Estimate

Don't work out exactly! Round the numbers to one significant figure first.

Estimate 4.7 x 6.2
Answer: 5 x 6 = 30

GCSE HIGHER YEAR 9 AUTUMN TERM UNIT 1: CALCULATIONS, ROUNDING,INDICES,HCF, LCM STANDARD FORM, SURDS

Work out

A written or mental calculation is needed.

Work out 6^2
Answer: 6 x 6 = 36

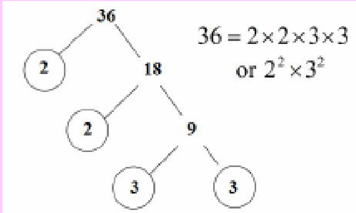
Understand and use the symbols

=, ≠, <, > , ≤, ≥

ESSENTIAL **BIDMAS!**

With strings of division and multiplication, or strings of addition and subtraction, and no brackets, work from left to right.

$$12 \div 4 \div 2 = 1.5, not\ 6$$

Product of Prime Factors	Finding out which **prime numbers multiply** together to make the **original** number. Use a **prime factor tree.** Also known as 'prime factorisation'.	

Rational Numbers	A number of the form , $\frac{p}{q}$ where p and q are **integers** and $q \neq 0$. A number that cannot be written in this form is called an 'irrational' number	$\frac{4}{9}, 6, -\frac{1}{3}, \sqrt{25}$ are examples of rational numbers. $\pi, \sqrt{2}$ are examples of an irrational numbers.

STANDARD FORM

0.00036 = 3.6 x 10^{-4}

8400 = 8.4 x 10^3

$$(1.2 \times 10^3) \times (4 \times 10^6)$$
$$= 8.8 \times 10^9$$
$$(4.5 \times 10^5) \div (3 \times 10^2)$$
$$= 1.5 \times 10^3$$
$$2.7 \times 10^4 + 4.6 \times 10^3$$
$$= 27000 + 4600 = 31600$$
$$= 3.16 \times 10^4$$

SURDS

A surd is an **irrational number** that is a **root of a positive integer,** whose value cannot be determined exactly.

A surd has **infinite non-recurring decimals**.

To simplify a surd expression involving squares

(e.g. √12 = √(4 × 3) = √4 × √3 = 2√3)

Rationalising the denominator is the process of rewriting a fraction so that the **denominator contains only rational numbers**.

$$\frac{\sqrt{3}}{\sqrt{2}} = \frac{\sqrt{3} \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = \frac{\sqrt{6}}{2}$$

INDICES (POWERS)

$$p = p^1$$
$$p^0 = 1$$
$$7^5 \times 7^3 = 7^8$$
$$a^{12} \times a = a^{13}$$
$$4x^5 \times 2x^8 = 8x^{13}$$
$$(6^3)^4 = 6^{12}$$
$$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$$
$$(5x^6)^3 = 125x^{18}$$
$$15^7 \div 15^4 = 15^3$$
$$(y^2)^5 = y^{10}$$
$$x^9 \div x^2 = x^7$$
$$27^{\frac{2}{3}} = \left(\sqrt[3]{27}\right)^2 = 3^2 = 9$$
$$20a^{11} \div 5a^3 = 4a^8$$
$$\left(\frac{25}{16}\right)^{\frac{3}{2}} = \left(\frac{\sqrt{25}}{\sqrt{16}}\right)^3 = \left(\frac{5}{4}\right)^3 = \frac{125}{64}$$

Rationalise a Denominator	The process of rewriting a fraction so that the **denominator contains only rational numbers.**	$\frac{\sqrt{3}}{\sqrt{2}} = \frac{\sqrt{3} \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = \frac{\sqrt{6}}{2}$ $\frac{6}{3+\sqrt{7}} = \frac{6(3-\sqrt{7})}{(3+\sqrt{7})(3-\sqrt{7})} = \frac{18-6\sqrt{7}}{9-7} = \frac{18-6\sqrt{7}}{2} = 9-3\sqrt{7}$

The reciprocal of a number is **1 divided by the number**.

The reciprocal of x is $\frac{1}{x}$

When we multiply a number by its reciprocal we get 1.

This is called the 'multiplicative inverse'.

The reciprocal of 5 is $\frac{1}{5}$

The reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$ because $\frac{2}{3} \times \frac{3}{2} = 1$

GCSE HIGHER YEAR 9 AUTUMN TERM UNIT 2

ALGEBRA BASICS, EQUATIONS AND SEQUENCES

Simplify	Expand	Factorise
Collect like terms together	Multiply out the brackets	To find factors and put brackets in.
Simplify e + 7e Answer: 8e	Expand 4(3x – 2) Answer: 12x – 8	Factorise 6x + 10x^2 Answer: 2x(3 + 5x)

Solve	Quadratic Expression	Factorising Quadratics
Find the value of the variable in the question.	Learn the form of $ax^2 + bx + c$	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)
Solve: 3x = 12 Answer: x = 4	where a, b and c are numbers, $a \neq 0$ eg: $8x^2 - 3x + 7$ or x^2	

Expression	A mathematical statement written using **symbols**, **numbers** or **letters**,	3x + 2 **or** 5y^2
Equation	A statement showing that **two expressions are equal**	2y – 17 = 15
Identity	An equation that is **true for all values** of the variables An identity uses the symbol: ≡	2x ≡ x + x
Formula	Shows the **relationship** between **two or more variables**	Area of a rectangle = length x width or A= L x W

Iteration	The act of **repeating a process** over and over again, often with the aim of **approximating** a desired result more closely. **Recursive** Notation: $x_{n+1} = \sqrt{3x_n + 6}$	$x_1 = 4$ $x_2 = \sqrt{3 \times 4 + 6} = 4.242640 \ldots$ $x_3 = \sqrt{3 \times 4.242640 \ldots + 6} = 4.357576 \ldots$
Fibonacci type sequence	A sequence where the next number is found by **adding up the previous two terms**	The Fibonacci sequence is: $1,1,2,3,5,8,13,21,34 \ldots$ An example of a Fibonacci-type sequence is: $4, 7, 11, 18, 29 \ldots$
Finding the nth term of a **linear sequence**	1. Find the **difference**. n. 2. **Multiply that by** $n = 1$ 3. Substitute to **find out what number you need to add or subtract to get the first number in the sequence**.	Find the nth term of: **3, 7, 11, 15**… 1. Difference is **+4** 2. Start with $4n$ 3. $4 \times 1 = 4$ so we need to subtract 1 to get 3. nth term = $4n - 1$

FORMULAE

Rearranging Formulae	**Use inverse operations** on both sides of the formula (balancing method) until you find the expression for the letter.	Make x the subject of $y = \frac{2x-1}{z}$ Multiply both sides by z $yz = 2x - 1$ Add 1 to both sides $yz + 1 = 2x$ Divide by 2 on both sides $\frac{yz+1}{2} = x$ We now have x as the subject.
Writing Formulae	**Substitute letters for words** in the question.	Bob charges £3 per window and a £5 call out charge. $C = 3N + 5$ Where N=number of windows and C=cost
Substitution	**Replace letters with numbers**. **Be careful** $7b^2$ **You need to square first, then multiply by 7.**	Find: $a = 3, b = 2$ and $c = 5$. 1 $2a = 2 \times 3 = 6$ 2. $3a - 2b = 3 \times 3 - 2 \times 2 = 5$ 3. $7b^2 - 5 = 7 \times 2^2 - 5 = 23$

Geometric Sequence	A sequence of numbers where each term is found by **multiplying the previous one** by a number called the **common ratio, r**.	An example of a geometric sequence is: $2, 10, 50, 250 \ldots$ The common ratio is 5 Another example of a geometric sequence is: $81, -27, 9, -3, 1 \ldots$ The common ratio is $-\frac{1}{3}$
Quadratic Sequence	A sequence of numbers where the **second difference is constant**. A quadratic sequence will have a n^2 term.