

**INFORMATION BOOKLET**

**Algebra**

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

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

$$\sum_{i=1}^n 1 = n$$

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

$$\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6} = \frac{n^3}{3} + \frac{n^2}{2} + \frac{n}{6}$$

$$\sum_{i=1}^n i^3 = \frac{n^2(n+1)^2}{4} = \frac{n^4}{4} + \frac{n^3}{2} + \frac{n^2}{4}$$

$$z = a + bi$$

$$z^* = a - bi$$

$$\ln A + \ln B = \ln(AB)$$

$$\ln A - \ln B = \ln\left(\frac{A}{B}\right)$$

$$\ln A^n = n \ln A$$

$$\log_a x = \frac{\log_b x}{\log_b a}$$

**Calculus**

$$\text{Area} = \lim_{n \rightarrow \infty} \left( \frac{b-a}{n} \right) \sum_{i=1}^n f(x_i)$$

$$\int_a^b x^n dx = \left[ \frac{x^{n+1}}{n+1} \right]_a^b$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$$

$$\int f'(g(x)) \cdot g'(x) dx = f(g(x)) + C$$

$$\int f(x) \cdot g'(x) dx = f(x) \cdot g(x) - \int g(x) \cdot f'(x) dx + C$$

$$x_{r+1} = x_r - \frac{f(x_r)}{f'(x_r)}$$

$$V = \pi \int_a^b y^2 dx$$

Function	Derivative
$x^n$	$nx^{n-1}$
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\cot x$	$-\operatorname{cosec}^2 x$
$\sec x$	$\sec x \cdot \tan x$
$\operatorname{cosec} x$	$-\operatorname{cosec} x \cdot \cot x$
$f(g(x))$	$f'(g(x)) \cdot g'(x)$
$f(x) \cdot g(x)$	$g(x) \cdot f'(x) + f(x) \cdot g'(x)$
$\frac{f(x)}{g(x)}$	$\frac{g(x) \cdot f'(x) - f(x) \cdot g'(x)}{[g(x)]^2}$

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

$$s = r\theta$$

In  $\triangle ABC$ :

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

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

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

$$\sin^2 A + \cos^2 A = 1$$

$$1 + \tan^2 A = \sec^2 A$$

$$1 + \cot^2 A = \operatorname{cosec}^2 A$$

$$\sin(A \pm B) = \sin A \cdot \cos B \pm \cos A \cdot \sin B$$

$$\cos(A \pm B) = \cos A \cdot \cos B \mp \sin A \cdot \sin B$$

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \begin{cases} \cos^2 A - \sin^2 A \\ 2\cos^2 A - 1 \\ 1 - 2\sin^2 A \end{cases}$$

$$\sin A \cdot \cos B = \frac{1}{2} [\sin(A+B) + \sin(A-B)]$$

$$\sin A \cdot \sin B = \frac{1}{2} [\cos(A-B) - \cos(A+B)]$$

$$\cos A \cdot \cos B = \frac{1}{2} [\cos(A-B) + \cos(A+B)]$$

**Finance & Modelling**

$$F = P(1+in) \qquad F = P(1-in) \qquad F = P(1+i)^n \qquad F = P(1-i)^n$$

$$F = x \left[ \frac{(1+i)^n - 1}{i} \right] \qquad P = x \left[ \frac{1 - (1+i)^{-n}}{i} \right] \qquad r_{eff} = \left( 1 + \frac{r}{k} \right)^k - 1$$

$$P_{n+1} = P_n + rP_n \left( 1 - \frac{P_n}{K} \right)$$

$$R_{n+1} = R_n + aR_n \left( 1 - \frac{R_n}{K} \right) - bR_n F_n \qquad F_{n+1} = F_n + f bR_n F_n - cF_n$$

**Statistics**

$$P(A) = \frac{n(A)}{n(S)} \qquad P(B|A) = \frac{P(B \cap A)}{P(A)} \qquad P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$${}^n P_r = \frac{n!}{(n-r)!} \qquad {}^n C_r = \binom{n}{r} = \frac{n!}{(n-r)!r!} \qquad P(X=x) = \binom{n}{x} p^x (1-p)^{n-x}$$

$$P(R=r) = \frac{\binom{p}{r} \binom{N-p}{n-r}}{\binom{N}{n}} \qquad z = \frac{X - \mu}{\sigma} \qquad z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$z = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{\sigma_x^2}{n_x} + \frac{\sigma_y^2}{n_y}}} \qquad b = \frac{n \sum(xy) - \sum x \sum y}{n(\sum x^2) - (\sum x)^2} \qquad b = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n(\bar{x})^2} \qquad b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

$$\bar{x} \pm z \frac{\sigma}{\sqrt{n}} \qquad p \pm z \sqrt{\frac{p(1-p)}{n}}$$

**Matrix Transformations**

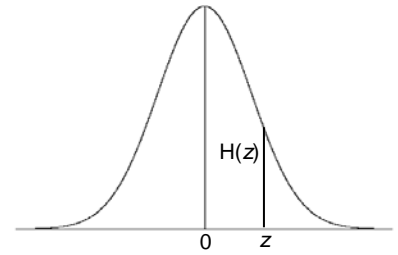
$$\begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix} \qquad \begin{pmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & -\cos 2\theta \end{pmatrix}$$

### Normal Distribution Table

Areas under the Normal Curve

$$H(z) = \frac{1}{\sqrt{2\pi}} \int_0^z e^{-\frac{1}{2}x^2} dx =$$

$$H(-z) = H(z), H(\infty) = \frac{1}{2}$$



Entries in the table are values of  $H(z)$  for  $z \geq 0$ .

z	,00	,01	,02	,03	,04	,05	,06	,07	,08	,09
0,0	,0000	,0040	,0080	,0120	,0160	,0199	,0239	,0279	,0319	,0359
0,1	,0398	,0438	,0478	,0517	,0557	,0596	,0636	,0675	,0714	,0753
0,2	,0793	,0832	,0871	,0910	,0948	,0987	,1026	,1064	,1103	,1141
0,3	,1179	,1217	,1255	,1293	,1331	,1368	,1406	,1443	,1480	,1517
0,4	,1554	,1591	,1628	,1664	,1700	,1736	,1772	,1808	,1844	,1879
0,5	,1915	,1950	,1985	,2019	,2054	,2088	,2123	,2157	,2190	,2224
0,6	,2257	,2291	,2324	,2357	,2389	,2422	,2454	,2486	,2517	,2549
0,7	,2580	,2611	,2642	,2673	,2704	,2734	,2764	,2794	,2823	,2852
0,8	,2881	,2910	,2939	,2967	,2995	,3023	,3051	,3078	,3106	,3133
0,9	,3159	,3186	,3212	,3238	,3264	,3289	,3315	,3340	,3365	,3389
1,0	,3413	,3438	,3461	,3485	,3508	,3531	,3554	,3577	,3599	,3621
1,1	,3643	,3665	,3686	,3708	,3729	,3749	,3770	,3790	,3810	,3830
1,2	,3849	,3869	,3888	,3907	,3925	,3944	,3962	,3980	,3997	,4015
1,3	,4032	,4049	,4066	,4082	,4099	,4115	,4131	,4147	,4162	,4177
1,4	,4192	,4207	,4222	,4236	,4251	,4265	,4279	,4292	,4306	,4319
1,5	,4332	,4345	,4357	,4370	,4382	,4394	,4406	,4418	,4429	,4441
1,6	,4452	,4463	,4474	,4484	,4495	,4505	,4515	,4525	,4535	,4545
1,7	,4554	,4564	,4573	,4582	,4591	,4599	,4608	,4616	,4625	,4633
1,8	,4641	,4649	,4656	,4664	,4671	,4678	,4686	,4693	,4699	,4706
1,9	,4713	,4719	,4726	,4732	,4738	,4744	,4750	,4756	,4761	,4767
2,0	,4772	,4778	,4783	,4788	,4793	,4798	,4803	,4808	,4812	,4817
2,1	,4821	,4826	,4830	,4834	,4838	,4842	,4846	,4850	,4854	,4857
2,2	,4861	,4864	,4868	,4871	,4875	,4878	,4881	,4884	,4887	,4890
2,3	,48928	,48956	,48983	,49010	,49036	,49061	,49086	,49111	,49134	,49158
2,4	,49180	,49202	,49224	,49245	,49266	,49286	,49305	,49324	,49343	,49361
2,5	,49379	,49396	,49413	,49430	,49446	,49461	,49477	,49492	,49506	,49520
2,6	,49534	,49547	,49560	,49573	,49585	,49598	,49609	,49621	,49632	,49643
2,7	,49653	,49664	,49674	,49683	,49693	,49702	,49711	,49720	,49728	,49736
2,8	,49744	,49752	,49760	,49767	,49774	,49781	,49788	,49795	,49801	,49807
2,9	,49813	,49819	,49825	,49831	,49836	,49841	,49846	,49851	,49856	,49861
3,0	,49865	,49869	,49874	,49878	,49882	,49886	,49889	,49893	,49896	,49900
3,1	,49903	,49906	,49910	,49913	,49916	,49918	,49921	,49924	,49926	,49929
3,2	,49931	,49934	,49936	,49938	,49940	,49942	,49944	,49946	,49948	,49950
3,3	,49952	,49953	,49955	,49957	,49958	,49960	,49961	,49962	,49964	,49965
3,4	,49966	,49968	,49969	,49970	,49971	,49972	,49973	,49974	,49975	,49976
3,5	,49977									
3,6	,49984									
3,7	,49989									
3,8	,49993									
3,9	,49995									
4,0	,49997									