

## Indices, Standard Form and Financial Mathematics

### Laws of Indices

- $a^m \times a^n = a^{m+n}$
- $a^m \div a^n = a^{m-n}$
- $a^{-n} = \frac{1}{a^n}$
- $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$
- $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n = \frac{b^n}{a^n}$
- $\frac{ab^{-n}}{c^{-m}d} = \frac{ac^m}{b^nd}$
- $a^0 = 1$
- $a^{\frac{1}{2}} = \sqrt{a}$
- $a^{\frac{1}{3}} = \sqrt[3]{a}$
- $a^{\frac{2}{3}} = \sqrt[3]{a^2}$
- $a^m \times b^m = (ab)^m$

### Common powers to take note for Indices

$n =$	1	2	3	4	5
$2^n$	2	4	8	16	32
$3^n$	3	9	27	81	243
$4^n$	4	16	64	256	-
$5^n$	5	25	125	625	-
$6^n$	6	36	216	-	-
$7^n$	7	49	343	-	-

Note: For higher powers like  $7^5$  use your calculator; the figures above are good to have at your fingertips

### Standard Form

$$A \times 10^b \text{ where } 1 \leq A < 10$$

$12345 = 1.2345 \times 10^4 \rightarrow$  Shifting the decimal to the left brings about a positive power of 10

$0.0012345 = 1.2345 \times 10^{-3} \rightarrow$  Shifting the decimal to the right brings about a negative power of 10

Power	SI	Prefix
$10^{12}$	Tera	T
$10^9$	Giga	G
$10^6$	Mega	M
$10^3$	Kilo	k
$10^{-3}$	Milli	m
$10^{-6}$	Micro	$\mu$
$10^{-9}$	Nano	n
$10^{-12}$	Pico	p

### 4 Types of Standard Form Questions:

Divide-

$$\frac{a \times 10^n}{b \times 10^m} = \frac{a}{b} \times 10^{n-m}$$

Multiply-

$$(a \times 10^m) \times (b \times 10^n) = ab \times 10^{m+n}$$

Addition or Subtraction-

Factorise out the common factor before simplifying:

Example:

$$\begin{aligned} 2.3 \times 10^5 - 0.16 \times 10^6 &= 10^5 (2.3 - 0.16 \times 10^1) \\ &= 10^5 (2.3 - 1.6) \\ &= 10^5 \times 0.7 \\ &= 7.0 \times 10^4 \end{aligned}$$

### Financial Mathematics

$$\text{Profit} = \text{Selling Price} - \text{Cost Price}$$

$$\text{Loss} = \text{Cost Price} - \text{Selling Price}$$

$$\% \text{ Profit} = \frac{\text{Profit}}{\text{Cost Price}} \times 100\%$$

$$\% \text{ Loss} = \frac{\text{Loss}}{\text{Cost Price}} \times 100\%$$

### Simple Interest

$$I = PRT$$

Where,

$I = \text{Interest}$

$P = \text{Original Principal}$

$R = \text{Interest Rate per annum (in \%)}$

$T = \text{Time in years}$

For questions involving hire purchase,

$$\text{Loan Amount} = \text{Cash Price} - \text{Downpayment}$$

$$\text{Monthly Repayment} = \frac{\text{Loan} + \text{Total Interest}}{\text{Number of Periods}}$$

### Compound Interest

$$A = P \left(1 + \frac{I}{100}\right)^n$$

Where,

$A = \text{Total Amount}$

$P = \text{Original Principal}$

$I = \text{Interest Rate per compounding period (in \%)}$

$T = \text{Number of compounding periods}$