

PRIME FACTORISATION, HCF and LCM

Note Title

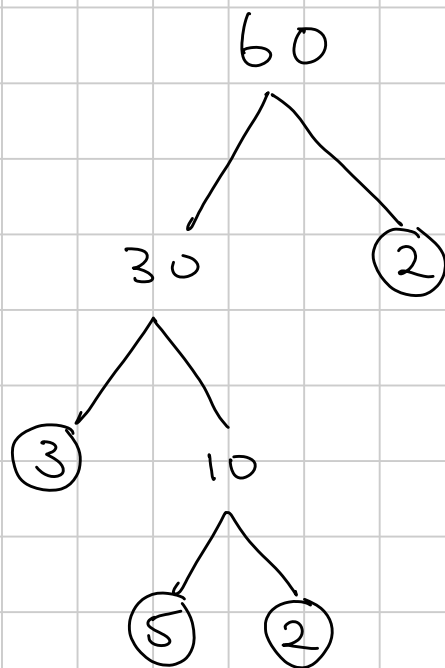
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Prime numbers are numbers with exactly 2 factors (1 and the number itself).

e.g. 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, ...

They are the 'building blocks' of arithmetic - all other numbers can be made by multiplying prime numbers.

We can break a number down into its 'prime factorisation' as follows



$$\underline{\underline{60 = 2 \times 2 \times 3 \times 5}}$$

or $\underline{\underline{60 = 2^2 \times 3 \times 5}}$

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Classwork

Find the prime factorisation of :

① 24 ② 36 ③ 90 ④ 72

⑤ 180 ⑥ 216 ⑦ 84 ⑧ 396

⑨ 210 ⑩ 720

① $2^3 \times 3$ ② $2^2 \times 3^2$ ③ $2 \times 3^2 \times 5$ ④ $2^3 \times 3^2$

⑤ $2^2 \times 3^2 \times 5$ ⑥ $2^3 \times 3^3$ ⑦ $2^2 \times 3 \times 7$ ⑧ $2^2 \times 3^2 \times 11$

⑨ $2 \times 3 \times 5 \times 7$ ⑩ $2^4 \times 3^2 \times 5$

Highest Common Factor (HCF)

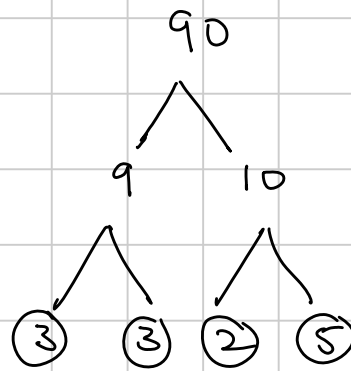
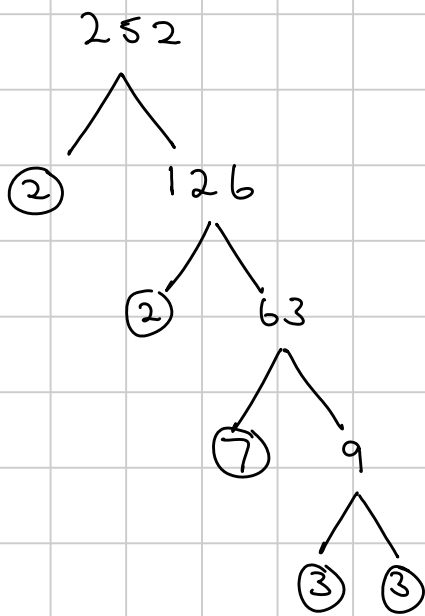
This is the greatest number which is a factor of both numbers. For small numbers we can just spot it.

e.g. HCF of 12 and 18 = 6

HCF of 32 and 48 = 8

For larger numbers, we need a method for finding the HCF. This is based on the prime factorisation of the numbers.

Example Find the HCF of 252 and 90.



$$252 = 2 \times 2 \times 3 \times 3 \times 7$$

$$90 = 2 \times 3 \times 3 \times 5$$

$$\text{HCF} = 2 \times 3 \times 3 = \underline{\underline{18}}$$

Classwork

Find the HCF of the following pairs of numbers:

Ans
36

① 72 and 180

18 ② 90 and 216

6 ③ 36 and 210

12 ④ 24 and 84

36 ⑤ 396 and 720

14 ⑥ 168 and 770

49 ⑦ 245 and 196

15 ⑧ 180 and 275

Lowest Common Multiple (LCM)

The LCM of two numbers is the smallest number which is a multiple of both numbers.

e.g. Multiples of 12 : 12, 24, 36, 48, 60, 72, 84 ...

Multiples of 15 : 15, 30, 45, 60, 75, 90, 105 ...

LCM of 12 and 15 = 60

For small numbers, we can spot the LCM

e.g. LCM of 8 and 12 = 24

For large numbers, we can use a rule :—

$$\text{LCM of } x \text{ and } y = \frac{x \times y}{\text{HCF of } x \text{ and } y}$$

e.g. Find the LCM of 252 and 90

From above, the HCF of 252 and 90 is 18

$$\begin{aligned} \text{So LCM of 252 and 90} &= \frac{252 \times 90}{18} \\ &= \underline{\underline{1260}} \end{aligned}$$

Classwork : Find the LCM of each pair of numbers

360 ① 72 and 180

1080 ② 90 and 216

1260 ③ 36 and 210

168 ④ 24 and 84

7920 ⑤ 396 and 720

420 ⑥ 42 and 60

1540 ⑦ 140 and 154

you will need to

- do factor trees
- find the HCF
- then find the LCM for these.