Squares, cubes, roots & indices (year 7)

Contents

1 Squaring

When we *square* a number, this is the same as multiplying it by itself. We write:

$$12 \times 12 = 12^2 = 144 \qquad \textit{(}12^2 \textit{ is read as "12 squared")}$$

You should know the first fifteen square numbers off by heart: look how easy it is to remember 13^2 and 14^2 since the digits are simply reversed.

Square	1^2	2^2	3^2	4^2	5^2	6^2	7^2	8^2	9^2	10^2	11^2	12^2	13^2	14^2	15^2
Value	1	4	9	16	25	36	49	64	81	100	121	144	169	196	225

Whats Up? Can you see what somebody might say $5^2 = 10$?

Using known squares. It is possible to use our knowledge of square numbers to square negatives, fractions, decimals and large numbers (you may need to look at these notes first). For instance:

$$(-8)^2 = (-8) \times (-8) = 64 \qquad \textit{(a negative squared is positive)}$$

$$\left(\frac{3}{7}\right)^2 = \frac{3}{7} \times \frac{3}{7} = \frac{9}{49}$$

$$(0.3)^2 = 0.3 \times 0.3 = 0.09$$

$$(6,000)^2 = 6,000 \times 6,000 = 36,000,000$$

2 Cubing

When we cube a number, it is the same as multiplying it by itself *three times*. We write:

$$2 \times 2 \times 2 = 2^3 = 8 \qquad \textit{(}2^3 \textit{ is read as "2 cubed")}$$

You should know the first six cube numbers and the tenth off by heart:

Cube	1^3	2^3	3^3	4^3	5^3	6^3	10^3
Value	1	8	27	64	125	216	1000

Whats up? Can you see why somebody might think $2^3 = 6$?

Using known cubes. When we cube a negative, we will always get a negative number:

$$(-4)^3 = (-4) \times (-4) \times (-4) = -64$$

3 Indices

This is the collective name given to any power. For instance, in 3^4, the "4" is the *power* or *index*. To work out any index, we multiply the base number by itself that many times. For instance:

$$3^4 = 3 \times 3 \times 3 \times 3 = 81$$

On your calculator, use the $\boxed{x^y}$ or $\boxed{\wedge}$ button to work out powers.
It helps to learn the powers of 2 we keep on doubling!

2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8	2^9	2^{10}
2	4	8	16	32	64	128	256	512	1024

4 Roots

The opposite of a power is a root. Square rooting "undoes" squaring: since $12^2 = 144$, then the square root of 144 is 12. We write:

$\sqrt{144} = 12$ *Don't confuse the square root sign with division.*

Cube rooting "undoes" cubing: since $2^3 = 8$, then the cube root of 8 is 2. We write:

$$\sqrt[3]{8} = 2.$$

The pattern can be extended to higher powers. Since $3^4 = 81$, then the fourth root of 81 is 3. We write:

$$\sqrt[4]{81} = 3.$$