271	0.0107	0.0037
3	0.9945	0.9444	0.8227	0.6482	0.4613	0.2969	0.1727	0.0905	0.0424	0.0176
4	0.9994	0.9873	0.9383	0.8358	0.6865	0.5155	0.3519	0.2173	0.1204	0.0592
5	0.9999	0.9978	0.9832	0.9389	0.8516	0.7216	0.5643	0.4032	0.2608	0.1509
6	1.0000	0.9997	0.9964	0.9819	0.9434	0.8689	0.7548	0.6098	0.4522	0.3036
7	1.0000	1.0000	0.9994	0.9958	0.9827	0.9500	0.8868	0.7869	0.6535	0.5000
8	1.0000	1.0000	0.9999	0.9992	0.9958	0.9848	0.9578	0.9050	0.8182	0.6964
9	1.0000	1.0000	1.0000	0.9999	0.9992	0.9963	0.9876	0.9662	0.9231	0.8491
10	1.0000	1.0000	1.0000	1.0000	0.9999	0.9993	0.9972	0.9907	0.9745	0.9408

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
11	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9995	0.9981	0.9937	0.9824
12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9989	0.9963
13	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9995
14	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

n = 20

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.3585	0.1216	0.0388	0.0115	0.0032	0.0008	0.0002	0.0000	0.0000	0.0000
1	0.7358	0.3917	0.1756	0.0692	0.0243	0.0076	0.0021	0.0005	0.0001	0.0000
2	0.9245	0.6769	0.4049	0.2061	0.0913	0.0355	0.0121	0.0036	0.0009	0.0002
3	0.9841	0.8670	0.6477	0.4114	0.2252	0.1071	0.0444	0.0160	0.0049	0.0013
4	0.9974	0.9568	0.8298	0.6296	0.4148	0.2375	0.1182	0.0510	0.0189	0.0059
5	0.9997	0.9887	0.9327	0.8042	0.6172	0.4164	0.2454	0.1256	0.0553	0.0207
6	1.0000	0.9976	0.9781	0.9133	0.7858	0.6080	0.4166	0.2500	0.1299	0.0577
7	1.0000	0.9996	0.9941	0.9679	0.8982	0.7723	0.6010	0.4159	0.2520	0.1316
8	1.0000	0.9999	0.9987	0.9900	0.9591	0.8867	0.7624	0.5956	0.4143	0.2517
9	1.0000	1.0000	0.9998	0.9974	0.9861	0.9520	0.8782	0.7553	0.5914	0.4119
10	1.0000	1.0000	1.0000	0.9994	0.9961	0.9829	0.9468	0.8725	0.7507	0.5881
11	1.0000	1.0000	1.0000	0.9999	0.9991	0.9949	0.9804	0.9435	0.8692	0.7483
12	1.0000	1.0000	1.0000	1.0000	0.9998	0.9987	0.9940	0.9790	0.9420	0.8684
13	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9985	0.9935	0.9786	0.9423
14	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9984	0.9936	0.9793
15	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9985	0.9941
16	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9987
17	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998
18	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

n = 25

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.2774	0.0718	0.0172	0.0038	0.0008	0.0001	0.0000	0.0000	0.0000	0.0000
1	0.6424	0.2712	0.0931	0.0274	0.0070	0.0016	0.0003	0.0001	0.0000	0.0000
2	0.8729	0.5371	0.2537	0.0982	0.0321	0.0090	0.0021	0.0004	0.0001	0.0000
3	0.9659	0.7636	0.4711	0.2340	0.0962	0.0332	0.0097	0.0024	0.0005	0.0001
4	0.9928	0.9020	0.6821	0.4207	0.2137	0.0905	0.0320	0.0095	0.0023	0.0005
5	0.9988	0.9666	0.8385	0.6167	0.3783	0.1935	0.0826	0.0294	0.0086	0.0020
6	0.9998	0.9905	0.9305	0.7800	0.5611	0.3407	0.1734	0.0736	0.0258	0.0073
7	1.0000	0.9977	0.9745	0.8909	0.7265	0.5118	0.3061	0.1536	0.0639	0.0216
8	1.0000	0.9995	0.9920	0.9532	0.8506	0.6769	0.4668	0.2735	0.1340	0.0539
9	1.0000	0.9999	0.9979	0.9827	0.9287	0.8106	0.6303	0.4246	0.2424	0.1148
10	1.0000	1.0000	0.9995	0.9944	0.9703	0.9022	0.7712	0.5858	0.3843	0.2122
11	1.0000	1.0000	0.9999	0.9985	0.9893	0.9558	0.8746	0.7323	0.5426	0.3450
12	1.0000	1.0000	1.0000	0.9996	0.9966	0.9825	0.9396	0.8462	0.6937	0.5000
13	1.0000	1.0000	1.0000	0.9999	0.9991	0.9940	0.9745	0.9222	0.8173	0.6550
14	1.0000	1.0000	1.0000	1.0000	0.9998	0.9982	0.9907	0.9656	0.9040	0.7878
15	1.0000	1.0000	1.0000	1.0000	1.0000	0.9995	0.9971	0.9868	0.9560	0.8852
16	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9992	0.9957	0.9826	0.9461
17	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9988	0.9942	0.9784
18	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9984	0.9927
19	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9996	0.9980
20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9995
21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999
22	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

n = 30

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.2146	0.0424	0.0076	0.0012	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.5535	0.1837	0.0480	0.0105	0.0020	0.0003	0.0000	0.0000	0.0000	0.0000
2	0.8122	0.4114	0.1514	0.0442	0.0106	0.0021	0.0003	0.0000	0.0000	0.0000
3	0.9392	0.6474	0.3217	0.1227	0.0374	0.0093	0.0019	0.0003	0.0000	0.0000
4	0.9844	0.8245	0.5245	0.2552	0.0979	0.0302	0.0075	0.0015	0.0002	0.0000
5	0.9967	0.9268	0.7106	0.4275	0.2026	0.0766	0.0233	0.0057	0.0011	0.0002
6	0.9994	0.9742	0.8474	0.6070	0.3481	0.1595	0.0586	0.0172	0.0040	0.0007
7	0.9999	0.9922	0.9302	0.7608	0.5143	0.2814	0.1238	0.0435	0.0121	0.0026
8	1.0000	0.9980	0.9722	0.8713	0.6736	0.4315	0.2247	0.0940	0.0312	0.0081
9	1.0000	0.9995	0.9903	0.9389	0.8034	0.5888	0.3575	0.1763	0.0694	0.0214
10	1.0000	0.9999	0.9971	0.9744	0.8943	0.7304	0.5078	0.2915	0.1350	0.0494
11	1.0000	1.0000	0.9992	0.9905	0.9493	0.8407	0.6548	0.4311	0.2327	0.1002
12	1.0000	1.0000	0.9998	0.9969	0.9784	0.9155	0.7802	0.5785	0.3592	0.1808
13	1.0000	1.0000	1.0000	0.9991	0.9918	0.9599	0.8737	0.7145	0.5025	0.2923
14	1.0000	1.0000	1.0000	0.9998	0.9973	0.9831	0.9348	0.8246	0.6448	0.4278
15	1.0000	1.0000	1.0000	0.9999	0.9992	0.9936	0.9699	0.9029	0.7691	0.5722
16	1.0000	1.0000	1.0000	1.0000	0.9998	0.9979	0.9876	0.9519	0.8644	0.7077
17	1.0000	1.0000	1.0000	1.0000	0.9999	0.9994	0.9955	0.9788	0.9286	0.8192
18	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9986	0.9917	0.9666	0.8998
19	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9996	0.9971	0.9862	0.9506
20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9991	0.9950	0.9786
21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9984	0.9919
22	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9996	0.9974
23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9993
24	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

n = 40

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.1285	0.0148	0.0015	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.3991	0.0805	0.0121	0.0015	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.6767	0.2228	0.0486	0.0079	0.0010	0.0001	0.0000	0.0000	0.0000	0.0000
3	0.8619	0.4231	0.1302	0.0285	0.0047	0.0006	0.0001	0.0000	0.0000	0.0000
4	0.9520	0.6290	0.2633	0.0759	0.0160	0.0026	0.0003	0.0000	0.0000	0.0000
5	0.9861	0.7937	0.4325	0.1613	0.0433	0.0086	0.0013	0.0001	0.0000	0.0000
6	0.9966	0.9005	0.6067	0.2859	0.0962	0.0238	0.0044	0.0006	0.0001	0.0000
7	0.9993	0.9581	0.7559	0.4371	0.1820	0.0553	0.0124	0.0021	0.0002	0.0000
8	0.9999	0.9845	0.8646	0.5931	0.2998	0.1110	0.0303	0.0061	0.0009	0.0001
9	1.0000	0.9949	0.9328	0.7318	0.4395	0.1959	0.0644	0.0156	0.0027	0.0003
10	1.0000	0.9985	0.9701	0.8392	0.5839	0.3087	0.1215	0.0352	0.0074	0.0011
11	1.0000	0.9996	0.9880	0.9125	0.7151	0.4406	0.2053	0.0709	0.0179	0.0032
12	1.0000	0.9999	0.9957	0.9568	0.8209	0.5772	0.3143	0.1285	0.0386	0.0083
13	1.0000	1.0000	0.9986	0.9806	0.8968	0.7032	0.4408	0.2112	0.0751	0.0192
14	1.0000	1.0000	0.9996	0.9921	0.9456	0.8074	0.5721	0.3174	0.1326	0.0403
15	1.0000	1.0000	0.9999	0.9971	0.9738	0.8849	0.6946	0.4402	0.2142	0.0769
16	1.0000	1.0000	1.0000	0.9990	0.9884	0.9367	0.7978	0.5681	0.3185	0.1341
17	1.0000	1.0000	1.0000	0.9997	0.9953	0.9680	0.8761	0.6885	0.4391	0.2148
18	1.0000	1.0000	1.0000	0.9999	0.9983	0.9852	0.9301	0.7911	0.5651	0.3179
19	1.0000	1.0000	1.0000	1.0000	0.9994	0.9937	0.9637	0.8702	0.6844	0.4373
20	1.0000	1.0000	1.0000	1.0000	0.9998	0.9976	0.9827	0.9256	0.7870	0.5627
21	1.0000	1.0000	1.0000	1.0000	1.0000	0.9991	0.9925	0.9608	0.8669	0.6821
22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9970	0.9811	0.9233	0.7852
23	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9989	0.9917	0.9595	0.8659

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
24	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9996	0.9966	0.9804	0.9231
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9988	0.9914	0.9597
26	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9996	0.9966	0.9808
27	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9988	0.9917
28	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9996	0.9968
29	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9989
30	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997
31	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999
32	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

n = 50

x	p = 0.05	p = 0.1	p = 0.15	p = 0.2	p = 0.25	p = 0.3	p = 0.35	p = 0.4	p = 0.45	p = 0.5
0	0.0769	0.0052	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.2794	0.0338	0.0029	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.5405	0.1117	0.0142	0.0013	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.7604	0.2503	0.0460	0.0057	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.8964	0.4312	0.1121	0.0185	0.0021	0.0002	0.0000	0.0000	0.0000	0.0000
5	0.9622	0.6161	0.2194	0.0480	0.0070	0.0007	0.0001	0.0000	0.0000	0.0000
6	0.9882	0.7702	0.3613	0.1034	0.0194	0.0025	0.0002	0.0000	0.0000	0.0000
7	0.9968	0.8779	0.5188	0.1904	0.0453	0.0073	0.0008	0.0001	0.0000	0.0000
8	0.9992	0.9421	0.6681	0.3073	0.0916	0.0183	0.0025	0.0002	0.0000	0.0000
9	0.9998	0.9755	0.7911	0.4437	0.1637	0.0402	0.0067	0.0008	0.0001	0.0000
10	1.0000	0.9906	0.8801	0.5836	0.2622	0.0789	0.0160	0.0022	0.0002	0.0000
11	1.0000	0.9968	0.9372	0.7107	0.3816	0.1390	0.0342	0.0057	0.0006	0.0000
12	1.0000	0.9990	0.9699	0.8139	0.5110	0.2229	0.0661	0.0133	0.0018	0.0002
13	1.0000	0.9997	0.9868	0.8894	0.6370	0.3279	0.1163	0.0280	0.0045	0.0005
14	1.0000	0.9999	0.9947	0.9393	0.7481	0.4468	0.1878	0.0540	0.0104	0.0013
15	1.0000	1.0000	0.9981	0.9692	0.8369	0.5692	0.2801	0.0955	0.0220	0.0033
16	1.0000	1.0000	0.9993	0.9856	0.9017	0.6839	0.3889	0.1561	0.0427	0.0077
17	1.0000	1.0000	0.9998	0.9937	0.9449	0.7822	0.5060	0.2369	0.0765	0.0164
18	1.0000	1.0000	0.9999	0.9975	0.9713	0.8594	0.6216	0.3356	0.1273	0.0325
19	1.0000	1.0000	1.0000	0.9991	0.9861	0.9152	0.7264	0.4465	0.1974	0.0595
20	1.0000	1.0000	1.0000	0.9997	0.9937	0.9522	0.8139	0.5610	0.2862	0.1013
21	1.0000	1.0000	1.0000	0.9999	0.9974	0.9749	0.8813	0.6701	0.3900	0.1611
22	1.0000	1.0000	1.0000	1.0000	0.9990	0.9877	0.9290	0.7660	0.5019	0.2399
23	1.0000	1.0000	1.0000	1.0000	0.9996	0.9944	0.9604	0.8438	0.6134	0.3359
24	1.0000	1.0000	1.0000	1.0000	0.9999	0.9976	0.9793	0.9022	0.7160	0.4439
25	1.0000	1.0000	1.0000	1.0000	1.0000	0.9991	0.9900	0.9427	0.8034	0.5561
26	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9955	0.9686	0.8721	0.6641
27	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9981	0.9840	0.9220	0.7601
28	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9993	0.9924	0.9556	0.8389
29	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9966	0.9765	0.8987
30	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9986	0.9884	0.9405
31	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9995	0.9947	0.9675
32	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9978	0.9836
33	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9991	0.9923
34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9967
35	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9987
36	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9995
37	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998
38	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Percentage points of the normal distribution

The values z are those which a random variable Z ~ N(0, 1) exceeds with probability p; that is, P(Z > z) = 1 - Φ(z) = p.

p	z	p	z
0.5000	0.0000	0.0500	1.6449
0.4000	0.2533	0.0250	1.9600
0.3000	0.5244	0.0100	2.3263
0.2000	0.8416	0.0050	2.5758
0.1500	1.0364	0.0010	3.0902
0.1000	1.2816	0.0005	3.2905

Poisson cumulative distribution function

The tabulated value is P(X ≤ x), where X has a Poisson distribution with parameter λ.

x	λ = 0.5	λ = 1	λ = 1.5	λ = 2	λ = 2.5	λ = 3	λ = 3.5	λ = 4	λ = 4.5	λ = 5
0	0.6065	0.3679	0.2231	0.1353	0.0821	0.0498	0.0302	0.0183	0.0111	0.0067
1	0.9098	0.7358	0.5578	0.4060	0.2873	0.1991	0.1359	0.0916	0.0611	0.0404
2	0.9856	0.9197	0.8088	0.6767	0.5438	0.4232	0.3208	0.2381	0.1736	0.1247
3	0.9982	0.9810	0.9344	0.8571	0.7576	0.6472	0.5366	0.4335	0.3423	0.2650
4	0.9998	0.9963	0.9814	0.9473	0.8912	0.8153	0.7254	0.6288	0.5321	0.4405
5	1.0000	0.9994	0.9955	0.9834	0.9580	0.9161	0.8576	0.7851	0.7029	0.6160
6	1.0000	0.9999	0.9991	0.9955	0.9858	0.9665	0.9347	0.8893	0.8311	0.7622
7	1.0000	1.0000	0.9998	0.9989	0.9958	0.9881	0.9733	0.9489	0.9134	0.8666
8	1.0000	1.0000	1.0000	0.9998	0.9989	0.9962	0.9901	0.9786	0.9597	0.9319
9	1.0000	1.0000	1.0000	1.0000	0.9997	0.9989	0.9967	0.9919	0.9829	0.9682
10	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9990	0.9972	0.9933	0.9863
11	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9991	0.9976	0.9945
12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9992	0.9980
13	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9993
14	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998
15	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999
16	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
17	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
18	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
19	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
x	λ = 5.5	λ = 6	λ = 6.5	λ = 7	λ = 7.5	λ = 8	λ = 8.5	λ = 9	λ = 9.5	λ = 10
0	0.0041	0.0025	0.0015	0.0009	0.0006	0.0003	0.0002	0.0001	0.0001	0.0000
1	0.0266	0.0174	0.0113	0.0073	0.0047	0.0030	0.0019	0.0012	0.0008	0.0005
2	0.0884	0.0620	0.0430	0.0296	0.0203	0.0138	0.0093	0.0062	0.0042	0.0028
3	0.2017	0.1512	0.1118	0.0818	0.0591	0.0424	0.0301	0.0212	0.0149	0.0103
4	0.3575	0.2851	0.2237	0.1730	0.1321	0.0996	0.0744	0.0550	0.0403	0.0293
5	0.5289	0.4457	0.3690	0.3007	0.2414	0.1912	0.1496	0.1157	0.0885	0.0671
6	0.6860	0.6063	0.5265	0.4497	0.3782	0.3134	0.2562	0.2068	0.1649	0.1301
7	0.8095	0.7440	0.6728	0.5987	0.5246	0.4530	0.3856	0.3239	0.2687	0.2202
8	0.8944	0.8472	0.7916	0.7291	0.6620	0.5925	0.5231	0.4557	0.3918	0.3328
9	0.9462	0.9161	0.8774	0.8305	0.7764	0.7166	0.6530	0.5874	0.5218	0.4579
10	0.9747	0.9574	0.9332	0.9015	0.8622	0.8159	0.7634	0.7060	0.6453	0.5830
11	0.9890	0.9799	0.9661	0.9467	0.9208	0.8881	0.8487	0.8030	0.7520	0.6968
12	0.9955	0.9912	0.9840	0.9730	0.9573	0.9362	0.9091	0.8758	0.8364	0.7916
13	0.9983	0.9964	0.9929	0.9872	0.9784	0.9658	0.9486	0.9261	0.8981	0.8645
14	0.9994	0.9986	0.9970	0.9943	0.9897	0.9827	0.9726	0.9585	0.9400	0.9165
15	0.9998	0.9995	0.9988	0.9976	0.9954	0.9918	0.9862	0.9780	0.9665	0.9513
16	0.9999	0.9998	0.9996	0.9990	0.9980	0.9963	0.9934	0.9889	0.9823	0.9730

x	λ = 5.5	λ = 6	λ = 6.5	λ = 7	λ = 7.5	λ = 8	λ = 8.5	λ = 9	λ = 9.5	λ = 10
17	1.0000	0.9999	0.9998	0.9996	0.9992	0.9984	0.9970	0.9947	0.9911	0.9857
18	1.0000	1.0000	0.9999	0.9999	0.9997	0.9993	0.9987	0.9976	0.9957	0.9928
19	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9995	0.9989	0.9980	0.9965
20	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996	0.9991	0.9984
21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996	0.9993
22	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9997

Percentage points of the chi-squared distribution

The values in the table are those which a random variable with the chi-squared distribution on v degrees of freedom exceeds with the probability shown.

v	0.995	0.990	0.975	0.950	0.900	0.100	0.050	0.025	0.010	0.005
1	0.000	0.000	0.001	0.004	0.016	2.705	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.832	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.580	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.042	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.558
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.194	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.256	16.047	17.708	19.768	39.088	42.557	45.722	49.588	52.336
30	13.787	14.953	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672

Critical values for correlation coefficients: product moment

These tables concern tests of the hypothesis that a population correlation coefficient ρ is 0. The values are the minimum values which need to be reached by a sample correlation coefficient in order to be significant at the level shown, on a one-tailed test.

Sample size	Level 0.10	Level 0.05	Level 0.025	Level 0.01	Level 0.005
4	0.8000	0.9000	0.9500	0.9800	0.9900
5	0.6870	0.8054	0.8783	0.9343	0.9587
6	0.6084	0.7293	0.8114	0.8822	0.9172
7	0.5509	0.6694	0.7545	0.8329	0.8745
8	0.5067	0.6215	0.7067	0.7887	0.8343
9	0.4716	0.5822	0.6664	0.7498	0.7977
10	0.4428	0.5494	0.6319	0.7155	0.7646
11	0.4187	0.5214	0.6021	0.6851	0.7348
12	0.3981	0.4973	0.5760	0.6581	0.7079
13	0.3802	0.4762	0.5529	0.6339	0.6835
14	0.3646	0.4575	0.5324	0.6120	0.6614
15	0.3507	0.4409	0.5140	0.5923	0.6411
16	0.3383	0.4259	0.4973	0.5742	0.6226
17	0.3271	0.4124	0.4821	0.5577	0.6055
18	0.3170	0.4000	0.4683	0.5425	0.5897
19	0.3077	0.3887	0.4555	0.5285	0.5751
20	0.2992	0.3783	0.4438	0.5155	0.5614
21	0.2914	0.3687	0.4329	0.5034	0.5487
22	0.2841	0.3598	0.4227	0.4921	0.5368
23	0.2774	0.3515	0.4133	0.4815	0.5256
24	0.2711	0.3438	0.4044	0.4716	0.5151
25	0.2653	0.3365	0.3961	0.4622	0.5052
26	0.2598	0.3297	0.3882	0.4534	0.4958
27	0.2546	0.3233	0.3809	0.4451	0.4869
28	0.2497	0.3172	0.3739	0.4372	0.4785
29	0.2451	0.3115	0.3673	0.4297	0.4705
30	0.2407	0.3061	0.3610	0.4226	0.4629
40	0.2070	0.2638	0.3120	0.3665	0.4026
50	0.1843	0.2353	0.2787	0.3281	0.3610
60	0.1678	0.2144	0.2542	0.2997	0.3301
70	0.1550	0.1982	0.2352	0.2776	0.3060
80	0.1448	0.1852	0.2199	0.2597	0.2864
90	0.1364	0.1745	0.2072	0.2449	0.2702
100	0.1292	0.1654	0.1966	0.2324	0.2565

Critical values for correlation coefficients: Spearman's

One-tailed test, as for the product moment table. 'none' means the booklet prints a dash, so no critical value exists for that sample size and level.

Sample size	Level 0.05	Level 0.025	Level 0.01
4	1.0000	none	none
5	0.9000	1.0000	1.0000
6	0.8286	0.8857	0.9429
7	0.7143	0.7857	0.8929
8	0.6429	0.7381	0.8333
9	0.6000	0.7000	0.7833
10	0.5636	0.6485	0.7455
11	0.5364	0.6182	0.7091
12	0.5035	0.5874	0.6783
13	0.4835	0.5604	0.6484
14	0.4637	0.5385	0.6264
15	0.4464	0.5214	0.6036
16	0.4294	0.5029	0.5824
17	0.4142	0.4877	0.5662
18	0.4014	0.4716	0.5501
19	0.3912	0.4596	0.5351
20	0.3805	0.4466	0.5218
21	0.3701	0.4364	0.5091
22	0.3608	0.4252	0.4975
23	0.3528	0.4160	0.4862
24	0.3443	0.4070	0.4757
25	0.3369	0.3977	0.4662
26	0.3306	0.3901	0.4571
27	0.3242	0.3828	0.4487
28	0.3180	0.3755	0.4401
29	0.3118	0.3685	0.4325
30	0.3063	0.3624	0.4251
40	0.2640	0.3128	0.3681
50	0.2353	0.2791	0.3293
60	0.2144	0.2545	0.3005
70	0.1982	0.2354	0.2782
80	0.1852	0.2201	0.2602
90	0.1745	0.2074	0.2453
100	0.1654	0.1967	0.2327

Random numbers

Twenty rows of twenty random digits, printed in pairs.

86 13	84 10	07 30	39 05	97 96	88 07	37 26	04 89	13 48	19 20

60 78	48 12	99 47	09 46	91 33	17 21	03 94	79 00	08 50	40 16
78 48	06 37	82 26	01 06	64 65	94 41	17 26	74 66	61 93	24 97
80 56	90 79	66 94	18 40	97 79	93 20	41 51	25 04	20 71	76 04
99 09	39 25	66 31	70 56	30 15	52 17	87 55	31 11	10 68	98 23
56 32	32 72	91 65	97 36	56 61	12 79	95 17	57 16	53 58	96 36
66 02	49 93	97 44	99 15	56 86	80 57	11 78	40 23	58 40	86 14
31 77	53 94	05 93	56 14	71 23	60 46	05 33	23 72	93 10	81 23
98 79	72 43	14 76	54 77	66 29	84 09	88 56	75 86	41 67	04 42
50 97	92 15	10 01	57 01	87 33	73 17	70 18	40 21	24 20	66 62
90 51	94 50	12 48	88 95	09 34	09 30	22 27	25 56	40 76	01 59
31 99	52 24	13 43	27 88	11 39	41 65	00 84	13 06	31 79	74 97
22 96	23 34	46 12	67 11	48 06	99 24	14 83	78 37	65 73	39 47
06 84	55 41	27 06	74 59	14 29	20 14	45 75	31 16	05 41	22 96
08 64	89 30	25 25	71 35	33 31	04 56	12 67	03 74	07 16	49 32
86 87	62 43	15 11	76 49	79 13	78 80	93 89	09 57	07 14	40 74
94 44	97 13	77 04	35 02	12 76	60 91	93 40	81 06	85 85	72 84
63 25	55 14	66 47	99 90	02 90	83 43	16 01	19 69	11 78	87 16
11 22	83 98	15 21	18 57	53 42	91 91	26 52	89 13	86 00	47 61
01 70	10 83	94 71	13 67	11 12	36 54	53 32	90 43	79 01	95 15

Percentage points of Student's t distribution

The values in the table are those which a random variable with Student's t distribution on v degrees of freedom exceeds with the probability shown.

v	0.10	0.05	0.025	0.01	0.005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878

v	0.10	0.05	0.025	0.01	0.005
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
32	1.309	1.694	2.037	2.449	2.738
34	1.307	1.691	2.032	2.441	2.728
36	1.306	1.688	2.028	2.435	2.719
38	1.304	1.686	2.024	2.429	2.712
40	1.303	1.684	2.021	2.423	2.704
45	1.301	1.679	2.014	2.412	2.690
50	1.299	1.676	2.009	2.403	2.678
55	1.297	1.673	2.004	2.396	2.668
60	1.296	1.671	2.000	2.390	2.660
70	1.294	1.667	1.994	2.381	2.648
80	1.292	1.664	1.990	2.374	2.639
90	1.291	1.662	1.987	2.369	2.632
100	1.290	1.660	1.984	2.364	2.626
110	1.289	1.659	1.982	2.361	2.621
120	1.289	1.658	1.980	2.358	2.617

Percentage points of the F distribution

The values in the table are those which a random variable with the F distribution on v1 and v2 degrees of freedom exceeds with probability 0.05 or 0.01. If an upper percentage point on v1 and v2 degrees of freedom is f, the corresponding lower percentage point on v2 and v1 degrees of freedom is 1/f. Copied as printed: the booklet prints 4.17 for probability 0.01, v1 = 12, v2 = 10 (the exact value is 4.71).

Probability	v2	v1 = 1	2	3	4	5	6	8	10	12	24	∞
0.05	1	161.4	199.5	215.7	224.6	230.2	234.0	238.9	241.9	243.9	249.1	254.3
0.05	2	18.51	19.00	19.16	19.25	19.30	19.33	19.37	19.40	19.41	19.46	19.50
0.05	3	10.13	9.55	9.28	9.12	9.01	8.94	8.85	8.79	8.74	8.64	8.53
0.05	4	7.71	6.94	6.59	6.39	6.26	6.16	6.04	5.96	5.91	5.77	5.63
0.05	5	6.61	5.79	5.41	5.19	5.05	4.95	4.82	4.74	4.68	4.53	4.37
0.05	6	5.99	5.14	4.76	4.53	4.39	4.28	4.15	4.06	4.00	3.84	3.67
0.05	7	5.59	4.74	4.35	4.12	3.97	3.87	3.73	3.64	3.57	3.41	3.23
0.05	8	5.32	4.46	4.07	3.84	3.69	3.58	3.44	3.35	3.28	3.12	2.93
0.05	9	5.12	4.26	3.86	3.63	3.48	3.37	3.23	3.14	3.07	2.90	2.71
0.05	10	4.96	4.10	3.71	3.48	3.33	3.22	3.07	2.98	2.91	2.74	2.54
0.05	11	4.84	3.98	3.59	3.36	3.20	3.09	2.95	2.85	2.79	2.61	2.40
0.05	12	4.75	3.89	3.49	3.26	3.11	3.00	2.85	2.75	2.69	2.51	2.30

Probability	v2	v1 = 1	2	3	4	5	6	8	10	12	24	∞
0.05	14	4.60	3.74	3.34	3.11	2.96	2.85	2.70	2.60	2.53	2.35	2.13
0.05	16	4.49	3.63	3.24	3.01	2.85	2.74	2.59	2.49	2.42	2.24	2.01
0.05	18	4.41	3.55	3.16	2.93	2.77	2.66	2.51	2.41	2.34	2.15	1.92
0.05	20	4.35	3.49	3.10	2.87	2.71	2.60	2.45	2.35	2.28	2.08	1.84
0.05	25	4.24	3.39	2.99	2.76	2.60	2.49	2.34	2.24	2.16	1.96	1.71
0.05	30	4.17	3.32	2.92	2.69	2.53	2.42	2.27	2.16	2.09	1.89	1.62
0.05	40	4.08	3.23	2.84	2.61	2.45	2.34	2.18	2.08	2.00	1.79	1.51
0.05	60	4.00	3.15	2.76	2.53	2.37	2.25	2.10	1.99	1.92	1.70	1.39
0.05	120	3.92	3.07	2.68	2.45	2.29	2.18	2.02	1.91	1.83	1.61	1.25
0.05	∞	3.84	3.00	2.60	2.37	2.21	2.10	1.94	1.83	1.75	1.52	1.00
0.01	1	4052.	5000.	5403.	5625.	5764.	5859.	5982.	6056.	6106.	6235.	6366.
0.01	2	98.50	99.00	99.17	99.25	99.30	99.33	99.37	99.40	99.42	99.46	99.50
0.01	3	34.12	30.82	29.46	28.71	28.24	27.91	27.49	27.23	27.05	26.60	26.13
0.01	4	21.20	18.00	16.69	15.98	15.52	15.21	14.80	14.55	14.37	13.93	13.45
0.01	5	16.26	13.27	12.06	11.39	10.97	10.67	10.29	10.05	9.89	9.47	9.02
0.01	6	13.70	10.90	9.78	9.15	8.75	8.47	8.10	7.87	7.72	7.31	6.88
0.01	7	12.20	9.55	8.45	7.85	7.46	7.19	6.84	6.62	6.47	6.07	5.65
0.01	8	11.30	8.65	7.59	7.01	6.63	6.37	6.03	5.81	5.67	5.28	4.86
0.01	9	10.60	8.02	6.99	6.42	6.06	5.80	5.47	5.26	5.11	4.73	4.31
0.01	10	10.00	7.56	6.55	5.99	5.64	5.39	5.06	4.85	4.17	4.33	3.91
0.01	11	9.65	7.21	6.22	5.67	5.32	5.07	4.74	4.54	4.40	4.02	3.60
0.01	12	9.33	6.93	5.95	5.41	5.06	4.82	4.50	4.30	4.16	3.78	3.36
0.01	14	8.86	6.51	5.56	5.04	4.70	4.46	4.14	3.94	3.80	3.43	3.00
0.01	16	8.53	6.23	5.29	4.77	4.44	4.20	3.89	3.69	3.55	3.18	2.75
0.01	18	8.29	6.01	5.09	4.58	4.25	4.01	3.71	3.51	3.37	3.00	2.57
0.01	20	8.10	5.85	4.94	4.43	4.10	3.87	3.56	3.37	3.23	2.86	2.42
0.01	25	7.77	5.57	4.68	4.18	3.86	3.63	3.32	3.13	2.99	2.62	2.17
0.01	30	7.56	5.39	4.51	4.02	3.70	3.47	3.17	2.98	2.84	2.47	2.01
0.01	40	7.31	5.18	4.31	3.83	3.51	3.29	2.99	2.80	2.66	2.29	1.80
0.01	60	7.08	4.98	4.13	3.65	3.34	3.12	2.82	2.63	2.50	2.12	1.60
0.01	120	6.85	4.79	3.95	3.48	3.17	2.96	2.66	2.47	2.34	1.95	1.38
0.01	∞	6.63	4.61	3.78	3.32	3.02	2.80	2.51	2.32	2.18	1.79	1.00

Learn these: not in the booklet

Maths pure, quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Maths pure, laws of indices

$a^x a^y \equiv a^{x+y},\ a^x \div a^y \equiv a^{x-y},\ (a^x)^y \equiv a^{xy}$

Maths pure, laws of logarithms

$x = a^n \iff n = \log_a x\ (a > 0,\ x > 0),\ \log_a x + \log_a y \equiv \log_a(xy),\ \log_a x - \log_a y \equiv \log_a \frac{x}{y},\ k \log_a x \equiv \log_a(x^k)$

Maths pure, straight lines

$y - y_1 = m(x - x_1);$ perpendicular lines $m_1 m_2 = -1$

Maths pure, sequences

$u_n = a + (n-1)d$ (arithmetic), $u_n = ar^{n-1}$ (geometric)

Maths pure, sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Maths pure, cosine rule

$a^2 = b^2 + c^2 - 2bc\cos A$

Maths pure, area of a triangle

$\text{Area} = \frac{1}{2}ab\sin C$

Maths pure, trigonometric identities

$\cos^2 A + \sin^2 A \equiv 1,\ \sec^2 A \equiv 1 + \tan^2 A,\ \operatorname{cosec}^2 A \equiv 1 + \cot^2 A$

Maths pure, double angle identities

$\sin 2A \equiv 2\sin A\cos A,\ \cos 2A \equiv \cos^2 A - \sin^2 A,\ \tan 2A \equiv \frac{2\tan A}{1 - \tan^2 A}$

Maths pure, circle, trapezium and prism

$C = 2\pi r = \pi d,\ A = \pi r^2,$ trapezium $A = \frac{1}{2}(a+b)h,$ prism $V =$ area of cross section $\times$ length

Maths pure, arc length and sector area (radians)

$s = r\theta,\ A = \frac{1}{2}r^2\theta$

Maths pure, differentiation

$\frac{d}{dx}x^n = nx^{n-1},\ \frac{d}{dx}\sin kx = k\cos kx,\ \frac{d}{dx}\cos kx = -k\sin kx,\ \frac{d}{dx}e^{kx} = ke^{kx},\ \frac{d}{dx}\ln x = \frac{1}{x}$

Maths pure, sum, product and chain rules

$(f+g)' = f' + g',\ (fg)' = f'g + fg',\ \frac{d}{dx}f(g(x)) = f'(g(x))\,g'(x)$

Maths pure, integration

$\int x^n dx = \frac{x^{n+1}}{n+1} + c\ (n \neq -1),\ \int \cos kx\,dx = \frac{\sin kx}{k} + c,\ \int \sin kx\,dx = -\frac{\cos kx}{k} + c,\ \int e^{kx} dx = \frac{e^{kx}}{k} + c,\ \int \frac{1}{x} dx = \ln|x| + c\ (x \neq 0)$

Maths pure, reverse chain rule and area

$\int f'(g(x))\,g'(x)\,dx = f(g(x)) + c,\ \text{area under a curve} = \int_a^b y\,dx\ (y \geqslant 0)$

Maths statistics, mean and standardising

$\bar{x} = \frac{\sum x}{n} = \frac{\sum fx}{\sum f},\ Z = \frac{X-\mu}{\sigma}\ \text{where}\ X \sim N(\mu, \sigma^2)$

Maths mechanics, forces

$W = mg,\ F \leqslant \mu R,\ F = ma$

Maths mechanics, variable acceleration

$v = \frac{dr}{dt},\ a = \frac{dv}{dt} = \frac{d^2r}{dt^2},\ r = \int v\,dt,\ v = \int a\,dt$

Further Maths mechanics, momentum and impulse

$\text{momentum} = mv,\ \text{impulse} = mv - mu$

Further Maths mechanics, energy

$KE = \frac{1}{2}mv^2,\ PE = mgh$

Maths mechanics, moment of a force

$\text{Moment} = \text{force} \times \text{perpendicular distance}$

Further Maths pure, complex numbers in exponential form

$z_1 = r_1 e^{i\theta_1},\ z_2 = r_2 e^{i\theta_2} \Rightarrow z_1 z_2 = r_1 r_2 e^{i(\theta_1+\theta_2)},\ \frac{z_1}{z_2} = \frac{r_1}{r_2} e^{i(\theta_1-\theta_2)}$

Further Maths pure, Euler's formula

$e^{i\theta} = \cos\theta + i\sin\theta$

Further Maths pure, loci in the Argand diagram

$|z-a| = r$ (circle, radius r, centre a), $\arg(z-a) = \theta$ (half-line from a)

Further Maths pure, 2 by 2 determinant and inverse

$\Delta = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc,\ \mathbf{M}^{-1} = \frac{1}{\Delta}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

Further Maths pure, products of matrices

AB means B first, then A; $(\mathbf{AB})^{-1} = \mathbf{B}^{-1}\mathbf{A}^{-1}$

Further Maths pure, sum of the first n integers

$\sum_{r=1}^{n} r = \frac{1}{2}n(n+1)$

Further Maths pure, roots of a quadratic

$ax^2 + bx + c = 0:\ \alpha + \beta = -\frac{b}{a},\ \alpha\beta = \frac{c}{a}$

Further Maths pure, roots of a cubic

$ax^3 + bx^2 + cx + d = 0:\ \sum \alpha = -\frac{b}{a},\ \sum \alpha\beta = \frac{c}{a},\ \alpha\beta\gamma = -\frac{d}{a}$

Further Maths pure, hyperbolic definitions

$\cosh x = \frac{1}{2}(e^x + e^{-x}),\ \sinh x = \frac{1}{2}(e^x - e^{-x}),\ \tanh x = \frac{\sinh x}{\cosh x}$

Further Maths pure, hyperbolic derivatives with k

$\frac{d}{dx}\sinh kx = k\cosh kx,\ \frac{d}{dx}\cosh kx = k\sinh kx$

Further Maths pure, hyperbolic integrals with k

$\int \cosh kx\,dx = \frac{1}{k}\sinh kx + c,\ \int \sinh kx\,dx = \frac{1}{k}\cosh kx + c$

Further Maths pure, sum rule for integration

$\int \{f'(x) + g'(x)\}dx = f(x) + g(x) + c$

Further Maths pure, volumes of revolution

$V_x = \pi\int_a^b y^2\,dx,\ V_y = \pi\int_c^d x^2\,dy$

Further Maths pure, magnitude of a vector

$|x\mathbf{i} + y\mathbf{j} + z\mathbf{k}| = \sqrt{x^2+y^2+z^2}$

Further Maths pure, scalar product

$\mathbf{a}\cdot\mathbf{b} = a_1b_1 + a_2b_2 + a_3b_3 = |\mathbf{a}||\mathbf{b}|\cos\theta$

Further Maths pure, line and plane in vector form

$\text{line}\ \mathbf{r} = \mathbf{a} + t\mathbf{b},\ \text{plane}\ (\mathbf{r}-\mathbf{a})\cdot\mathbf{n} = 0$

Further Maths mechanics, elastic strings

$T = \frac{\lambda x}{l},\ E = \frac{\lambda x^2}{2l}$

Further Maths mechanics, simple harmonic motion

$\ddot{x} = -\omega^2 x,\ x = a\cos\omega t$ or $x = a\sin\omega t,\ v^2 = \omega^2(a^2 - x^2),\ T = \frac{2\pi}{\omega}$

Using the booklet in the exam

- Find your own section before the exam starts: Maths students use sections 1 or 2, Further Maths students use 3 or 4 plus section 2 when a paper needs it.
- Learn the recall list first: the quadratic formula, sine and cosine rules, double angle identities, basic derivatives and F = ma are not printed.
- For hypothesis tests, read the critical value table for a one-tailed test at the stated level, and halve the significance level for a two-tailed test.

- The chi-squared, t and F tables give upper-tail points, and the normal percentage points table gives P(Z > z), so check which tail your question needs.
- In Further Maths, tab the Maclaurin series, hyperbolic functions and the sampling distribution pages: they are the pages you will return to most.

Based on: Pearson Edexcel A Level Mathematics (9MA0, 8MA0) and Further Mathematics (9FM0, 8FM0), Mathematical Formulae and Statistical Tables, Issue 1, July 2017 (P54458A); Pearson Edexcel A Level Further Mathematics 9FM0 specification, Specification Issue 4, June 2023, Appendix 1: Formulae; Pearson Edexcel A Level Mathematics 9MA0 specification, Specification Issue 4, February 2020, Appendix 1: Formulae. Statistical tables are calculated by CuratedPrep to the same layout. Updated 31 October 2026. Always practise with the version of the official booklet your exam uses. More free sheets and topic worksheets at curatedprep.com.