STUDY FORMULA BOOKLET

OxfordAQA International AS and A Level Mathematics 9660 formulae and statistical tables

The 9660 booklet gives pure, mechanics, probability and statistics formulae and seven statistical tables. Quadratic formula, sine rule and SUVAT are not printed; learn them.

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

Based on the official **OxfordAQA International AS and A-level Mathematics (9660) Formulae and Statistical Tables (copyright 2016 Oxford International AQA Examinations)**, with what to learn and exam tips added by CuratedPrep.

Pure: Arithmetic series

The booklet opens with Pure Mathematics, then Mechanics, then Probability and Statistics.

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

Pure: Geometric series

nth term	$u_n = ar^{n-1}$	IN THE BOOKLET
Sum of n terms	$S_n = \dfrac{a(1-r^n)}{1-r}$	IN THE BOOKLET
Sum to infinity	$S_\infty = \dfrac{a}{1-r} \quad \text{for } \lvert r\rvert < 1$	IN THE BOOKLET

Pure: Summations

Sum of integers	$\sum_{r=1}^{n} r = \frac{1}{2}n(n+1)$	IN THE BOOKLET
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

Pure: Trigonometry, the cosine rule

Cosine rule	$a^2 = b^2 + c^2 - 2bc\cos A$	IN THE BOOKLET

Pure: Binomial series

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

Binomial expansion, any n The booklet prints 1.2 for 1 times 2.	$(1+x)^n = 1 + nx + \frac{n(n-1)}{1.2}x^2 + \ldots + \frac{n(n-1)\ldots(n-r+1)}{1.2\ldots r}x^r + \ldots \quad (\lvert x\rvert < 1,\ n \in \mathbb{R})$	IN THE BOOKLET

Pure: Logarithms and exponentials

Exponential form of a^x	$a^x = e^{x \ln a}$	IN THE BOOKLET

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
Euler's relation	$e^{i\theta} = \cos\theta + i\sin\theta$	IN THE BOOKLET
Roots of z^n = 1	$z = e^{\frac{2\pi ki}{n}}, \quad k = 0, 1, 2, \ldots, n-1$	IN THE BOOKLET

Pure: Maclaurin's series

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

Pure: Hyperbolic functions

Basic identity	$\cosh^2 x - \sinh^2 x = 1$	IN THE BOOKLET
sinh of a double angle	$\sinh 2x = 2\sinh x \cosh x$	IN THE BOOKLET
cosh of a double angle	$\cosh 2x = \cosh^2 x + \sinh^2 x$	IN THE BOOKLET
Inverse hyperbolic cosine	$\cosh^{-1} x = \ln\{x + \sqrt{x^2-1}\} \quad (x \geqslant 1)$	IN THE BOOKLET
Inverse hyperbolic sine	$\sinh^{-1} x = \ln\{x + \sqrt{x^2+1}\}$	IN THE BOOKLET
Inverse hyperbolic tangent	$\tanh^{-1} x = \frac{1}{2}\ln\left(\frac{1+x}{1-x}\right) \quad (\lvert x\rvert < 1)$	IN THE BOOKLET

Pure: Conics

The booklet prints only the standard forms and the asymptotes.

	Ellipse	Parabola	Hyperbola	Rectangular hyperbola
Standard form	$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	$y^2 = 4ax$	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$	$xy = c^2$
Asymptotes	none	none	$\frac{x}{a} = \pm\frac{y}{b}$	$x = 0,\ y = 0$

Pure: Trigonometric identities

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

Pure: Vectors

Resolved part of a in the direction of b	$\dfrac{\mathbf{a} \cdot \mathbf{b}}{\lvert\mathbf{b}\rvert}$	IN THE BOOKLET
Position vector of the point dividing AB in the ratio λ : μ	$\dfrac{\mu\mathbf{a} + \lambda\mathbf{b}}{\lambda + \mu}$	IN THE BOOKLET
Vector product n-hat is the unit vector perpendicular to a and b. The booklet writes i, j, k down the first column.	$\mathbf{a} \times \mathbf{b} = \lvert\mathbf{a}\rvert\lvert\mathbf{b}\rvert \sin\theta\, \hat{\mathbf{n}} = \begin{vmatrix} \mathbf{i} & a_1 & b_1 \\ \mathbf{j} & a_2 & b_2 \\ \mathbf{k} & a_3 & b_3 \end{vmatrix} = \begin{pmatrix} a_2b_3 - a_3b_2 \\ a_3b_1 - a_1b_3 \\ a_1b_2 - a_2b_1 \end{pmatrix}$	IN THE BOOKLET
Cartesian equation of a line Line through A with position vector a = a1 i + a2 j + a3 k and direction vector b = b1 i + b2 j + b3 k.	$\dfrac{x - a_1}{b_1} = \dfrac{y - a_2}{b_2} = \dfrac{z - a_3}{b_3} = \lambda$	IN THE BOOKLET
Cartesian equation of a plane Plane through A with normal vector n = n1 i + n2 j + n3 k. The booklet prints d = a.n on the right-hand side.	$n_1x + n_2y + n_3z = d, \quad d = \mathbf{a} \cdot \mathbf{n}$	IN THE BOOKLET
Vector equation of the plane through A, B and C A, B and C are non-collinear points.	$\mathbf{r} = \mathbf{a} + \lambda(\mathbf{b} - \mathbf{a}) + \mu(\mathbf{c} - \mathbf{a}) = (1 - \lambda - \mu)\mathbf{a} + \lambda\mathbf{b} + \mu\mathbf{c}$	IN THE BOOKLET
Plane through a, parallel to b and c	$\mathbf{r} = \mathbf{a} + s\mathbf{b} + t\mathbf{c}$	IN THE BOOKLET

Pure: Matrix transformations

Anticlockwise rotation through angle 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
Rotation through angle θ about the x-axis (three dimensions)	$\begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{pmatrix}$	IN THE BOOKLET
Rotation through angle θ about the y-axis (three dimensions)	$\begin{pmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{pmatrix}$	IN THE BOOKLET

Rotation through angle θ about the z-axis (three dimensions)	$\begin{pmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$	IN THE BOOKLET

Pure: Differentiation

Derivative of $\sin^{-1} x$	$\frac{d}{dx}\left(\sin^{-1} x\right) = \frac{1}{\sqrt{1-x^2}}$	IN THE BOOKLET
Derivative of $\cos^{-1} x$	$\frac{d}{dx}\left(\cos^{-1} x\right) = -\frac{1}{\sqrt{1-x^2}}$	IN THE BOOKLET
Derivative of $\tan^{-1} x$	$\frac{d}{dx}\left(\tan^{-1} x\right) = \frac{1}{1+x^2}$	IN THE BOOKLET
Derivative of tan kx	$\frac{d}{dx}(\tan kx) = k\sec^2 kx$	IN THE BOOKLET
Derivative of cosec x	$\frac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x$	IN THE BOOKLET
Derivative of sec x	$\frac{d}{dx}(\sec x) = \sec x \tan x$	IN THE BOOKLET
Derivative of cot x	$\frac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x$	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 $\sinh^{-1} x$	$\frac{d}{dx}\left(\sinh^{-1} x\right) = \frac{1}{\sqrt{1+x^2}}$	IN THE BOOKLET
Derivative of $\cosh^{-1} x$	$\frac{d}{dx}\left(\cosh^{-1} x\right) = \frac{1}{\sqrt{x^2-1}}$	IN THE BOOKLET
Derivative of $\tanh^{-1} x$	$\frac{d}{dx}\left(\tanh^{-1} x\right) = \frac{1}{1-x^2}$	IN THE BOOKLET
Quotient rule	$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2}$	IN THE BOOKLET

Pure: Integration (+ constant; a > 0 where relevant)

Integral of tan x	$\int \tan x\,dx = \ln\lvert\sec x\rvert$	IN THE BOOKLET
Integral of cot x	$\int \cot x\,dx = \ln\lvert\sin x\rvert$	IN THE BOOKLET
Integral of cosec x The two forms are equal.	$\int \operatorname{cosec} x\,dx = -\ln\lvert\operatorname{cosec} x + \cot x\rvert = \ln\left\lvert\tan\left(\frac{1}{2}x\right)\right\rvert$	IN THE BOOKLET
Integral of sec x The two forms are equal.	$\int \sec x\,dx = \ln\lvert\sec x + \tan x\rvert = \ln\left\lvert\tan\left(\frac{1}{2}x + \frac{1}{4}\pi\right)\right\rvert$	IN THE BOOKLET
Integral of sec squared kx	$\int \sec^2 kx\,dx = \frac{1}{k}\tan kx$	IN THE BOOKLET
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 of 1 over root (a squared minus x squared)	$\int \frac{1}{\sqrt{a^2 - x^2}} \, dx = \sin^{-1}\left(\frac{x}{a}\right) \quad (\lvert x \rvert < a)$	IN THE BOOKLET
Integral of 1 over (a squared plus x squared)	$\int \frac{1}{a^2 + x^2} \, dx = \frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right)$	IN THE BOOKLET
Integral of 1 over root (x squared minus a squared) Two equivalent forms.	$\int \frac{1}{\sqrt{x^2 - a^2}} \, dx = \cosh^{-1}\left(\frac{x}{a}\right) \text{ or } \ln\{x + \sqrt{x^2 - a^2}\} \quad (x > a)$	IN THE BOOKLET
Integral of 1 over root (a squared plus x squared) Two equivalent forms.	$\int \frac{1}{\sqrt{a^2 + x^2}} \, dx = \sinh^{-1}\left(\frac{x}{a}\right) \text{ or } \ln\{x + \sqrt{x^2 + a^2}\}$	IN THE BOOKLET
Integral of 1 over (a squared minus x squared)	$\int \frac{1}{a^2 - x^2} \, dx = \frac{1}{2a} \ln \left\lvert \frac{a + x}{a - x} \right\rvert = \frac{1}{a} \tanh^{-1}\left(\frac{x}{a}\right) \quad (\lvert x \rvert < a)$	IN THE BOOKLET
Integral of 1 over (x squared minus a squared)	$\int \frac{1}{x^2 - a^2} \, dx = \frac{1}{2a} \ln \left\lvert \frac{x - a}{x + a} \right\rvert$	IN THE BOOKLET
Integration by parts	$\int u \frac{dv}{dx} \, dx = uv - \int v \frac{du}{dx} \, dx$	IN THE BOOKLET

Pure: Area of a sector

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

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

Pure: Surface area of revolution

Surface area about the x-axis (Cartesian coordinates)	$S_x = 2\pi \int y \sqrt{1 + \left(\frac{dy}{dx}\right)^2} \, dx$	IN THE BOOKLET
Surface area about the x-axis (parametric form)	$S_x = 2\pi \int y \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} \, dt$	IN THE BOOKLET

Pure: Numerical integration

Trapezium rule n is the number of strips.	$\int_a^b y \, dx \approx \frac{1}{2} h\{(y_0 + y_n) + 2(y_1 + y_2 + \ldots + y_{n-1})\}, \quad h = \frac{b - a}{n}$	IN THE BOOKLET
Mid-ordinate rule The ordinates are at the middle of each strip.	$\int_a^b y \, dx \approx h\left(y_{\frac{1}{2}} + y_{\frac{3}{2}} + \ldots + y_{n-\frac{3}{2}} + y_{n-\frac{1}{2}}\right), \quad h = \frac{b - a}{n}$	IN THE BOOKLET

Simpson's rule n must be even.	$\int_a^b y\,dx \approx \frac{1}{3}h\{(y_0+y_n)+4(y_1+y_3+\ldots+y_{n-1})+2(y_2+y_4+\ldots+y_{n-2})\}, \quad h=\frac{b-a}{n}$	IN THE BOOKLET

Pure: Numerical solution of differential equations

Euler's method For dy/dx = f(x, y).	$y_{r+1} = y_r + h\,f(x_r, y_r)$	IN THE BOOKLET

Pure: Numerical solution of equations

Newton-Raphson iteration Solves f(x) = 0.	$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$	IN THE BOOKLET

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 The minus sign shows it acts towards the centre.	$-r\dot{\theta}^2 = -\frac{v^2}{r}$	IN THE BOOKLET

Statistics: Probability

Addition law	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	IN THE BOOKLET
Multiplication law	$P(A \cap B) = P(A) \times P(B \mid A)$	IN THE BOOKLET
Bayes' theorem	$P(A_j \mid B) = \frac{P(A_j) \times P(B \mid A_j)}{\sum_{i=1}^{n} P(A_i) \times P(B \mid A_i)}$	IN THE BOOKLET

Statistics: Expectation algebra

Expectation of a linear function	$E(aX+b) = aE(X) + b$	IN THE BOOKLET
Variance of a linear function	$\mathrm{Var}(aX+b) = a^2\,\mathrm{Var}(X)$	IN THE BOOKLET
Covariance	$\mathrm{Cov}(X,Y) = E((X-\mu_X)(Y-\mu_Y)) = E(XY) - \mu_X\mu_Y$	IN THE BOOKLET
Variance of aX plus or minus bY	$\mathrm{Var}(aX \pm bY) = a^2\,\mathrm{Var}(X) + b^2\,\mathrm{Var}(Y) \pm 2ab\,\mathrm{Cov}(X,Y)$	IN THE BOOKLET
Product moment correlation coefficient	$\rho = \frac{\mathrm{Cov}(X,Y)}{\sigma_X\sigma_Y}$	IN THE BOOKLET
Independent X and Y: E(XY)	$E(XY) = E(X)E(Y)$	IN THE BOOKLET
Independent X and Y: variance of aX plus or minus bY	$\mathrm{Var}(aX \pm bY) = a^2\,\mathrm{Var}(X) + b^2\,\mathrm{Var}(Y)$	IN THE BOOKLET
Independent X_i: expectation of a sum	$E\left(\sum a_iX_i\right) = \sum a_iE(X_i)$	IN THE BOOKLET
Independent X_i: variance of a sum	$\mathrm{Var}\left(\sum a_iX_i\right) = \sum a_i^2\,\mathrm{Var}(X_i)$	IN THE BOOKLET

Statistics: Discrete distributions

Expectation (mean) For a discrete random variable X taking values xi with probabilities pi.	$E(X) = \mu = \sum x_i p_i$	IN THE BOOKLET
Variance	$\mathrm{Var}(X) = \sigma^2 = \sum (x_i - \mu)^2 p_i = \sum x_i^2 p_i - \mu^2 = E(X^2) - \mu^2$	IN THE BOOKLET
Expectation of a function	$E(g(X)) = \sum g(x_i)\, p_i$	IN THE BOOKLET
Uniform on [1, n]: probability	$P(X = x) = \frac{1}{n}$	IN THE BOOKLET
Uniform on [1, n]: mean	$\frac{n+1}{2}$	IN THE BOOKLET
Uniform on [1, n]: variance	$\frac{n^2 - 1}{12}$	IN THE BOOKLET
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	$P(X = x) = e^{-\lambda} \frac{\lambda^x}{x!}$	IN THE BOOKLET
Poisson Po(λ): mean	λ	IN THE BOOKLET
Poisson Po(λ): variance	λ	IN THE BOOKLET
Geometric Geo(p) on 1, 2, ...: probability	$P(X = x) = p(1-p)^{x-1}$	IN THE BOOKLET
Geometric Geo(p) on 1, 2, ...: mean	$\frac{1}{p}$	IN THE BOOKLET
Geometric Geo(p) on 1, 2, ...: variance	$\frac{1-p}{p^2}$	IN THE BOOKLET

Statistics: Continuous distributions

Expectation (mean) For a continuous random variable X with probability density function f.	$E(X) = \mu = \int x\, f(x)\, dx$	IN THE BOOKLET
Variance	$\mathrm{Var}(X) = \sigma^2 = \int (x-\mu)^2 f(x)\, dx = \int x^2 f(x)\, dx - \mu^2 = E(X^2) - \mu^2$	IN THE BOOKLET
Expectation of a function	$E(g(X)) = \int g(x)\, f(x)\, dx$	IN THE BOOKLET
Cumulative distribution function	$F(x) = P(X \leqslant x) = \int_{-\infty}^{x} f(t)\, dt$	IN THE BOOKLET
Rectangular on [a, b]: p.d.f.	$f(x) = \frac{1}{b-a}$	IN THE BOOKLET
Rectangular on [a, b]: mean	$\frac{1}{2}(a+b)$	IN THE BOOKLET
Rectangular on [a, b]: variance	$\frac{1}{12}(b-a)^2$	IN THE BOOKLET
Normal N(μ, σ²): p.d.f.	$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$	IN THE BOOKLET

Normal N(μ, σ²): mean	μ	IN THE BOOKLET
Normal N(μ, σ²): variance	σ^2	IN THE BOOKLET
Exponential: p.d.f.	$f(x) = \lambda e^{-\lambda x}$	IN THE BOOKLET
Exponential: mean	$\frac{1}{\lambda}$	IN THE BOOKLET
Exponential: variance	$\frac{1}{\lambda^2}$	IN THE BOOKLET

Statistics: Generating functions

Probability generating function (discrete) For a discrete random variable X taking values xi with probabilities pi.	$G_X(t) = E(t^X) = \sum_x t^{x_i} p_i$	IN THE BOOKLET
Moment generating function (discrete)	$M_X(t) = E(e^{tX}) = \sum_x e^{tx_i} p_i$	IN THE BOOKLET
Moment generating function (continuous) For a continuous random variable X with probability density function f.	$M_X(t) = E(e^{tX}) = \int_x e^{tx} f(x)\,dx$	IN THE BOOKLET
Mean	$\mu = G'_X(1) \quad \text{or} \quad \mu = M'_X(0)$	IN THE BOOKLET
Variance	$\sigma^2 = G''_X(1) + \mu - \mu^2 \quad \text{or} \quad \sigma^2 = M''_X(0) - \mu^2$	IN THE BOOKLET
Moment generating function of a + bX	$M_{a+bX}(t) = e^{at} M_X(bt)$	IN THE BOOKLET

Statistics: Sampling distributions

Unbiased estimator of the mean For a random sample X1, X2, ..., Xn of n independent observations from a distribution with mean μ and variance σ².	$\bar{X}$ is an unbiased estimator for μ, $\mathrm{Var}(\bar{X}) = \frac{\sigma^2}{n}$	IN THE BOOKLET
Unbiased estimator of the variance S squared is an unbiased estimator for σ².	$S^2 = \frac{\sum (X_i - \bar{X})^2}{n-1} = \frac{1}{n-1}\left(\sum X_i^2 - \frac{(\sum X_i)^2}{n}\right)$	IN THE BOOKLET
Standardised sample mean (σ known) 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
Standardised sample mean (σ unknown) Also valid in matched-pairs situations.	$\frac{\bar{X} - \mu}{S/\sqrt{n}} \sim t_{n-1}$	IN THE BOOKLET
Chi-squared statistic for the variance	$\frac{(n-1)S^2}{\sigma^2} \sim \chi^2_{n-1}$	IN THE BOOKLET
Sample proportion X is the observed number of successes in n independent Bernoulli trials, each with probability of success p.	$Y = \frac{X}{n} : \; E(Y) = p, \quad \mathrm{Var}(Y) = \frac{p(1-p)}{n}$	IN THE BOOKLET

Difference of two sample means (σ known) Independent random samples of nx observations from N(μx, σx²) and ny observations from N(μy, σy²).	$\dfrac{(\bar{X}-\bar{Y})-(\mu_x-\mu_y)}{\sqrt{\frac{\sigma_x^2}{n_x}+\frac{\sigma_y^2}{n_y}}} \sim N(0,1)$	IN THE BOOKLET
Ratio of sample variances	$\dfrac{S_x^2/\sigma_x^2}{S_y^2/\sigma_y^2} \sim F_{n_x-1,\,n_y-1}$	IN THE BOOKLET
Difference of two sample means (common unknown σ) If σx² = σy² = σ² (unknown).	$\dfrac{(\bar{X}-\bar{Y})-(\mu_x-\mu_y)}{\sqrt{S_p^2\left(\frac{1}{n_x}+\frac{1}{n_y}\right)}} \sim t_{n_x+n_y-2}$	IN THE BOOKLET
Pooled variance estimate	$S_p^2=\dfrac{(n_x-1)S_x^2+(n_y-1)S_y^2}{n_x+n_y-2}$	IN THE BOOKLET

Statistics: Approximate sampling distributions

Goodness of fit and contingency tables For goodness of fit tests and contingency table tests.	$\sum \dfrac{(O_i-E_i)^2}{E_i}$ is approximately distributed as χ^2	IN THE BOOKLET
Yates' correction (2 by 2 contingency table)	$\sum \dfrac{(\lvert O_i-E_i\rvert-0.5)^2}{E_i}$	IN THE BOOKLET

Statistics: Other statistical formulae

Type I error	$P(\text{Type I error}) = P(\text{reject } H_0 \mid H_0 \text{ true})$	IN THE BOOKLET
Type II error	$P(\text{Type II error}) = P(\text{accept } H_0 \mid H_0 \text{ false})$	IN THE BOOKLET
Power	$\text{Power} = 1 - P(\text{Type II error})$	IN THE BOOKLET
Efficiency of estimator A relative to estimator B	$\dfrac{1/\operatorname{Var}(\text{Estimator } A)}{1/\operatorname{Var}(\text{Estimator } B)}$	IN THE BOOKLET

Table 1: Cumulative binomial distribution function

The tabulated value is P(X ≤ x), where X has a binomial distribution with parameters n and p. The booklet leaves a cell blank once the value above it has reached 1.0000, and prints a final row x = n of 1.0000 values; this study version prints 1.0000 in those cells and omits the final all-1.0000 row.

n = 2

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.9801	0.9604	0.9409	0.9216	0.9025	0.8836	0.8649	0.8464	0.8281	0.8100	0.7225	0.6400	0.5625	0.4900	0.4225	0.3600	0.3025	0.2500
1	0.9999	0.9996	0.9991	0.9984	0.9975	0.9964	0.9951	0.9936	0.9919	0.9900	0.9775	0.9600	0.9375	0.9100	0.8775	0.8400	0.7975	0.7500

n = 3

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.9703	0.9412	0.9127	0.8847	0.8574	0.8306	0.8044	0.7787	0.7536	0.7290	0.6141	0.5120	0.4219	0.3430	0.2746	0.2160	0.1664	0.1250
1	0.9997	0.9988	0.9974	0.9953	0.9928	0.9896	0.9860	0.9818	0.9772	0.9720	0.9393	0.8960	0.8438	0.7840	0.7183	0.6480	0.5748	0.5000
2	1.0000	1.0000	1.0000	0.9999	0.9999	0.9998	0.9997	0.9995	0.9993	0.9990	0.9966	0.9920	0.9844	0.9730	0.9571	0.9360	0.9089	0.8750

n = 4

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.9606	0.9224	0.8853	0.8493	0.8145	0.7807	0.7481	0.7164	0.6857	0.6561	0.5220	0.4096	0.3164	0.2401	0.1785	0.1296	0.0915	0.0625
1	0.9994	0.9977	0.9948	0.9909	0.9860	0.9801	0.9733	0.9656	0.9570	0.9477	0.8905	0.8192	0.7383	0.6517	0.5630	0.4752	0.3910	0.3125
2	1.0000	1.0000	0.9999	0.9998	0.9995	0.9992	0.9987	0.9981	0.9973	0.9963	0.9880	0.9728	0.9492	0.9163	0.8735	0.8208	0.7585	0.6875

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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
3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9995	0.9984	0.9961	0.9919	0.9850	0.9744	0.9590	0.9375

n = 5

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.9510	0.9039	0.8587	0.8154	0.7738	0.7339	0.6957	0.6591	0.6240	0.5905	0.4437	0.3277	0.2373	0.1681	0.1160	0.0778	0.0503	0.0313
1	0.9990	0.9962	0.9915	0.9852	0.9774	0.9681	0.9575	0.9456	0.9326	0.9185	0.8352	0.7373	0.6328	0.5282	0.4284	0.3370	0.2562	0.1875
2	1.0000	0.9999	0.9997	0.9994	0.9988	0.9980	0.9969	0.9955	0.9937	0.9914	0.9734	0.9421	0.8965	0.8369	0.7648	0.6826	0.5931	0.5000
3	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9998	0.9997	0.9995	0.9978	0.9933	0.9844	0.9692	0.9460	0.9130	0.8688	0.8125
4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9990	0.9976	0.9947	0.9898	0.9815	0.9688

n = 6

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.9415	0.8858	0.8330	0.7828	0.7351	0.6899	0.6470	0.6064	0.5679	0.5314	0.3771	0.2621	0.1780	0.1176	0.0754	0.0467	0.0277	0.0156
1	0.9985	0.9943	0.9875	0.9784	0.9672	0.9541	0.9392	0.9227	0.9048	0.8857	0.7765	0.6554	0.5339	0.4202	0.3191	0.2333	0.1636	0.1094
2	1.0000	0.9998	0.9995	0.9988	0.9978	0.9962	0.9942	0.9915	0.9882	0.9842	0.9527	0.9011	0.8306	0.7443	0.6471	0.5443	0.4415	0.3438
3	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9997	0.9995	0.9992	0.9987	0.9941	0.9830	0.9624	0.9295	0.8826	0.8208	0.7447	0.6563
4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9993	0.9982	0.9959	0.9917	0.9844

n = 7

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.9321	0.8681	0.8080	0.7514	0.6983	0.6485	0.6017	0.5578	0.5168	0.4783	0.3206	0.2097	0.1335	0.0824	0.0490	0.0280	0.0152	0.0078
1	0.9980	0.9921	0.9829	0.9706	0.9556	0.9382	0.9187	0.8974	0.8745	0.8503	0.7166	0.5767	0.4449	0.3294	0.2338	0.1586	0.1024	0.0625
2	1.0000	0.9997	0.9991	0.9980	0.9962	0.9937	0.9903	0.9860	0.9807	0.9743	0.9262	0.8520	0.7564	0.6471	0.5323	0.4199	0.3164	0.2266
3	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996	0.9993	0.9988	0.9982	0.9973	0.9879	0.9667	0.9294	0.8740	0.8002	0.7102	0.6083	0.5000
4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9998	0.9988	0.9953	0.9871	0.9712	0.9444	0.9037	0.8471	0.7734
5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9994	0.9984	0.9963	0.9922

n = 8

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.9227	0.8508	0.7837	0.7214	0.6634	0.6096	0.5596	0.5132	0.4703	0.4305	0.2725	0.1678	0.1001	0.0576	0.0319	0.0168	0.0084	0.0039
1	0.9973	0.9897	0.9777	0.9619	0.9428	0.9208	0.8965	0.8702	0.8423	0.8131	0.6572	0.5033	0.3671	0.2553	0.1691	0.1064	0.0632	0.0352
2	0.9999	0.9996	0.9987	0.9969	0.9942	0.9904	0.9853	0.9789	0.9711	0.9619	0.8948	0.7969	0.6785	0.5518	0.4278	0.3154	0.2201	0.1445
3	1.0000	1.0000	0.9999	0.9998	0.9996	0.9993	0.9987	0.9978	0.9966	0.9950	0.9786	0.9437	0.8862	0.8059	0.7064	0.5941	0.4770	0.3633
4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9997	0.9996	0.9971	0.9896	0.9727	0.9420	0.8939	0.8263	0.7396	0.6367
5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9988	0.9958	0.9887	0.9747	0.9502	0.9115	0.8555
6	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9993	0.9983	0.9961

n = 9

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.9135	0.8337	0.7602	0.6925	0.6302	0.5730	0.5204	0.4722	0.4279	0.3874	0.2316	0.1342	0.0751	0.0404	0.0207	0.0101	0.0046	0.0020
1	0.9966	0.9869	0.9718	0.9522	0.9288	0.9022	0.8729	0.8417	0.8088	0.7748	0.5995	0.4362	0.3003	0.1960	0.1211	0.0705	0.0385	0.0195
2	0.9999	0.9994	0.9980	0.9955	0.9916	0.9862	0.9791	0.9702	0.9595	0.9470	0.8591	0.7382	0.6007	0.4628	0.3373	0.2318	0.1495	0.0898
3	1.0000	1.0000	0.9999	0.9997	0.9994	0.9987	0.9977	0.9963	0.9943	0.9917	0.9661	0.9144	0.8343	0.7297	0.6089	0.4826	0.3614	0.2539
4	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9997	0.9995	0.9991	0.9944	0.9804	0.9511	0.9012	0.8283	0.7334	0.6214	0.5000
5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9992	0.9980

n = 10

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.9044	0.8171	0.7374	0.6648	0.5987	0.5386	0.4840	0.4344	0.3894	0.3487	0.1969	0.1074	0.0563	0.0282	0.0135	0.0060	0.0025	0.0010
1	0.9957	0.9838	0.9655	0.9418	0.9139	0.8824	0.8483	0.8121	0.7746	0.7361	0.5443	0.3758	0.2440	0.1493	0.0860	0.0464	0.0233	0.0107
2	0.9999	0.9991	0.9972	0.9938	0.9885	0.9812	0.9717	0.9599	0.9460	0.9298	0.8202	0.6778	0.5256	0.3828	0.2616	0.1673	0.0996	0.0547
3	1.0000	1.0000	0.9999	0.9996	0.9990	0.9980	0.9964	0.9942	0.9912	0.9872	0.9500	0.8791	0.7759	0.6496	0.5138	0.3823	0.2660	0.1719
4	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9997	0.9994	0.9990	0.9984	0.9901	0.9672	0.9219	0.8497	0.7515	0.6331	0.5044	0.3770
5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9986	0.9936	0.9803	0.9527	0.9051	0.8338	0.7384	0.6230
6	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9990

n = 11

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.8953	0.8007	0.7153	0.6382	0.5688	0.5063	0.4501	0.3996	0.3544	0.3138	0.1673	0.0859	0.0422	0.0198	0.0088	0.0036	0.0014	0.0005
1	0.9948	0.9805	0.9587	0.9308	0.8981	0.8618	0.8228	0.7819	0.7399	0.6974	0.4922	0.3221	0.1971	0.1130	0.0606	0.0302	0.0139	0.0059
2	0.9998	0.9988	0.9963	0.9917	0.9848	0.9752	0.9630	0.9481	0.9305	0.9104	0.7788	0.6174	0.4552	0.3127	0.2001	0.1189	0.0652	0.0327
3	1.0000	1.0000	0.9998	0.9993	0.9984	0.9970	0.9947	0.9915	0.9871	0.9815	0.9306	0.8389	0.7133	0.5696	0.4256	0.2963	0.1911	0.1133
4	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9995	0.9990	0.9983	0.9972	0.9841	0.9496	0.8854	0.7897	0.6683	0.5328	0.3971	0.2744
5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9997	0.9973	0.9883	0.9657	0.9218	0.8513	0.7535	0.6331	0.5000
6	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9980	0.9924	0.9784	0.9499	0.9006	0.8262	0.7256
7	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9988	0.9957	0.9878	0.9707	0.9390	0.8867
8	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9994	0.9980	0.9941	0.9852	0.9673
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9993	0.9978	0.9941
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9995

n = 12

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.8864	0.7847	0.6938	0.6127	0.5404	0.4759	0.4186	0.3677	0.3225	0.2824	0.1422	0.0687	0.0317	0.0138	0.0057	0.0022	0.0008	0.0002
1	0.9938	0.9769	0.9514	0.9191	0.8816	0.8405	0.7967	0.7513	0.7052	0.6590	0.4435	0.2749	0.1584	0.0850	0.0424	0.0196	0.0083	0.0032
2	0.9998	0.9985	0.9952	0.9893	0.9804	0.9684	0.9532	0.9348	0.9134	0.8891	0.7358	0.5583	0.3907	0.2528	0.1513	0.0834	0.0421	0.0193
3	1.0000	0.9999	0.9997	0.9990	0.9978	0.9957	0.9925	0.9880	0.9820	0.9744	0.9078	0.7946	0.6488	0.4925	0.3467	0.2253	0.1345	0.0730
4	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996	0.9991	0.9984	0.9973	0.9957	0.9761	0.9274	0.8424	0.7237	0.5833	0.4382	0.3044	0.1938
5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9997	0.9995	0.9954	0.9806	0.9456	0.8822	0.7873	0.6652	0.5269	0.3872
6	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998

n = 13

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.8775	0.7690	0.6730	0.5882	0.5133	0.4474	0.3893	0.3383	0.2935	0.2542	0.1209	0.0550	0.0238	0.0097	0.0037	0.0013	0.0004	0.0001
1	0.9928	0.9730	0.9436	0.9068	0.8646	0.8186	0.7702	0.7206	0.6707	0.6213	0.3983	0.2336	0.1267	0.0637	0.0296	0.0126	0.0049	0.0017
2	0.9997	0.9980	0.9938	0.9865	0.9755	0.9608	0.9422	0.9201	0.8946	0.8661	0.6920	0.5017	0.3326	0.2025	0.1132	0.0579	0.0269	0.0112
3	1.0000	0.9999	0.9995	0.9986	0.9969	0.9940	0.9897	0.9837	0.9758	0.9658	0.8820	0.7473	0.5843	0.4206	0.2783	0.1686	0.0929	0.0461
4	1.0000	1.0000	1.0000	0.9999	0.9997	0.9993	0.9987	0.9976	0.9959	0.9935	0.9658	0.9009	0.7940	0.6543	0.5005	0.3530	0.2279	0.1334
5	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9997	0.9995	0.9991	0.9925	0.9700	0.9198	0.8346	0.7159	0.5744	0.4268	0.2905
6	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9987	0.9930	0.9757	0.9376	0.8705	0.7712	0.6437	0.5000
7	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9988	0.9944	0.9818	0.9538	0.9023	0.8212	0.7095
8	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9990	0.9960	0.9874	0.9679	0.9302	0.8666

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9993	0.9975	0.9922	0.9797	0.9539
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9987	0.9959	0.9888
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9995	0.9983
12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999

n = 14

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.8687	0.7536	0.6528	0.5647	0.4877	0.4205	0.3620	0.3112	0.2670	0.2288	0.1028	0.0440	0.0178	0.0068	0.0024	0.0008	0.0002	0.0001
1	0.9916	0.9690	0.9355	0.8941	0.8470	0.7963	0.7436	0.6900	0.6368	0.5846	0.3567	0.1979	0.1010	0.0475	0.0205	0.0081	0.0029	0.0009
2	0.9997	0.9975	0.9923	0.9833	0.9699	0.9522	0.9302	0.9042	0.8745	0.8416	0.6479	0.4481	0.2811	0.1608	0.0839	0.0398	0.0170	0.0065
3	1.0000	0.9999	0.9994	0.9981	0.9958	0.9920	0.9864	0.9786	0.9685	0.9559	0.8535	0.6982	0.5213	0.3552	0.2205	0.1243	0.0632	0.0287
4	1.0000	1.0000	1.0000	0.9998	0.9996	0.9990	0.9980	0.9965	0.9941	0.9908	0.9533	0.8702	0.7415	0.5842	0.4227	0.2793	0.1672	0.0898
5	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996	0.9992	0.9985	0.9885	0.9561	0.8883	0.7805	0.6405	0.4859	0.3373	0.2120
6	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9978	0.9884	0.9617	0.9067	0.8164	0.6925	0.5461	0.3953
7	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9976	0.9897	0.9685	0.9247	0.8499	0.7414	0.6047
8	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9996	0.9978	0.9917	0.9757	0.9417	0.8811	0.7880
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9983	0.9940	0.9825	0.9574	0.9102
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9989	0.9961	0.9886	0.9713
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9994	0.9978	0.9935
12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9991
13	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999

n = 15

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.8601	0.7386	0.6333	0.5421	0.4633	0.3953	0.3367	0.2863	0.2430	0.2059	0.0874	0.0352	0.0134	0.0047	0.0016	0.0005	0.0001	0.0000
1	0.9904	0.9647	0.9270	0.8809	0.8290	0.7738	0.7168	0.6597	0.6035	0.5490	0.3186	0.1671	0.0802	0.0353	0.0142	0.0052	0.0017	0.0005
2	0.9996	0.9970	0.9906	0.9797	0.9638	0.9429	0.9171	0.8870	0.8531	0.8159	0.6042	0.3980	0.2361	0.1268	0.0617	0.0271	0.0107	0.0037
3	1.0000	0.9998	0.9992	0.9976	0.9945	0.9896	0.9825	0.9727	0.9601	0.9444	0.8227	0.6482	0.4613	0.2969	0.1727	0.0905	0.0424	0.0176
4	1.0000	1.0000	0.9999	0.9998	0.9994	0.9986	0.9972	0.9950	0.9918	0.9873	0.9383	0.8358	0.6865	0.5155	0.3519	0.2173	0.1204	0.0592
5	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9997	0.9993	0.9987	0.9978	0.9832	0.9389	0.8516	0.7216	0.5643	0.4032	0.2608	0.1509
6	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9997	0.9964	0.9819	0.9434	0.8689	0.7548	0.6098	0.4522	0.3036
7	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9993	0.9972	0.9907	0.9745	0.9408
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	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	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

n = 20

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.8179	0.6676	0.5438	0.4420	0.3585	0.2901	0.2342	0.1887	0.1516	0.1216	0.0388	0.0115	0.0032	0.0008	0.0002	0.0000	0.0000	0.0000
1	0.9831	0.9401	0.8802	0.8103	0.7358	0.6605	0.5869	0.5169	0.4516	0.3917	0.1756	0.0692	0.0243	0.0076	0.0021	0.0005	0.0001	0.0000
2	0.9990	0.9929	0.9790	0.9561	0.9245	0.8850	0.8390	0.7879	0.7334	0.6769	0.4049	0.2061	0.0913	0.0355	0.0121	0.0036	0.0009	0.0002
3	1.0000	0.9994	0.9973	0.9926	0.9841	0.9710	0.9529	0.9294	0.9007	0.8670	0.6477	0.4114	0.2252	0.1071	0.0444	0.0160	0.0049	0.0013
4	1.0000	1.0000	0.9997	0.9990	0.9974	0.9944	0.9893	0.9817	0.9710	0.9568	0.8298	0.6296	0.4148	0.2375	0.1182	0.0510	0.0189	0.0059
5	1.0000	1.0000	1.0000	0.9999	0.9997	0.9991	0.9981	0.9962	0.9932	0.9887	0.9327	0.8042	0.6172	0.4164	0.2454	0.1256	0.0553	0.0207
6	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9994	0.9987	0.9976	0.9781	0.9133	0.7858	0.6080	0.4166	0.2500	0.1299	0.0577
7	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996	0.9941	0.9679	0.8982	0.7723	0.6010	0.4159	0.2520	0.1316
8	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9974	0.9861	0.9520	0.8782	0.7553	0.5914	0.4119

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	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	1.0000	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	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	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	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

n = 25

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.7778	0.6035	0.4670	0.3604	0.2774	0.2129	0.1630	0.1244	0.0946	0.0718	0.0172	0.0038	0.0008	0.0001	0.0000	0.0000	0.0000	0.0000
1	0.9742	0.9114	0.8280	0.7358	0.6424	0.5527	0.4696	0.3947	0.3286	0.2712	0.0931	0.0274	0.0070	0.0016	0.0003	0.0001	0.0000	0.0000
2	0.9980	0.9868	0.9620	0.9235	0.8729	0.8129	0.7466	0.6768	0.6063	0.5371	0.2537	0.0982	0.0321	0.0090	0.0021	0.0004	0.0001	0.0000
3	0.9999	0.9986	0.9938	0.9835	0.9659	0.9402	0.9064	0.8649	0.8169	0.7636	0.4711	0.2340	0.0962	0.0332	0.0097	0.0024	0.0005	0.0001
4	1.0000	0.9999	0.9992	0.9972	0.9928	0.9850	0.9726	0.9549	0.9314	0.9020	0.6821	0.4207	0.2137	0.0905	0.0320	0.0095	0.0023	0.0005
5	1.0000	1.0000	0.9999	0.9996	0.9988	0.9969	0.9935	0.9877	0.9790	0.9666	0.8385	0.6167	0.3783	0.1935	0.0826	0.0294	0.0086	0.0020
6	1.0000	1.0000	1.0000	1.0000	0.9998	0.9995	0.9987	0.9972	0.9946	0.9905	0.9305	0.7800	0.5611	0.3407	0.1734	0.0736	0.0258	0.0073
7	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9995	0.9989	0.9977	0.9745	0.8909	0.7265	0.5118	0.3061	0.1536	0.0639	0.0216
8	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9995	0.9920	0.9532	0.8506	0.6769	0.4668	0.2735	0.1340	0.0539
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	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	1.0000	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	1.0000	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	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	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
24	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

n = 30

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.7397	0.5455	0.4010	0.2939	0.2146	0.1563	0.1134	0.0820	0.0591	0.0424	0.0076	0.0012	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.9639	0.8795	0.7731	0.6612	0.5535	0.4555	0.3694	0.2958	0.2343	0.1837	0.0480	0.0105	0.0020	0.0003	0.0000	0.0000	0.0000	0.0000
2	0.9967	0.9783	0.9399	0.8831	0.8122	0.7324	0.6487	0.5654	0.4855	0.4114	0.1514	0.0442	0.0106	0.0021	0.0003	0.0000	0.0000	0.0000
3	0.9998	0.9971	0.9881	0.9694	0.9392	0.8974	0.8450	0.7842	0.7175	0.6474	0.3217	0.1227	0.0374	0.0093	0.0019	0.0003	0.0000	0.0000
4	1.0000	0.9997	0.9982	0.9937	0.9844	0.9685	0.9447	0.9126	0.8723	0.8245	0.5245	0.2552	0.0979	0.0302	0.0075	0.0015	0.0002	0.0000
5	1.0000	1.0000	0.9998	0.9989	0.9967	0.9921	0.9838	0.9707	0.9519	0.9268	0.7106	0.4275	0.2026	0.0766	0.0233	0.0057	0.0011	0.0002
6	1.0000	1.0000	1.0000	0.9999	0.9994	0.9983	0.9960	0.9918	0.9848	0.9742	0.8474	0.6070	0.3481	0.1595	0.0586	0.0172	0.0040	0.0007
7	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9992	0.9980	0.9959	0.9922	0.9302	0.7608	0.5143	0.2814	0.1238	0.0435	0.0121	0.0026
8	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9996	0.9990	0.9980	0.9722	0.8713	0.6736	0.4315	0.2247	0.0940	0.0312	0.0081
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9995	0.9903	0.9389	0.8034	0.5888	0.3575	0.1763	0.0694	0.0214
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9971	0.9744	0.8943	0.7304	0.5078	0.2915	0.1350	0.0494

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	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	1.0000	1.0000	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	1.0000	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	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	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	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
26	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
27	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
28	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
29	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

n = 40

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.6690	0.4457	0.2957	0.1954	0.1285	0.0842	0.0549	0.0356	0.0230	0.0148	0.0015	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.9393	0.8095	0.6615	0.5210	0.3991	0.2990	0.2201	0.1594	0.1140	0.0805	0.0121	0.0015	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.9925	0.9543	0.8822	0.7855	0.6767	0.5665	0.4625	0.3694	0.2894	0.2228	0.0486	0.0079	0.0010	0.0001	0.0000	0.0000	0.0000	0.0000
3	0.9993	0.9918	0.9686	0.9252	0.8619	0.7827	0.6937	0.6007	0.5092	0.4231	0.1302	0.0285	0.0047	0.0006	0.0001	0.0000	0.0000	0.0000
4	1.0000	0.9988	0.9933	0.9790	0.9520	0.9104	0.8546	0.7868	0.7103	0.6290	0.2633	0.0759	0.0160	0.0026	0.0003	0.0000	0.0000	0.0000
5	1.0000	0.9999	0.9988	0.9951	0.9861	0.9691	0.9419	0.9033	0.8535	0.7937	0.4325	0.1613	0.0433	0.0086	0.0013	0.0001	0.0000	0.0000
6	1.0000	1.0000	0.9998	0.9990	0.9966	0.9909	0.9801	0.9624	0.9361	0.9005	0.6067	0.2859	0.0962	0.0238	0.0044	0.0006	0.0001	0.0000
7	1.0000	1.0000	1.0000	0.9998	0.9993	0.9977	0.9942	0.9873	0.9758	0.9581	0.7559	0.4371	0.1820	0.0553	0.0124	0.0021	0.0002	0.0000
8	1.0000	1.0000	1.0000	1.0000	0.9999	0.9995	0.9985	0.9963	0.9919	0.9845	0.8646	0.5931	0.2998	0.1110	0.0303	0.0061	0.0009	0.0001
9	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9990	0.9976	0.9949	0.9328	0.7318	0.4395	0.1959	0.0644	0.0156	0.0027	0.0003
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9994	0.9985	0.9701	0.8392	0.5839	0.3087	0.1215	0.0352	0.0074	0.0011
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9996	0.9880	0.9125	0.7151	0.4406	0.2053	0.0709	0.0179	0.0032
12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9989	0.9917	0.9595	0.8659
24	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	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	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	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	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9989

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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
30	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
33	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
35	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
36	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
37	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
38	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
39	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

n = 50

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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	0.6050	0.3642	0.2181	0.1299	0.0769	0.0453	0.0266	0.0155	0.0090	0.0052	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.9106	0.7358	0.5553	0.4005	0.2794	0.1900	0.1265	0.0827	0.0532	0.0338	0.0029	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.9862	0.9216	0.8108	0.6767	0.5405	0.4162	0.3108	0.2260	0.1605	0.1117	0.0142	0.0013	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.9984	0.9822	0.9372	0.8609	0.7604	0.6473	0.5327	0.4253	0.3303	0.2503	0.0460	0.0057	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.9999	0.9968	0.9832	0.9510	0.8964	0.8206	0.7290	0.6290	0.5277	0.4312	0.1121	0.0185	0.0021	0.0002	0.0000	0.0000	0.0000	0.0000
5	1.0000	0.9995	0.9963	0.9856	0.9622	0.9224	0.8650	0.7919	0.7072	0.6161	0.2194	0.0480	0.0070	0.0007	0.0001	0.0000	0.0000	0.0000
6	1.0000	0.9999	0.9993	0.9964	0.9882	0.9711	0.9417	0.8981	0.8404	0.7702	0.3613	0.1034	0.0194	0.0025	0.0002	0.0000	0.0000	0.0000
7	1.0000	1.0000	0.9999	0.9992	0.9968	0.9906	0.9780	0.9562	0.9232	0.8779	0.5188	0.1904	0.0453	0.0073	0.0008	0.0001	0.0000	0.0000
8	1.0000	1.0000	1.0000	0.9999	0.9992	0.9973	0.9927	0.9833	0.9672	0.9421	0.6681	0.3073	0.0916	0.0183	0.0025	0.0002	0.0000	0.0000
9	1.0000	1.0000	1.0000	1.0000	0.9998	0.9993	0.9978	0.9944	0.9875	0.9755	0.7911	0.4437	0.1637	0.0402	0.0067	0.0008	0.0001	0.0000
10	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9994	0.9983	0.9957	0.9906	0.8801	0.5836	0.2622	0.0789	0.0160	0.0022	0.0002	0.0000
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9995	0.9987	0.9968	0.9372	0.7107	0.3816	0.1390	0.0342	0.0057	0.0006	0.0000
12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9996	0.9990	0.9699	0.8139	0.5110	0.2229	0.0661	0.0133	0.0018	0.0002
13	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9868	0.8894	0.6370	0.3279	0.1163	0.0280	0.0045	0.0005
14	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	1.0000	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	1.0000	1.0000	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	1.0000	1.0000	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	1.0000	1.0000	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	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	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	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	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	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	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	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

x	p = 0.01	p = 0.02	p = 0.03	p = 0.04	p = 0.05	p = 0.06	p = 0.07	p = 0.08	p = 0.09	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
39	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
40	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
41	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
42	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
43	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
44	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
46	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
47	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
48	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
49	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 2: Cumulative Poisson distribution function

The tabulated value is $P(X \le x)$, where X has a Poisson distribution with mean λ. The booklet leaves a cell blank once the value above it has reached 1.0000; this study version prints 1.0000 there.

x	λ = 0.1	λ = 0.2	λ = 0.3	λ = 0.4	λ = 0.5	λ = 0.6	λ = 0.7	λ = 0.8	λ = 0.9
0	0.9048	0.8187	0.7408	0.6703	0.6065	0.5488	0.4966	0.4493	0.4066
1	0.9953	0.9825	0.9631	0.9384	0.9098	0.8781	0.8442	0.8088	0.7725
2	0.9998	0.9989	0.9964	0.9921	0.9856	0.9769	0.9659	0.9526	0.9371
3	1.0000	0.9999	0.9997	0.9992	0.9982	0.9966	0.9942	0.9909	0.9865
4	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996	0.9992	0.9986	0.9977
5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9997
6	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

x	λ = 1	λ = 1.2	λ = 1.4	λ = 1.6	λ = 1.8	λ = 2	λ = 2.2	λ = 2.4	λ = 2.6
0	0.3679	0.3012	0.2466	0.2019	0.1653	0.1353	0.1108	0.0907	0.0743
1	0.7358	0.6626	0.5918	0.5249	0.4628	0.4060	0.3546	0.3084	0.2674
2	0.9197	0.8795	0.8335	0.7834	0.7306	0.6767	0.6227	0.5697	0.5184
3	0.9810	0.9662	0.9463	0.9212	0.8913	0.8571	0.8194	0.7787	0.7360
4	0.9963	0.9923	0.9857	0.9763	0.9636	0.9473	0.9275	0.9041	0.8774
5	0.9994	0.9985	0.9968	0.9940	0.9896	0.9834	0.9751	0.9643	0.9510
6	0.9999	0.9997	0.9994	0.9987	0.9974	0.9955	0.9925	0.9884	0.9828
7	1.0000	1.0000	0.9999	0.9997	0.9994	0.9989	0.9980	0.9967	0.9947
8	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9995	0.9991	0.9985
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

x	λ = 2.8	λ = 3	λ = 3.2	λ = 3.4	λ = 3.6	λ = 3.8	λ = 4	λ = 4.5
0	0.0608	0.0498	0.0408	0.0334	0.0273	0.0224	0.0183	0.0111
1	0.2311	0.1991	0.1712	0.1468	0.1257	0.1074	0.0916	0.0611
2	0.4695	0.4232	0.3799	0.3397	0.3027	0.2689	0.2381	0.1736
3	0.6919	0.6472	0.6025	0.5584	0.5152	0.4735	0.4335	0.3423
4	0.8477	0.8153	0.7806	0.7442	0.7064	0.6678	0.6288	0.5321
5	0.9349	0.9161	0.8946	0.8705	0.8441	0.8156	0.7851	0.7029
6	0.9756	0.9665	0.9554	0.9421	0.9267	0.9091	0.8893	0.8311
7	0.9919	0.9881	0.9832	0.9769	0.9692	0.9599	0.9489	0.9134
8	0.9976	0.9962	0.9943	0.9917	0.9883	0.9840	0.9786	0.9597
9	0.9993	0.9989	0.9982	0.9973	0.9960	0.9942	0.9919	0.9829
10	0.9998	0.9997	0.9995	0.9992	0.9987	0.9981	0.9972	0.9933
11	1.0000	0.9999	0.9999	0.9998	0.9996	0.9994	0.9991	0.9976
12	1.0000	1.0000	1.0000	0.9999	0.9999	0.9998	0.9997	0.9992
13	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997
14	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999

x	λ = 2.8	λ = 3	λ = 3.2	λ = 3.4	λ = 3.6	λ = 3.8	λ = 4	λ = 4.5
15	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
x	λ = 5	λ = 5.5	λ = 6	λ = 6.5	λ = 7	λ = 7.5	λ = 8	λ = 8.5
0	0.0067	0.0041	0.0025	0.0015	0.0009	0.0006	0.0003	0.0002
1	0.0404	0.0266	0.0174	0.0113	0.0073	0.0047	0.0030	0.0019
2	0.1247	0.0884	0.0620	0.0430	0.0296	0.0203	0.0138	0.0093
3	0.2650	0.2017	0.1512	0.1118	0.0818	0.0591	0.0424	0.0301
4	0.4405	0.3575	0.2851	0.2237	0.1730	0.1321	0.0996	0.0744
5	0.6160	0.5289	0.4457	0.3690	0.3007	0.2414	0.1912	0.1496
6	0.7622	0.6860	0.6063	0.5265	0.4497	0.3782	0.3134	0.2562
7	0.8666	0.8095	0.7440	0.6728	0.5987	0.5246	0.4530	0.3856
8	0.9319	0.8944	0.8472	0.7916	0.7291	0.6620	0.5925	0.5231
9	0.9682	0.9462	0.9161	0.8774	0.8305	0.7764	0.7166	0.6530
10	0.9863	0.9747	0.9574	0.9332	0.9015	0.8622	0.8159	0.7634
11	0.9945	0.9890	0.9799	0.9661	0.9467	0.9208	0.8881	0.8487
12	0.9980	0.9955	0.9912	0.9840	0.9730	0.9573	0.9362	0.9091
13	0.9993	0.9983	0.9964	0.9929	0.9872	0.9784	0.9658	0.9486
14	0.9998	0.9994	0.9986	0.9970	0.9943	0.9897	0.9827	0.9726
15	0.9999	0.9998	0.9995	0.9988	0.9976	0.9954	0.9918	0.9862
16	1.0000	0.9999	0.9998	0.9996	0.9990	0.9980	0.9963	0.9934
17	1.0000	1.0000	0.9999	0.9998	0.9996	0.9992	0.9984	0.9970
18	1.0000	1.0000	1.0000	0.9999	0.9999	0.9997	0.9993	0.9987
19	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9995
20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998
21	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
x	λ = 9	λ = 9.5	λ = 10	λ = 11	λ = 12	λ = 13	λ = 14	λ = 15
0	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.0012	0.0008	0.0005	0.0002	0.0001	0.0000	0.0000	0.0000
2	0.0062	0.0042	0.0028	0.0012	0.0005	0.0002	0.0001	0.0000
3	0.0212	0.0149	0.0103	0.0049	0.0023	0.0011	0.0005	0.0002
4	0.0550	0.0403	0.0293	0.0151	0.0076	0.0037	0.0018	0.0009
5	0.1157	0.0885	0.0671	0.0375	0.0203	0.0107	0.0055	0.0028
6	0.2068	0.1649	0.1301	0.0786	0.0458	0.0259	0.0142	0.0076
7	0.3239	0.2687	0.2202	0.1432	0.0895	0.0540	0.0316	0.0180
8	0.4557	0.3918	0.3328	0.2320	0.1550	0.0998	0.0621	0.0374
9	0.5874	0.5218	0.4579	0.3405	0.2424	0.1658	0.1094	0.0699
10	0.7060	0.6453	0.5830	0.4599	0.3472	0.2517	0.1757	0.1185
11	0.8030	0.7520	0.6968	0.5793	0.4616	0.3532	0.2600	0.1848
12	0.8758	0.8364	0.7916	0.6887	0.5760	0.4631	0.3585	0.2676
13	0.9261	0.8981	0.8645	0.7813	0.6815	0.5730	0.4644	0.3632
14	0.9585	0.9400	0.9165	0.8540	0.7720	0.6751	0.5704	0.4657
15	0.9780	0.9665	0.9513	0.9074	0.8444	0.7636	0.6694	0.5681
16	0.9889	0.9823	0.9730	0.9441	0.8987	0.8355	0.7559	0.6641
17	0.9947	0.9911	0.9857	0.9678	0.9370	0.8905	0.8272	0.7489
18	0.9976	0.9957	0.9928	0.9823	0.9626	0.9302	0.8826	0.8195
19	0.9989	0.9980	0.9965	0.9907	0.9787	0.9573	0.9235	0.8752
20	0.9996	0.9991	0.9984	0.9953	0.9884	0.9750	0.9521	0.9170
21	0.9998	0.9996	0.9993	0.9977	0.9939	0.9859	0.9712	0.9469
22	0.9999	0.9999	0.9997	0.9990	0.9970	0.9924	0.9833	0.9673
23	1.0000	0.9999	0.9999	0.9995	0.9985	0.9960	0.9907	0.9805
24	1.0000	1.0000	1.0000	0.9998	0.9993	0.9980	0.9950	0.9888
25	1.0000	1.0000	1.0000	0.9999	0.9997	0.9990	0.9974	0.9938
26	1.0000	1.0000	1.0000	1.0000	0.9999	0.9995	0.9987	0.9967

x	λ = 9	λ = 9.5	λ = 10	λ = 11	λ = 12	λ = 13	λ = 14	λ = 15
27	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9994	0.9983
28	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9991
29	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9996
30	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998
31	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

Table 3: Normal distribution function

The table gives the probability, p, that a normally distributed random variable Z, with mean 0 and variance 1, is less than or equal to z. Printed to 5 decimal places.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.50000	0.50399	0.50798	0.51197	0.51595	0.51994	0.52392	0.52790	0.53188	0.53586
0.1	0.53983	0.54380	0.54776	0.55172	0.55567	0.55962	0.56356	0.56749	0.57142	0.57535
0.2	0.57926	0.58317	0.58706	0.59095	0.59483	0.59871	0.60257	0.60642	0.61026	0.61409
0.3	0.61791	0.62172	0.62552	0.62930	0.63307	0.63683	0.64058	0.64431	0.64803	0.65173
0.4	0.65542	0.65910	0.66276	0.66640	0.67003	0.67364	0.67724	0.68082	0.68439	0.68793
0.5	0.69146	0.69497	0.69847	0.70194	0.70540	0.70884	0.71226	0.71566	0.71904	0.72240
0.6	0.72575	0.72907	0.73237	0.73565	0.73891	0.74215	0.74537	0.74857	0.75175	0.75490
0.7	0.75804	0.76115	0.76424	0.76730	0.77035	0.77337	0.77637	0.77935	0.78230	0.78524
0.8	0.78814	0.79103	0.79389	0.79673	0.79955	0.80234	0.80511	0.80785	0.81057	0.81327
0.9	0.81594	0.81859	0.82121	0.82381	0.82639	0.82894	0.83147	0.83398	0.83646	0.83891
1.0	0.84134	0.84375	0.84614	0.84849	0.85083	0.85314	0.85543	0.85769	0.85993	0.86214
1.1	0.86433	0.86650	0.86864	0.87076	0.87286	0.87493	0.87698	0.87900	0.88100	0.88298
1.2	0.88493	0.88686	0.88877	0.89065	0.89251	0.89435	0.89617	0.89796	0.89973	0.90147
1.3	0.90320	0.90490	0.90658	0.90824	0.90988	0.91149	0.91309	0.91466	0.91621	0.91774
1.4	0.91924	0.92073	0.92220	0.92364	0.92507	0.92647	0.92785	0.92922	0.93056	0.93189
1.5	0.93319	0.93448	0.93574	0.93699	0.93822	0.93943	0.94062	0.94179	0.94295	0.94408
1.6	0.94520	0.94630	0.94738	0.94845	0.94950	0.95053	0.95154	0.95254	0.95352	0.95449
1.7	0.95543	0.95637	0.95728	0.95818	0.95907	0.95994	0.96080	0.96164	0.96246	0.96327
1.8	0.96407	0.96485	0.96562	0.96638	0.96712	0.96784	0.96856	0.96926	0.96995	0.97062
1.9	0.97128	0.97193	0.97257	0.97320	0.97381	0.97441	0.97500	0.97558	0.97615	0.97670
2.0	0.97725	0.97778	0.97831	0.97882	0.97932	0.97982	0.98030	0.98077	0.98124	0.98169
2.1	0.98214	0.98257	0.98300	0.98341	0.98382	0.98422	0.98461	0.98500	0.98537	0.98574
2.2	0.98610	0.98645	0.98679	0.98713	0.98745	0.98778	0.98809	0.98840	0.98870	0.98899
2.3	0.98928	0.98956	0.98983	0.99010	0.99036	0.99061	0.99086	0.99111	0.99134	0.99158
2.4	0.99180	0.99202	0.99224	0.99245	0.99266	0.99286	0.99305	0.99324	0.99343	0.99361
2.5	0.99379	0.99396	0.99413	0.99430	0.99446	0.99461	0.99477	0.99492	0.99506	0.99520
2.6	0.99534	0.99547	0.99560	0.99573	0.99585	0.99598	0.99609	0.99621	0.99632	0.99643
2.7	0.99653	0.99664	0.99674	0.99683	0.99693	0.99702	0.99711	0.99720	0.99728	0.99736
2.8	0.99744	0.99752	0.99760	0.99767	0.99774	0.99781	0.99788	0.99795	0.99801	0.99807
2.9	0.99813	0.99819	0.99825	0.99831	0.99836	0.99841	0.99846	0.99851	0.99856	0.99861
3.0	0.99865	0.99869	0.99874	0.99878	0.99882	0.99886	0.99889	0.99893	0.99896	0.99900
3.1	0.99903	0.99906	0.99910	0.99913	0.99916	0.99918	0.99921	0.99924	0.99926	0.99929

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
3.2	0.99931	0.99934	0.99936	0.99938	0.99940	0.99942	0.99944	0.99946	0.99948	0.99950
3.3	0.99952	0.99953	0.99955	0.99957	0.99958	0.99960	0.99961	0.99962	0.99964	0.99965
3.4	0.99966	0.99968	0.99969	0.99970	0.99971	0.99972	0.99973	0.99974	0.99975	0.99976
3.5	0.99977	0.99978	0.99978	0.99979	0.99980	0.99981	0.99981	0.99982	0.99983	0.99983
3.6	0.99984	0.99985	0.99985	0.99986	0.99986	0.99987	0.99987	0.99988	0.99988	0.99989
3.7	0.99989	0.99990	0.99990	0.99990	0.99991	0.99991	0.99992	0.99992	0.99992	0.99992
3.8	0.99993	0.99993	0.99993	0.99994	0.99994	0.99994	0.99994	0.99995	0.99995	0.99995
3.9	0.99995	0.99995	0.99996	0.99996	0.99996	0.99996	0.99996	0.99996	0.99997	0.99997

Table 4: Percentage points of the normal distribution

The table gives the values of z satisfying P(Z ≤ z) = p, where Z is the normally distributed random variable with mean 0 and variance 1. Row label plus column heading gives p, for example 0.5 and 0.01 give p = 0.51.

p	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.5	0.0000	0.0251	0.0502	0.0753	0.1004	0.1257	0.1510	0.1764	0.2019	0.2275
0.6	0.2533	0.2793	0.3055	0.3319	0.3585	0.3853	0.4125	0.4399	0.4677	0.4958
0.7	0.5244	0.5534	0.5828	0.6128	0.6433	0.6745	0.7063	0.7388	0.7722	0.8064
0.8	0.8416	0.8779	0.9154	0.9542	0.9945	1.0364	1.0803	1.1264	1.1750	1.2265
0.9	1.2816	1.3408	1.4051	1.4758	1.5548	1.6449	1.7507	1.8808	2.0537	2.3263

Continued for p from 0.95 upwards: row label plus column heading gives p, for example 0.95 and 0.001 give p = 0.951.

p	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.95	1.6449	1.6546	1.6646	1.6747	1.6849	1.6954	1.7060	1.7169	1.7279	1.7392
0.96	1.7507	1.7624	1.7744	1.7866	1.7991	1.8119	1.8250	1.8384	1.8522	1.8663
0.97	1.8808	1.8957	1.9110	1.9268	1.9431	1.9600	1.9774	1.9954	2.0141	2.0335
0.98	2.0537	2.0749	2.0969	2.1201	2.1444	2.1701	2.1973	2.2262	2.2571	2.2904
0.99	2.3263	2.3656	2.4089	2.4573	2.5121	2.5758	2.6521	2.7478	2.8782	3.0902

Table 5: Percentage points of the Student's t-distribution

The table gives the values of x satisfying P(X ≤ x) = p, where X has the Student's t-distribution with v degrees of freedom. The last row, v = ∞, is printed without a label in the booklet. Copied exactly as printed in the official booklet. One printed value looks like a misprint: at v = 85, p = 0.975 the booklet prints 1.998; the true value is 1.988.

v \ p	0.9	0.95	0.975	0.99	0.995
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

v \ p	0.9	0.95	0.975	0.99	0.995
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	2.121	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
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
31	1.309	1.696	2.040	2.453	2.744
32	1.309	1.694	2.037	2.449	2.738
33	1.308	1.692	2.035	2.445	2.733
34	1.307	1.691	2.032	2.441	2.728
35	1.306	1.690	2.030	2.438	2.724
36	1.306	1.688	2.028	2.434	2.719
37	1.305	1.687	2.026	2.431	2.715
38	1.304	1.686	2.024	2.429	2.712
39	1.304	1.685	2.023	2.426	2.708
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
65	1.295	1.669	1.997	2.385	2.654
70	1.294	1.667	1.994	2.381	2.648
75	1.293	1.665	1.992	2.377	2.643
80	1.292	1.664	1.990	2.374	2.639
85	1.292	1.663	1.998	2.371	2.635
90	1.291	1.662	1.987	2.368	2.632
95	1.291	1.661	1.985	2.366	2.629
100	1.290	1.660	1.984	2.364	2.626
125	1.288	1.657	1.979	2.357	2.616

v \ p	0.9	0.95	0.975	0.99	0.995
150	1.287	1.655	1.976	2.351	2.609
200	1.286	1.653	1.972	2.345	2.601
∞	1.282	1.645	1.960	2.326	2.576

Table 6: Percentage points of the chi-squared distribution

The table gives the values of x satisfying P(X ≤ x) = p, where X has the chi-squared distribution with v degrees of freedom. Copied exactly as printed in the official booklet. Two printed values look like misprints: v = 34, p = 0.975 prints 51.996 (true value 51.966) and v = 36, p = 0.01 prints 19.223 (true value 19.233).

v \ p	0.005	0.01	0.025	0.05	0.1	0.9	0.95	0.975	0.99	0.995
1	0.00004	0.0002	0.001	0.004	0.016	2.706	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	12.833	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	5.578	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	14.041	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	45.559
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	43.195	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	39.087	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
31	14.458	15.655	17.539	19.281	21.434	41.422	44.985	48.232	52.191	55.003
32	15.134	16.362	18.291	20.072	22.271	42.585	46.194	49.480	53.486	56.328
33	15.815	17.074	19.047	20.867	23.110	43.745	47.400	50.725	54.776	57.648

v \ p	0.005	0.01	0.025	0.05	0.1	0.9	0.95	0.975	0.99	0.995
34	16.501	17.789	19.806	21.664	23.952	44.903	48.602	51.996	56.061	58.964
35	17.192	18.509	20.569	22.465	24.797	46.059	49.802	53.203	57.342	60.275
36	17.887	19.223	21.336	23.269	25.643	47.212	50.998	54.437	58.619	61.581
37	18.586	19.960	22.106	24.075	26.492	48.363	52.192	55.668	59.892	62.883
38	19.289	20.691	22.878	24.884	27.343	49.513	53.384	56.896	61.162	64.181
39	19.996	21.426	23.654	25.695	28.196	50.660	54.572	58.120	62.428	65.476
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
45	24.311	25.901	28.366	30.612	33.350	57.505	61.656	65.410	69.957	73.166
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
55	31.735	33.570	36.398	38.958	42.060	68.796	73.311	77.380	82.292	85.749
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
65	39.383	41.444	44.603	47.450	50.883	79.973	84.821	89.177	94.422	98.105
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
75	47.206	49.475	52.942	56.054	59.795	91.061	96.217	100.839	106.393	110.286
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
85	55.170	57.634	61.389	64.749	68.777	102.079	107.522	112.393	118.236	122.325
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
95	63.250	65.898	69.925	73.520	77.818	113.038	118.752	123.858	129.973	134.247
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

Table 7: Percentage points of the F-distribution, p = 0.995

The tables give the values of x satisfying P(X ≤ x) = p, where X has the F-distribution with v1 degrees of freedom in the numerator and v2 in the denominator. Use for one-tail tests at significance level 0.5% or two-tail tests at significance level 1%. The booklet prints all 20 columns across one page; here they are split into v1 = 1 to 10 and v1 = 11 to ∞.

v2 \ v1	1	2	3	4	5	6	7	8	9	10
1	16211	20000	21615	22500	23056	23437	23715	23925	24091	24224
2	198.5	199.0	199.2	199.2	199.3	199.3	199.4	199.4	199.4	199.4
3	55.55	49.80	47.47	46.19	45.39	44.84	44.43	44.13	43.88	43.69
4	31.33	26.28	24.26	23.15	22.46	21.97	21.62	21.35	21.14	20.97
5	22.78	18.31	16.53	15.56	14.94	14.51	14.20	13.96	13.77	13.62
6	18.635	14.544	12.917	12.028	11.464	11.073	10.786	10.566	10.391	10.250
7	16.236	12.404	10.882	10.050	9.522	9.155	8.885	8.678	8.514	8.380
8	14.688	11.042	9.596	8.805	8.302	7.952	7.694	7.496	7.339	7.211
9	13.614	10.107	8.717	7.956	7.471	7.134	6.885	6.693	6.541	6.417
10	12.826	9.427	8.081	7.343	6.872	6.545	6.302	6.116	5.968	5.847
11	12.226	8.912	7.600	6.881	6.422	6.102	5.865	5.682	5.537	5.418
12	11.754	8.510	7.226	6.521	6.071	5.757	5.525	5.345	5.202	5.085
13	11.374	8.186	6.926	6.233	5.791	5.482	5.253	5.076	4.935	4.820
14	11.060	7.922	6.680	5.998	5.562	5.257	5.031	4.857	4.717	4.603
15	10.798	7.701	6.476	5.803	5.372	5.071	4.847	4.674	4.536	4.424
20	9.944	6.986	5.818	5.174	4.762	4.472	4.257	4.090	3.956	3.847
25	9.475	6.598	5.462	4.835	4.433	4.150	3.939	3.776	3.645	3.537

v2 \ v1	1	2	3	4	5	6	7	8	9	10
30	9.180	6.355	5.239	4.623	4.228	3.949	3.742	3.580	3.450	3.344
40	8.828	6.066	4.976	4.374	3.986	3.713	3.509	3.350	3.222	3.117
50	8.626	5.902	4.826	4.232	3.849	3.579	3.376	3.219	3.092	2.988
100	8.241	5.589	4.542	3.963	3.589	3.325	3.127	2.972	2.847	2.744
∞	7.879	5.298	4.279	3.715	3.350	3.091	2.897	2.744	2.621	2.519

Table 7: Percentage points of the F-distribution, p = 0.995 (continued)

Continued: v1 = 11, 12, 15, 20, 25, 30, 40, 50, 100, ∞.

v2 \ v1	11	12	15	20	25	30	40	50	100	∞
1	24334	24426	24630	24836	24960	25044	25148	25211	25337	25464
2	199.4	199.4	199.4	199.4	199.5	199.5	199.5	199.5	199.5	199.5
3	43.52	43.39	43.08	42.78	42.59	42.47	42.31	42.21	42.02	41.83
4	20.82	20.70	20.44	20.17	20.00	19.89	19.75	19.67	19.50	19.32
5	13.49	13.38	13.15	12.90	12.76	12.66	12.53	12.45	12.30	12.14
6	10.133	10.034	9.814	9.589	9.451	9.358	9.241	9.170	9.026	8.879
7	8.270	8.176	7.968	7.754	7.623	7.534	7.422	7.354	7.217	7.076
8	7.104	7.015	6.814	6.608	6.482	6.396	6.288	6.222	6.088	5.951
9	6.314	6.227	6.032	5.832	5.708	5.625	5.519	5.454	5.322	5.188
10	5.746	5.661	5.471	5.274	5.153	5.071	4.966	4.902	4.772	4.639
11	5.320	5.236	5.049	4.855	4.736	4.654	4.551	4.488	4.359	4.226
12	4.988	4.906	4.721	4.530	4.412	4.331	4.228	4.165	4.037	3.904
13	4.724	4.643	4.460	4.270	4.153	4.073	3.970	3.908	3.780	3.647
14	4.508	4.428	4.247	4.059	3.942	3.862	3.760	3.697	3.569	3.436
15	4.329	4.250	4.070	3.883	3.766	3.687	3.585	3.523	3.394	3.260
20	3.756	3.678	3.502	3.318	3.203	3.123	3.022	2.959	2.828	2.690
25	3.447	3.370	3.196	3.013	2.898	2.819	2.716	2.652	2.519	2.377
30	3.255	3.179	3.006	2.823	2.708	2.628	2.524	2.459	2.323	2.176
40	3.028	2.953	2.781	2.598	2.482	2.401	2.296	2.230	2.088	1.932
50	2.900	2.825	2.653	2.470	2.353	2.272	2.164	2.097	1.951	1.786
100	2.657	2.583	2.411	2.227	2.108	2.024	1.912	1.840	1.681	1.485
∞	2.432	2.358	2.187	2.000	1.877	1.789	1.669	1.590	1.402	1.001

Table 7: Percentage points of the F-distribution, p = 0.99

Use for one-tail tests at significance level 1% or two-tail tests at significance level 2%. The booklet prints all 20 columns across one page; here they are split into v1 = 1 to 10 and v1 = 11 to ∞.

v2 \ v1	1	2	3	4	5	6	7	8	9	10
1	4052	5000	5403	5625	5764	5859	5928	5981	6022	6056
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39	99.40
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35	27.23
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66	14.55
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16	10.05
6	13.745	10.925	9.780	9.148	8.746	8.466	8.260	8.102	7.976	7.874

v2 \ v1	1	2	3	4	5	6	7	8	9	10
7	12.246	9.547	8.451	7.847	7.460	7.191	6.993	6.840	6.719	6.620
8	11.259	8.649	7.591	7.006	6.632	6.371	6.178	6.029	5.911	5.814
9	10.561	8.022	6.992	6.422	6.057	5.802	5.613	5.467	5.351	5.257
10	10.044	7.559	6.552	5.994	5.636	5.386	5.200	5.057	4.942	4.849
11	9.646	7.206	6.217	5.668	5.316	5.069	4.886	4.744	4.632	4.539
12	9.330	6.927	5.953	5.412	5.064	4.821	4.640	4.499	4.388	4.296
13	9.074	6.701	5.739	5.205	4.862	4.620	4.441	4.302	4.191	4.100
14	8.862	6.515	5.564	5.035	4.695	4.456	4.278	4.140	4.030	3.939
15	8.683	6.359	5.417	4.893	4.556	4.318	4.142	4.004	3.895	3.805
20	8.096	5.849	4.938	4.431	4.103	3.871	3.699	3.564	3.457	3.368
25	7.770	5.568	4.675	4.177	3.855	3.627	3.457	3.324	3.217	3.129
30	7.562	5.390	4.510	4.018	3.699	3.473	3.304	3.173	3.067	2.979
40	7.314	5.179	4.313	3.828	3.514	3.291	3.124	2.993	2.888	2.801
50	7.171	5.057	4.199	3.720	3.408	3.186	3.020	2.890	2.785	2.698
100	6.895	4.824	3.984	3.513	3.206	2.988	2.823	2.694	2.590	2.503
∞	6.635	4.605	3.782	3.319	3.017	2.802	2.639	2.511	2.407	2.321

Table 7: Percentage points of the F-distribution, p = 0.99 (continued)

Continued: v1 = 11, 12, 15, 20, 25, 30, 40, 50, 100, ∞.

v2 \ v1	11	12	15	20	25	30	40	50	100	∞
1	6083	6106	6157	6209	6240	6261	6287	6303	6334	6366
2	99.41	99.42	99.43	99.45	99.46	99.47	99.47	99.48	99.49	99.50
3	27.13	27.05	26.87	26.69	26.58	26.50	26.41	26.35	26.24	26.13
4	14.45	14.37	14.20	14.02	13.91	13.84	13.75	13.69	13.58	13.46
5	9.96	9.89	9.72	9.55	9.45	9.38	9.29	9.24	9.13	9.02
6	7.790	7.718	7.559	7.396	7.296	7.229	7.143	7.091	6.987	6.880
7	6.538	6.469	6.314	6.155	6.058	5.992	5.908	5.858	5.755	5.650
8	5.734	5.667	5.515	5.359	5.263	5.198	5.116	5.065	4.963	4.859
9	5.178	5.111	4.962	4.808	4.713	4.649	4.567	4.517	4.415	4.311
10	4.772	4.706	4.558	4.405	4.311	4.247	4.165	4.115	4.014	3.909
11	4.462	4.397	4.251	4.099	4.005	3.941	3.860	3.810	3.708	3.602
12	4.220	4.155	4.010	3.858	3.765	3.701	3.619	3.569	3.467	3.361
13	4.025	3.960	3.815	3.665	3.571	3.507	3.425	3.375	3.272	3.165
14	3.864	3.800	3.656	3.505	3.412	3.348	3.266	3.215	3.112	3.004
15	3.730	3.666	3.522	3.372	3.278	3.214	3.132	3.081	2.977	2.868
20	3.294	3.231	3.088	2.938	2.843	2.778	2.695	2.643	2.535	2.421
25	3.056	2.993	2.850	2.699	2.604	2.538	2.453	2.400	2.289	2.169
30	2.906	2.843	2.700	2.549	2.453	2.386	2.299	2.245	2.131	2.006
40	2.727	2.665	2.522	2.369	2.271	2.203	2.114	2.058	1.938	1.805
50	2.625	2.562	2.419	2.265	2.167	2.098	2.007	1.949	1.825	1.683
100	2.430	2.368	2.223	2.067	1.965	1.893	1.797	1.735	1.598	1.427

v2 \ v1	11	12	15	20	25	30	40	50	100	∞
∞	2.248	2.185	2.039	1.878	1.773	1.696	1.592	1.523	1.358	1.000

Table 7: Percentage points of the F-distribution, p = 0.975

Use for one-tail tests at significance level 2.5% or two-tail tests at significance level 5%. The booklet prints all 20 columns across one page; here they are split into v1 = 1 to 10 and v1 = 11 to ∞.

v2 \ v1	1	2	3	4	5	6	7	8	9	10
1	647.8	799.5	864.2	899.6	921.8	937.1	948.2	956.7	963.3	968.6
2	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.39	39.40
3	17.44	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.47	14.42
4	12.22	10.65	9.98	9.60	9.36	9.20	9.07	8.98	8.90	8.84
5	10.01	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68	6.62
6	8.813	7.260	6.599	6.227	5.988	5.820	5.695	5.600	5.523	5.461
7	8.073	6.542	5.890	5.523	5.285	5.119	4.995	4.899	4.823	4.761
8	7.571	6.059	5.416	5.053	4.817	4.652	4.529	4.433	4.357	4.295
9	7.209	5.715	5.078	4.718	4.484	4.320	4.197	4.102	4.026	3.964
10	6.937	5.456	4.826	4.468	4.236	4.072	3.950	3.855	3.779	3.717
11	6.724	5.256	4.630	4.275	4.044	3.881	3.759	3.664	3.588	3.526
12	6.554	5.096	4.474	4.121	3.891	3.728	3.607	3.512	3.436	3.374
13	6.414	4.965	4.347	3.996	3.767	3.604	3.483	3.388	3.312	3.250
14	6.298	4.857	4.242	3.892	3.663	3.501	3.380	3.285	3.209	3.147
15	6.200	4.765	4.153	3.804	3.576	3.415	3.293	3.199	3.123	3.060
20	5.871	4.461	3.859	3.515	3.289	3.128	3.007	2.913	2.837	2.774
25	5.686	4.291	3.694	3.353	3.129	2.969	2.848	2.753	2.677	2.613
30	5.568	4.182	3.589	3.250	3.026	2.867	2.746	2.651	2.575	2.511
40	5.424	4.051	3.463	3.126	2.904	2.744	2.624	2.529	2.452	2.388
50	5.340	3.975	3.390	3.054	2.833	2.674	2.553	2.458	2.381	2.317
100	5.179	3.828	3.250	2.917	2.696	2.537	2.417	2.321	2.244	2.179
∞	5.024	3.689	3.116	2.786	2.567	2.408	2.288	2.192	2.114	2.048

Table 7: Percentage points of the F-distribution, p = 0.975 (continued)

Continued: v1 = 11, 12, 15, 20, 25, 30, 40, 50, 100, ∞.

v2 \ v1	11	12	15	20	25	30	40	50	100	∞
1	973.0	976.7	984.9	993.1	998.1	1001.4	1005.6	1008.1	1013.2	1018.3
2	39.41	39.41	39.43	39.45	39.46	39.46	39.47	39.48	39.49	39.50
3	14.37	14.34	14.25	14.17	14.12	14.08	14.04	14.01	13.96	13.90
4	8.79	8.75	8.66	8.56	8.50	8.46	8.41	8.38	8.32	8.26
5	6.57	6.52	6.43	6.33	6.27	6.23	6.18	6.14	6.08	6.02
6	5.410	5.366	5.269	5.168	5.107	5.065	5.012	4.980	4.915	4.849
7	4.709	4.666	4.568	4.467	4.405	4.362	4.309	4.276	4.210	4.142
8	4.243	4.200	4.101	3.999	3.937	3.894	3.840	3.807	3.739	3.670
9	3.912	3.868	3.769	3.667	3.604	3.560	3.505	3.472	3.403	3.333
10	3.665	3.621	3.522	3.419	3.355	3.311	3.255	3.221	3.152	3.080

v2 \ v1	11	12	15	20	25	30	40	50	100	∞
11	3.474	3.430	3.330	3.226	3.162	3.118	3.061	3.027	2.956	2.883
12	3.321	3.277	3.177	3.073	3.008	2.963	2.906	2.871	2.800	2.725
13	3.197	3.153	3.053	2.948	2.882	2.837	2.780	2.744	2.671	2.595
14	3.095	3.050	2.949	2.844	2.778	2.732	2.674	2.638	2.565	2.487
15	3.008	2.963	2.862	2.756	2.689	2.644	2.585	2.549	2.474	2.395
20	2.721	2.676	2.573	2.464	2.396	2.349	2.287	2.249	2.170	2.085
25	2.560	2.515	2.411	2.300	2.230	2.182	2.118	2.079	1.996	1.906
30	2.458	2.412	2.307	2.195	2.124	2.074	2.009	1.968	1.882	1.787
40	2.334	2.288	2.182	2.068	1.994	1.943	1.875	1.832	1.741	1.637
50	2.263	2.216	2.109	1.993	1.919	1.866	1.796	1.752	1.656	1.545
100	2.125	2.077	1.968	1.849	1.770	1.715	1.640	1.592	1.483	1.347
∞	1.993	1.945	1.833	1.708	1.626	1.566	1.484	1.428	1.296	1.000

Table 7: Percentage points of the F-distribution, p = 0.95

Use for one-tail tests at significance level 5% or two-tail tests at significance level 10%. The booklet prints all 20 columns across one page; here they are split into v1 = 1 to 10 and v1 = 11 to ∞.

v2 \ v1	1	2	3	4	5	6	7	8	9	10
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637
8	5.318	4.459	4.066	3.838	3.688	3.581	3.500	3.438	3.388	3.347
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.211	2.165
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.124	2.077
50	4.034	3.183	2.790	2.557	2.400	2.286	2.199	2.130	2.073	2.026
100	3.936	3.087	2.696	2.463	2.305	2.191	2.103	2.032	1.975	1.927
∞	3.841	2.996	2.605	2.372	2.214	2.099	2.010	1.938	1.880	1.831

Table 7: Percentage points of the F-distribution, p = 0.95 (continued)

Continued: v1 = 11, 12, 15, 20, 25, 30, 40, 50, 100, ∞.

v2 \ v1	11	12	15	20	25	30	40	50	100	∞
1	243.0	243.9	245.9	248.0	249.3	250.1	251.1	251.8	253.0	254.3
2	19.40	19.41	19.43	19.45	19.46	19.46	19.47	19.48	19.49	19.50
3	8.76	8.74	8.70	8.66	8.63	8.62	8.59	8.58	8.55	8.53
4	5.94	5.91	5.86	5.80	5.77	5.75	5.72	5.70	5.66	5.63
5	4.70	4.68	4.62	4.56	4.52	4.50	4.46	4.44	4.41	4.36
6	4.027	4.000	3.938	3.874	3.835	3.808	3.774	3.754	3.712	3.669
7	3.603	3.575	3.511	3.445	3.404	3.376	3.340	3.319	3.275	3.230
8	3.313	3.284	3.218	3.150	3.108	3.079	3.043	3.020	2.975	2.928
9	3.102	3.073	3.006	2.936	2.893	2.864	2.826	2.803	2.756	2.707
10	2.943	2.913	2.845	2.774	2.730	2.700	2.661	2.637	2.588	2.538
11	2.818	2.788	2.719	2.646	2.601	2.570	2.531	2.507	2.457	2.404
12	2.717	2.687	2.617	2.544	2.498	2.466	2.426	2.401	2.350	2.296
13	2.635	2.604	2.533	2.459	2.412	2.380	2.339	2.314	2.261	2.206
14	2.565	2.534	2.463	2.388	2.341	2.308	2.266	2.241	2.187	2.131
15	2.507	2.475	2.403	2.328	2.280	2.247	2.204	2.178	2.123	2.066
20	2.310	2.278	2.203	2.124	2.074	2.039	1.994	1.966	1.907	1.843
25	2.198	2.165	2.089	2.007	1.955	1.919	1.872	1.842	1.779	1.711
30	2.126	2.092	2.015	1.932	1.878	1.841	1.792	1.761	1.695	1.622
40	2.038	2.003	1.924	1.839	1.783	1.744	1.693	1.660	1.589	1.509
50	1.986	1.952	1.871	1.784	1.727	1.687	1.634	1.599	1.525	1.438
100	1.886	1.850	1.768	1.676	1.616	1.573	1.515	1.477	1.392	1.283
∞	1.789	1.752	1.666	1.571	1.506	1.459	1.394	1.350	1.243	1.000

Learn these: not in the booklet

P1 quadratic formula

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

P1 differentiation

$$\frac{d}{dx}(ax^n) = anx^{n-1}, \text{ and term by term for sums}$$

P1 integration

$$\int ax^n \, dx = \frac{a}{n+1}x^{n+1} + c, \; n \neq -1$$

P1 area under a curve

$$\int_a^b y \, dx \; (y \geqslant 0)$$

PSM1 circle

$$(x-a)^2 + (y-b)^2 = r^2, \text{ centre } (a, b), \text{ radius } r$$

PSM1 sine rule

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

PSM1 area of a triangle

$$\tfrac{1}{2}ab\sin C$$

PSM1 arc length and sector area (radians)

$$l = r\theta, \; A = \tfrac{1}{2}r^2\theta$$

PSM1 trigonometric identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta}, \; \sin^2\theta + \cos^2\theta = 1$$

PSM1 laws of logarithms

$$\log_a x + \log_a y = \log_a(xy), \; \log_a x - \log_a y = \log_a \frac{x}{y}, \; k\log_a x = \log_a(x^k)$$

PSM1 complement and addition law

$$P(A') = 1 - P(A), \text{ mutually exclusive: } P(A \cup B) = P(A) + P(B)$$

PSM1 independent events

$$P(A \cap B) = P(A) \times P(B)$$

PSM1 discrete random variables

$E(X) = \sum x_i p_i,\ E(g(X)) = \sum g(x_i)p_i,\ \mathrm{Var}(X) = E(X^2) - \mu^2$

PSM1 linear functions

$E(aX + b) = aE(X) + b,\ \mathrm{Var}(aX + b) = a^2\,\mathrm{Var}(X)$

PSM1 sums of independent variables

$E(aX \pm bY) = aE(X) \pm bE(Y),\ \mathrm{Var}(aX \pm bY) = a^2\,\mathrm{Var}(X) + b^2\,\mathrm{Var}(Y)$

PSM1 Bernoulli trial

$E(X) = p,\ \mathrm{Var}(X) = p(1-p)$

PSM1 weight and momentum

$W = mg,\ \text{momentum} = mv$

PSM1 Newton's second law

$F = ma$ or force $=$ rate of change of momentum

PSM1 dynamic friction

$F = \mu R$

PSM1 constant acceleration

$v = u + at,\ s = ut + \frac{1}{2}at^2,\ s = vt - \frac{1}{2}at^2,\ v^2 = u^2 + 2as,\ s = \frac{1}{2}(u+v)t$

PSM1 variable acceleration

$v = \dfrac{ds}{dt},\ a = \dfrac{dv}{dt} = \dfrac{d^2s}{dt^2},\ s = \displaystyle\int v\,dt,\ v = \int a\,dt$

P2 trigonometric identities

$\sec^2 A = 1 + \tan^2 A,\ \mathrm{cosec}^2 A = 1 + \cot^2 A$

P2 double angle

$\sin 2A = 2\sin A\cos A,\ \cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A,\ \tan 2A = \dfrac{2\tan A}{1 - \tan^2 A}$

P2 harmonic form

$a\cos\theta + b\sin\theta = R\sin(\theta + \alpha),\ R = \sqrt{a^2 + b^2},\ \tan\alpha = \dfrac{a}{b}$

P2 harmonic form with cos

$a\cos\theta - b\sin\theta = R\cos(\theta + \alpha),\ R = \sqrt{a^2 + b^2},\ \tan\alpha = \dfrac{b}{a}$

P2 derivatives

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

P2 product rule

$\dfrac{d}{dx}\big(f(x)g(x)\big) = f'(x)g(x) + f(x)g'(x)$

P2 chain rule

$\dfrac{d}{dx}f(g(x)) = f'(g(x))\,g'(x)$

P2 integrals

$\displaystyle\int \cos kx\,dx = \frac{1}{k}\sin kx + c,\ \int \sin kx\,dx = -\frac{1}{k}\cos kx + c,\ \int e^{kx}dx = \frac{1}{k}e^{kx} + c,\ \int \frac{1}{x}dx = \ln|x| + c$

P2 reverse chain rule

$\displaystyle\int f'(g(x))\,g'(x)\,dx = f(g(x)) + c$

P2 volume of revolution

about the x-axis $V = \pi\displaystyle\int_a^b y^2\,dx$, about the y-axis $V = \pi\displaystyle\int_c^d x^2\,dy$

P2 scalar product of vectors

$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \cdot \begin{pmatrix} a \\ b \\ c \end{pmatrix} = xa + yb + zc = \sqrt{x^2 + y^2 + z^2}\sqrt{a^2 + b^2 + c^2}\cos\theta$

S2 continuous random variables

$F(x) = \displaystyle\int_{-\infty}^{x} f(t)\,dt,\ f(x) = \frac{d}{dx}F(x),\ P(a < X < b) = \int_a^b f(x)\,dx$

M2 centre of mass

$\bar{x}\sum m_i = \sum m_i x_i,\ \bar{y}\sum m_i = \sum m_i y_i$

M2 circular motion

$v = r\omega,\ a = r\omega^2 = \dfrac{v^2}{r}$

M2 work and energy

$\text{work done} = Fd\cos\theta,\ GPE = mgh,\ KE = \frac{1}{2}mv^2$

M2 position, velocity and acceleration vectors

$\mathbf{r} = f(t)\mathbf{i} + g(t)\mathbf{j} + h(t)\mathbf{k} \Rightarrow \mathbf{v} = f'(t)\mathbf{i} + g'(t)\mathbf{j} + h'(t)\mathbf{k},\ \mathbf{a} = f''(t)\mathbf{i} + g''(t)\mathbf{j} + h''(t)\mathbf{k}$

Using the booklet in the exam

- Learn the recall list first: the quadratic formula, sine rule, area of a triangle, SUVAT, F = ma and the double angle identities are not printed.
- Check which table you need: Table 3 gives P(Z ≤ z) to five decimal places, while Table 4 gives z for a given probability.
- Tables 5 and 6 give P(X ≤ x) = p, so for a chi-squared upper tail use p = 1 minus the significance level. Table 7 has separate pages for p = 0.995, 0.99, 0.975 and 0.95.
- The plane equation in the booklet is n1 x + n2 y + n3 z = d with d = a.n, not the form with a plus d: do not mix it with other boards' conventions.

- Binomial Table 1 has blanks where the value is already 1.0000, and the Poisson table stops once it reaches 1.0000: a missing entry means 1.0000.

Based on: OxfordAQA International AS and A-level Mathematics (9660), Formulae and Statistical Tables booklet (copyright 2016); specification version 5.2. 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.