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## INFORMATION BOOKLET

## Algebra

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

$$|x| = \begin{cases} x & ; \quad x \geq 0 \\ -x & ; \quad x < 0 \end{cases}$$

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

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

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_n = \frac{a(1-r^n)}{1-r}$$

$$z = a + bi$$

$$z^* = a - bi$$

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

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

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

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

## Calculus

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

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

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

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

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

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

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

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

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

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

$$s = r\theta$$

In  $\triangle ABC$ :

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

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

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

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

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

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

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

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

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

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

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

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

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

**Matrix Transformations**

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

**Finance & Modelling**

$$F = P(1 + in)$$

$$F = P(1 - in)$$

$$F = P(1 + i)^n$$

$$F = P(1 - i)^n$$

$$F = X \left[ \frac{(1 + i)^n - 1}{i} \right]$$

$$P = X \left[ \frac{1 - (1 + i)^{-n}}{i} \right]$$

$$r_{\text{eff}} = \left( 1 + \frac{r}{k} \right)^k - 1$$

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

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

$$F_{n+1} = F_n + f b R_n F_n - c F_n$$

**Statistics**

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(B|A) = \frac{P(B \cap A)}{P(A)}$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$${}^n P_r = \frac{n!}{(n-r)!}$$

$${}^n C_r = \binom{n}{r} = \frac{n!}{(n-r)!r!}$$

$$P(X = x) = \binom{n}{x} p^x (1-p)^{n-x}$$

$$P(R=r) = \frac{\binom{p}{r} \binom{N-p}{n-r}}{\binom{N}{n}}$$

$$E[X] = n \cdot p$$

$$\text{Var}[X] = n \cdot p(1-p)$$

$$z = \frac{X - \mu}{\sigma}$$

$$z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$z = \frac{(\bar{X} - \bar{Y}) - (\mu_x - \mu_y)}{\sqrt{\frac{\sigma_x^2}{n_x} + \frac{\sigma_y^2}{n_y}}}$$

$$\bar{X} \pm z \frac{\sigma}{\sqrt{n}}$$

$$p \pm z \sqrt{\frac{p(1-p)}{n}}$$

$$E[X] = \sum x \cdot P(X = x)$$

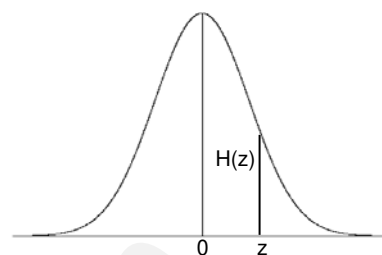
$$\text{Var}[X] = E[X^2] - (E[X])^2$$

**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 |        |        |        |        |        |        |        |        |        |