Tip 1 – Logarithms, Surds and Indices

- “Logarithms, Surds and Indices” is one of the easiest topics in the quantitative section of the CAT exam.
- Although the number of formulae is high, the basic concepts are very simple to understand and apply.
- There are no shortcuts to remember and the scope of the questions that can be asked is very limited.
- The accuracy of answering questions from this section is very high and good students tend to score very well here.

Tip 2 – Logarithms, Surds and Indices

If X,Y > 0 and m,n are rational numbers then

- $X^m \times X^n = X^{m+n}$
- $X^0 = 1$
- $\frac{X^m}{X^n} = X^{m-n}$
- $(X^m)^n = X^{mn}$
- $X^m \times Y^m = (X \times Y)^m$
- $\frac{X^m}{Y^m} = (X/Y)^m$

- $X^{-m} = \frac{1}{X^{m}}$

Tip 3 – Logarithms, Surds and Indices

If X and Y are positive real numbers and a,b are rational numbers.

- $(X/Y)^{-a} = (Y/X)^{a}$
- $X^{1/a} = \sqrt[a]{X}$
- $X^{a/b} = \sqrt[b]{X^{a}}$
- $\sqrt[a]{X} \times \sqrt[a]{Y} = \sqrt[a]{XY}$
- $\sqrt[a]{X} \,/\, \sqrt[a]{Y} = \sqrt[a]{X/Y}$
- $\frac{1}{\sqrt{N+1}-\sqrt{N}} = \sqrt{N+1}+\sqrt{N}$

Tip 4 – Logarithms, Surds and Indices

- Surd is an irrational number involving a root ex : $\sqrt{5}, \sqrt[3]{7}, \sqrt[5]{2}$
- Like surds are two surds having same number under radical sign.
- Like surds can be added or subtracted. $6\sqrt{2} + 3\sqrt{2} = 9\sqrt{2}$

Tip 5 – Logarithms, Surds and Indices

- If $a+\sqrt{b} = c+\sqrt{d}$, then a = c and b = d
- The conjugate of $a+\sqrt{b}$ is $a-\sqrt{b}$
- $\sqrt{a\sqrt{a\sqrt{a \ldots . \infty}}} = a$
- $\sqrt{a\sqrt{a\sqrt{a \ldots . x \text{ times}}}} = a^{1-[1/(2^{\wedge}x)]}$
- To find $\sqrt{\sqrt{x}+\sqrt{y}}$, $\sqrt{x}+\sqrt{y}$ should be written in the form of $m+n+2\sqrt{mn}$ where x = m+n and 4mn = y and $\sqrt{\sqrt{x}+\sqrt{y}} = \pm(\sqrt{m}+\sqrt{n})$

Tip 6 – Logarithms, Surds and Indices

If $N = a^x$ then, x is defined as the logarithm of N to base a

or $x = \log_a N$

Logarithm of a negative number or zero is not defined.

- $\log_a 1 = 0$
- $\log_a xy = \log_a x + \log_a y$
- $\log_a b^c = c \log_a b$
- $\log_a a = 1$
- $x^{\log_b y} = y^{\log_b x}$

Tip 7 – Logarithms, Surds and Indices

- $\log_a \sqrt[n]{b} = \frac{\log_a b}{n}$
- $\log_a x = \frac{1}{\log_x a}$
- $b^{\log_b x} = x$
- $\log_a b = \frac{\log_c b}{\log_c a}$
- $\log_a b * \log_b a = 1$
- $\log_a (X/Y) = \log_a X - \log_a Y$

Tip 8 – Logarithms, Surds and Indices

- If $0 < a < 1$, then $\log_a x < \log_a y$ (if $x>y$)
- If $a > 1$ then $\log_a x > \log_a y$ (if $x>y$)