Exmouth Community College
Academy Trust

Year 9 – Maths Higher / Unit 1: Number – HT1 &2

HCF and LCM V219 V218

(Highest Common Factor and Lowest Common Multiple)

HCF - this is largest number that divides exactly into 2 or more numbers. E.g. HCF or 12 and 20 = 4

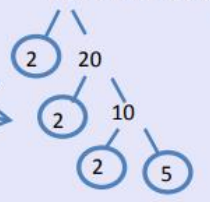
LCM - this is the smallest number that is in the times table of 2 or more numbers. E.g. LCM of 12 and 20 = 60

Product of Prime Factors V219

This is finding all the prime numbers that would multiply to give our number. It is often shown using a factor tree ('tree thingy'). V223

Eg. 40 as a product of prime factors

40 = 2 x 2 x 2 x 5



We are looking for the prime numbers that go into our number

We can then multiply our prime numbers together to get our original number

Using product of prime factors to find our HCF and LCM

Example: Find the HCF and LCM of 24 and 60

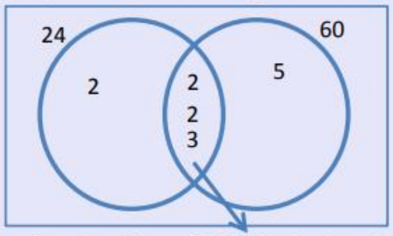
Step 1:

24 = 2 x 2 x 2 x 2

60 = 2 x 2 x 3 x 5

Write each number as a product of prime factors

Step 2: Draw a Venn Diagram V224



Place you prime factors into your Venn diagram

The HCF of 24 and 60 = 2 x 2 x 3 = 12 — *Multiply the common prime factors*

The LCM of 24 and 60 = 2 x 2 x 2 x 3 x 5 = 120 — *Multiply all the prime factors*

Laws of Indices V17

3^3 — Index/power; base

When multiplying indices with the same base, you ADD the indices

Multiplying Indices

$y^3 \times y^3 = y \times y \times y \times y \times y \times y = y^6$

Dividing Indices

$y^6 \div y^4 = \frac{y \times y \times y \times y \times y \times y}{y \times y \times y \times y} = y^2$

When dividing indices with the same base, you SUBTRACT the indices

Power to another power (brackets)

$(y^3)^2 = (y \times y \times y)^2$

$= y \times y \times y \times y \times y \times y = y^6$

With brackets just MULTIPLY your indices

Zero Indices

$y^0 = 1$

Anything to the power of 0 always equals 1

Negative Indices V175

$y^{-1} = \frac{1}{y}$

$y^{-2} = \frac{1}{y^2}$

e.g. $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

The negative sign means 'one over' the base number

Fractional Indices

$y^{\frac{2}{3}} = (\sqrt[3]{y})^2$

$8^{\frac{2}{3}} = (\sqrt[3]{8})^2 = 4$

The denominator of the fractional power becomes a root and the numerator becomes a power

V173

Standard Form

V300 V301 V302 V303

A number is in standard form when it is in the form A x 10^n, $where\ 1 \leq A < 10$.

For example, 63000 = 6.3 x 10^4. This is in standard form because 6.3 is between 1 and 10. 63 x10^4 is not in standard form as 63 is not between 1 and 10.

Examples

45 000 000 000 = 4.5 x 10^{10}

0.0000000000091 = 9.1 x 10^{-12}

Standard form is used so very large or very small numbers can be written out easily.

Surds

A surd is a number written exactly using square or cube roots.

For example $\sqrt{3}$ and $\sqrt{5}$ are surds. $\sqrt{4}$ and $\sqrt[3]{27}$ are not surds, because $\sqrt{4}$ = 2 and $\sqrt[3]{27}$ = 3.

Multiplying Surds

$\sqrt{m} \times \sqrt{n} = \sqrt{m \times n} = \sqrt{mn}$

E.g. $\sqrt{3} \times \sqrt{2} = \sqrt{3 \times 2} = \sqrt{6}$

Dividing Surds

$\sqrt{m} \div \sqrt{n} = \sqrt{\frac{m}{n}}$

E.g. $\sqrt{12} \div \sqrt{3} = \sqrt{\frac{12}{3}} = \sqrt{4} = 2$

V305 V306 V307 V308

n^{th} term:

Example: For the following sequence, the first term (n = 1)
The 2^{nd} term (n = 2) is 5.

Positions (n numbers) →	1	2	3	4	5	6	. . . . n
TERMS →	2	5	8	11	14	17	. . . . .

+3 +3 +3 +3 +3

So we try rule: $n^{th\ term} = 3n$. Testing the rule with n = 1 (1^{st} term) gives 3, and we know 1^{st} term should be 2, so we need an extra correction to rule of -1

So rule is: $t_n = 3n - 1$ 67^{th} term is $t_{67} = 3 \times 67 - 1 = 200$

Corbett Maths video links: V7 V13 V288

Substitution:

Just like in sport, *substitution* means *swapping* one thing for another – but instead of a fresh player for a tired player, it's swapping a number for a letter.

If ⚽ = 5
then: ⚽ + 4 = 5 + 4 = 9
6 x ⚽ = 6 x 5 = 30
⚽ / 5 = 5 ÷ 5 = 1

When the expressions or formulae become a bit more complicated, it's *essential* that you follow the rules of BODMAS/BIDMAS:

e.g. If g = 10: 5 + 3g = 5 + 3 x 10
= 5 + 30
= 35

Rather than drawing a football every time, they'd just use the letter "f"

Simplifying expressions:

Gather together like terms,
eg. **3e** + *2* + **4e** – *8* = **7e** + *6*

Classic exam question:

Bob works shifts in a café, where he get £6 a hour, plus a £5 travel bonus each day.

(a) Write a formula to describe his pay P for a day's shift of h hours: P = 6h + 5
(b) Use this formula to find his pay for a 7 hour shift: P = 6h + 5 = 6 x 7 + 5 = 42 + 5 = £47

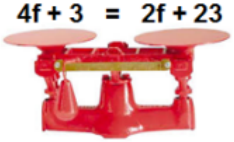
Solving equations:

BALANCE METHOD:

You can use this on any equation, whether the unknown is on one side, or both

You can do whatever to like, so long as you do the *same* to both sides:

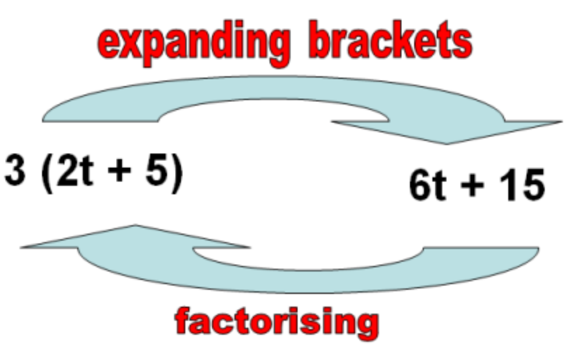
4f + 3 = 2f + 23



4f + 3 = 2f + 23 [take 2f from each side]
2f + 3 = 23 [take 3 from each side]
2f = 20 [divide both sides by 2]
f = 10

If you want to get rid of something negative, ADD that same amount to both sides

Factorising



Expanding (2a+3)(4a+2)

	2a	+3
4a	$8a^2$	+12a
+2	+4a	+6

$8a^2 + 16a + 6$