N2 Number Properties – Y10 Higher

Knowledge Organiser

Keywords

Standard (index) Form: A system of writing very big or very small numbers
Base: The number that gets multiplied by a power
Power/Indices: the number that tells you how many times to use the number in multiplication
Coefficient: The number used to multiply a variable
Surds: A number that **can't** be simplified to remove a square root
Square numbers: the number we get after multiplying an integer by itself.
Square root: a value that, when multiplied by itself, gives the number
Irrational number: A real number that can **not** be made by dividing two integers

Formulae

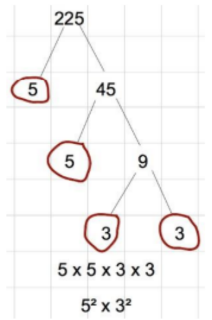
Laws of Indices

multiplication	$n^a \times n^b = n^{a+b}$	(add powers)
division	$n^a \div n^b = n^{a-b}$	(subtract powers)
power of a power	$(n^a)^b = n^{a \times b}$	(multiply powers)
zero power	$n^0 = 1$	(always equals 1)
negative	$n^{-a} = \frac{1}{n^a}$	(reciprocal)
fractional	$n^{\frac{1}{a}} = \sqrt[a]{n}$	(roots)

Rules for Surds

$$\sqrt{ab} = \sqrt{a} \times \sqrt{b}$$
$$\sqrt{a} \times \sqrt{a} = a$$
$$\sqrt{a} \div \sqrt{b} = \sqrt{a \div b}$$

Factor trees are used to find the product of prime factors.
The two branches multiply together to make the number above.
Circle and stop at prime numbers.



Standard Form

Any number between 1 and less than 10

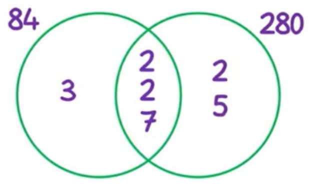
$A \times 10^n$

Any integer

Key Facts

HCF and LCM

Create a Venn diagram using the prime factors.



HCF = the middle multiplied together
LCM = all the number multiplied together

Examples

Standard Form

Addition and Subtraction

Tip: Convert into ordinary numbers first and back to standard from at the end

$6 \times 10^5 + 8 \times 10^5$

Method 1

$= 600000 + 800000$
$= 1400000$
$= 1.4 \times 10^5$

Method 2

$= (6 + 8) \times 10^5$
$= 14 \times 10^5$
$= 1.4 \times 10^1 \times 10^5$
$= 1.4 \times 10^5$

This is not the final answer

Multiplication and division

$\frac{1.5 \times 10^5}{0.3 \times 10^3}$

Division questions can look like this

$(1.5 \times 10^5) \div (0.3 \times 10^3)$

$1.5 \div 0.3 \times 10^5 \div 10^3$

$= 5 \times 10^2$

For multiplication and division you can look at the values for A and the powers of 10 as two separate calculations

Surds

Simplify

$\sqrt{45} = \sqrt{9} \times \sqrt{5}$
$= 3 \times \sqrt{5}$
$= 3\sqrt{5}$

Multiply and Divide

$\sqrt{6} \times \sqrt{5} = \sqrt{6 \times 5}$
$= \sqrt{30}$

$\frac{\sqrt{24}}{\sqrt{8}} = \sqrt{\frac{24}{8}}$
$= \sqrt{3}$

Add and Subtract (<u>not a rule!</u>)

$\sqrt{7} + \sqrt{3} = \sqrt{7+3}$ ✗