Powers

Multiplication Index Law	When **multiplying** with the same base (number or letter), **add the powers**. $$a^m \times a^n = a^{m+n}$$	$7^5 \times 7^3 = 7^8$ $a^{12} \times a = a^{13}$ $4x^5 \times 2x^8 = 8x^{13}$
Division Index Law	When **dividing** with the same base (number or letter), **subtract the powers**. $$a^m \div a^n = a^{m-n}$$	$15^7 \div 15^4 = 15^3$ $x^9 \div x^2 = x^7$ $20a^{11} \div 5a^3 = 4a^8$
Brackets Index Laws	When raising a power to another power, multiply the powers together. $$(a^m)^n = a^{mn}$$	$(y^2)^5 = y^{10}$ $(6^3)^4 = 6^{12}$ $(5x^6)^3 = 125x^{18}$
Notable Powers	$p = p^1$ $p^0 = 1$	$99999^0 = 1$
Negative Powers	A negative power performs the reciprocal. $$a^{-m} = \frac{1}{a^m}$$	$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$
Fractional Powers	The denominator of a fractional power acts as a 'root'. The numerator of a fractional power acts as a normal power. $$a^{\frac{m}{n}} = \left(\sqrt[n]{a}\right)^m$$	$27^{\frac{2}{3}} = \left(\sqrt[3]{27}\right)^2 = 3^2 = 9$ $\left(\frac{25}{16}\right)^{\frac{3}{2}} = \left(\frac{\sqrt{25}}{\sqrt{16}}\right)^3 = \left(\frac{5}{4}\right)^3 = \frac{125}{64}$

Factorising

Factorising Quadratics	When a quadratic expression is in the form $x^2 + bx + c$ find the two numbers that **add to give b** and **multiply to give c**.	$x^2 + 7x + 10 = (x+5)(x+2)$ (because 5 and 2 add to give 7 and multiply to give 10) $x^2 + 2x - 8 = (x+4)(x-2)$ (because +4 and -2 add to give +2 and multiply to give -8)
Difference of Two Squares	An expression of the form $a^2 - b^2$ can be factorised to give $(a+b)(a-b)$	$x^2 - 25 = (x+5)(x-5)$ $16x^2 - 81 = (4x+9)(4x-9)$

Fractions

Simplifying Fractions	**Divide the numerator and denominator by the highest common factor**.	$\frac{20}{45} = \frac{4}{9}$
Equivalent Fractions	Fractions which represent the **same value**.	$\frac{2}{5} = \frac{4}{10} = \frac{20}{50} = \frac{60}{150}$ etc.
Comparing Fractions	To compare fractions, they each need to be rewritten so that they have a **common denominator**. **Ascending** means **smallest to biggest**. **Descending** means **biggest to smallest**.	Put in to ascending order : $\frac{3}{4}, \frac{2}{3}, \frac{5}{6}, \frac{1}{2}$. Equivalent: $\frac{9}{12}, \frac{8}{12}, \frac{10}{12}, \frac{6}{12}$ Correct order: $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{5}{6}$
Adding or Subtracting Fractions	Find the **LCM of the denominators** to find a common denominator. Use equivalent fractions to change each fraction to the **common denominator**. Then just **add or subtract the numerators** and keep the **denominator the same**.	$\frac{2}{3} + \frac{4}{5}$ Multiples of 3: 3, 6, 9, 12, **15**.. Multiples of 5: 5, 10, **15**.. LCM of 3 and 5 = 15 $\frac{2}{3} = \frac{10}{15}$ and $\frac{4}{5} = \frac{12}{15}$ $\frac{10}{15} + \frac{12}{15} = \frac{22}{15} = 1\frac{7}{15}$

Estimating

Error Interval	A **range of values** that a number could have taken before being rounded or truncated. An error interval is written using inequalities, with a **lower bound** and an **upper bound**. Note that the lower bound inequality can be 'equal to', but the upper bound cannot be 'equal to'.	0.6 has been rounded to 1 decimal place. The error interval is: $$0.55 \leq x < 0.65$$ The lower bound is 0.55 The upper bound is 0.65
Estimate	To find something **close to the correct answer**.	An estimate for the height of a man is 1.8 metres.
Approximation	When using approximations to estimate the solution to a calculation, **round each number in the calculation to 1 significant figure**. $\approx$ means 'approximately equal to'	$\frac{348 + 692}{0.526} \approx \frac{300 + 700}{0.5} = 2000$ 'Note that dividing by 0.5 is the same as multiplying by 2'

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