

Core knowledge

Topic: Indices

Links to simplifying calculations, standard form, algebraic expressions

Topic/Skill	Definition/Tips	Example
1. Square Number	The number you get when you multiply a number by itself .	1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225... $9^2 = 9 \times 9 = 81$
2. Square Root	The number you multiply by itself to get another number. The reverse process of squaring a number.	$\sqrt{36} = 6$ because $6 \times 6 = 36$
3. Solutions to $x^2 = \dots$	Equations involving squares have two solutions , one positive and one negative .	Solve $x^2 = 25$ $x = 5$ or $x = -5$ This can also be written as $x = \pm 5$
4. Cube Number	The number you get when you multiply a number by itself and itself again .	1, 8, 27, 64, 125... $2^3 = 2 \times 2 \times 2 = 8$
5. Cube Root	The number you multiply by itself and itself again to get another number. The reverse process of cubing a number.	$\sqrt[3]{125} = 5$ because $5 \times 5 \times 5 = 125$
6. Powers of...	The powers of a number are that number raised to various powers .	The powers of 3 are: $3^1 = 3$ $3^2 = 9$ $3^3 = 27$ $3^4 = 81$ etc.
7. Multiplication Index Law	When multiplying with the same base (number or letter), add the powers . $a^m \times a^n = a^{m+n}$	$7^5 \times 7^3 = 7^8$ $a^{12} \times a = a^{13}$ $4x^5 \times 2x^8 = 8x^{13}$
8. Division Index Law	When dividing with the same base (number or letter), subtract the powers . $a^m \div a^n = a^{m-n}$	$15^7 \div 15^4 = 15^3$ $x^9 \div x^2 = x^7$ $20a^{11} \div 5a^3 = 4a^8$
9. Brackets Index Laws	When raising a power to another power, multiply the powers together. $(a^m)^n = a^{mn}$	$(y^2)^5 = y^{10}$ $(6^3)^4 = 6^{12}$ $(5x^6)^3 = 125x^{18}$
10. Notable Powers	$p = p^1$ $p^0 = 1$	$99999^0 = 1$
11. Negative Powers	A negative power performs the reciprocal. $a^{-m} = \frac{1}{a^m}$	$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$
12. Fractional Powers	The denominator of a fractional power acts as a 'root'. The numerator of a fractional power acts as a normal power. $a^{\frac{m}{n}} = (\sqrt[n]{a})^m$	$27^{\frac{2}{3}} = (\sqrt[3]{27})^2 = 3^2 = 9$ $\left(\frac{25}{16}\right)^{\frac{3}{2}} = \left(\frac{\sqrt{25}}{\sqrt{16}}\right)^3 = \left(\frac{5}{4}\right)^3 = \frac{125}{64}$
13. Negative fractional powers	A negative power performs the reciprocal. $a^{-m} = \frac{1}{a^m}$	$9^{-0.5} = \frac{1}{9^{0.5}} = \frac{1}{3}$