Prime Factors, HCFs and LCMs

Low prime numbers $2, 3, 5, 7, 11, 13, 17, 19$

All integers can be factorised into a product of prime factors

Ex1

$$\begin{array}{r|l} 2 & 20 \\ \hline 2 & 10 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$20 = 2 \times 2 \times 5$

$20 = 2^2 \times 5$

Ex2

$$\begin{array}{r|l} 2 & 56 \\ \hline 2 & 28 \\ \hline 2 & 14 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

$56 = 2 \times 2 \times 2 \times 7$

$53 = 2^3 \times 7$

Ex3

$$\begin{array}{r|l} 2 & 180 \\ \hline 2 & 90 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$180 = 2 \times 2 \times 3 \times 3 \times 5$

$180 = 2^2 \times 3^2 \times 5$

<u>Exercise</u> Write as a product of prime factors

1)

$$\begin{array}{r|l} 2 & 24 \\ \hline 2 & 12 \\ \hline 2 & 6 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$24 = 2 \times 2 \times 2 \times 3$

$24 = 2^3 \times 3$

2)

$$\begin{array}{r|l} 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$27 = 3 \times 3 \times 3$

$27 = 3^3$

3)

$$\begin{array}{r|l} 2 & 98 \\ \hline 7 & 49 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

$98 = 2 \times 7 \times 7$

$98 = 2 \times 7^2$

4)

$$\begin{array}{r|l} 2 & 90 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

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

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

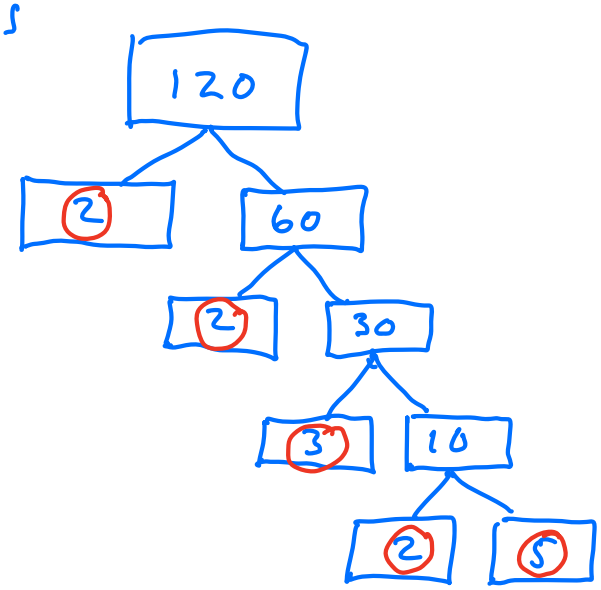
5)

$$\begin{array}{r|l} 2 & 120 \\ \hline 2 & 60 \\ \hline 2 & 30 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$120 = 2 \times 2 \times 2 \times 3 \times 5$

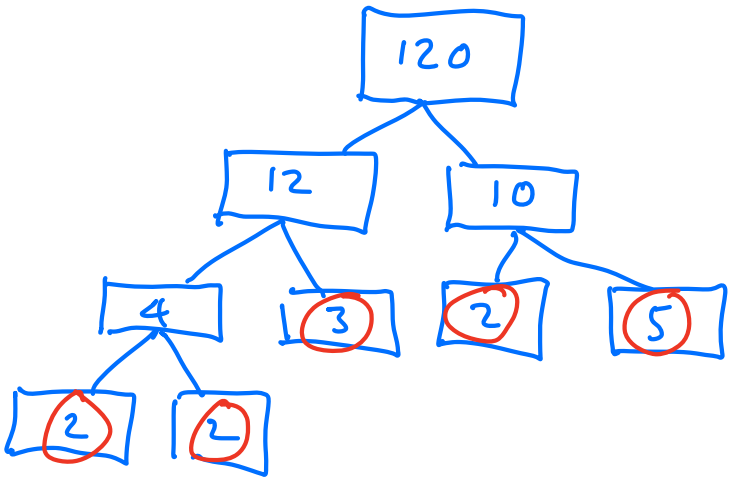
$120 = 2^3 \times 3 \times 5$

Factor Trees



The leaves of the tree are the prime factors

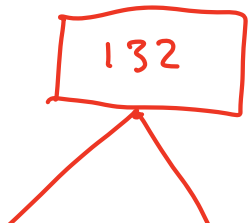
$$120 = 2 \times 2 \times 2 \times 3 \times 5$$



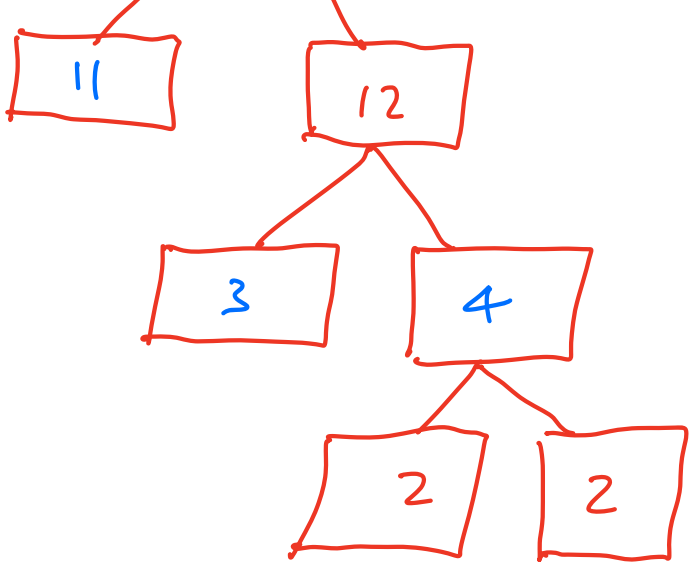
$$120 = 2 \times 2 \times 2 \times 3 \times 5$$

Sometimes you may be asked to fill in missing numbers from a factor tree

Example



Complete the factor tree



Highest Common Factors HCFs

Ex1 Find the HCF of 54 and 72

$$\begin{array}{r|l} 2 & 54 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array} \qquad \begin{array}{r|l} 2 & 72 \\ \hline 2 & 36 \\ \hline 2 & 18 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$54 = 2 \times 3 \times 3 \times 3$

$72 = 2 \times 2 \times 2 \times 3 \times 3$

$HCF = 2 \times 3 \times 3$

$HCF = 18$

Ex2 45 and 60

$$\begin{array}{r|l} 3 & 45 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array} \qquad \begin{array}{r|l} 2 & 60 \\ \hline 2 & 30 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$45 = 3 \times 3 \times 5$

$60 = 2 \times 2 \times 3 \times 5$

$HCF = 3 \times 5$

$HCF = 15$

Exercise

1) 84 and 120

$$\begin{array}{r|l} 2 & 84 \\ \hline 2 & 42 \\ \hline 3 & 21 \\ \hline 7 & 7 \\ \hline & 1 \end{array} \qquad \begin{array}{r|l} 2 & 120 \\ \hline 2 & 60 \\ \hline 2 & 30 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$84 = 2 \times 2 \times 3 \times 7$

$120 = 2 \times 2 \times 2 \times 3 \times 5$

$HCF = 2 \times 2 \times 3$

$HCF = 12$

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2) 48 and 72

$$\begin{array}{r|l} 2 & 48 \\ \hline 2 & 24 \\ \hline 2 & 12 \\ \hline 2 & 6 \\ \hline 3 & 3 \\ \hline & 1 \end{array} \qquad \begin{array}{r|l} 2 & 72 \\ \hline 2 & 36 \\ \hline 2 & 18 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$48 = 2 \times 2 \times 2 \times 2 \times 3$

$72 = 2 \times 2 \times 2 \times 3 \times 3$

$HCF = 2 \times 2 \times 2 \times 3$

$HCF = 24$

LCMs held over to next lesson.