

Lesson 11 – Product of Prime Factors

Starter

- 1) Write down the first 10 prime numbers
- 2) Explain why 21 is not a prime number
- 3) $\frac{3}{4} \times \frac{1}{5}$
- 4) Work out $\frac{4}{5}$ of 0.6. Could you change this calculation to make it easier?

Starter Answers

- 1) 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
- 2) 21 has more than just 1 and itself as factors. Its factors are 1, 3, 7 and 21
- 3) $\frac{3}{20}$
- 4) $\frac{4}{5} \times 0.6 = \frac{4}{5} \times \frac{3}{5} = \frac{12}{25}$

Any **whole number greater than 1** is either **prime** or it can be made by **multiplying prime numbers** together.

For example:

$12 = 2 \times 2 \times 3$	2 and 3 are called prime factors
$15 = 3 \times 5$	3 and 5 are prime factors of 15
$24 = 2 \times 2 \times 2 \times 3$	2 and 3 are prime factors of 24

Your go

Make the following numbers by multiplying prime numbers together:

- 1) 25
- 2) 28
- 3) 36
- 4) 100
- 5) 150

Answers

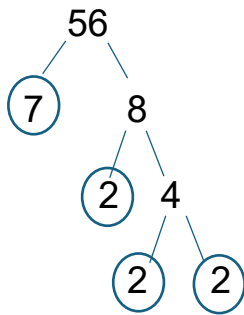
- 1) $25 = 5 \times 5$
- 2) $28 = 2 \times 2 \times 7$
- 3) $36 = 2 \times 2 \times 3 \times 3$
- 4) $100 = 2 \times 2 \times 5 \times 5$
- 5) $150 = 2 \times 3 \times 5 \times 5$

If the numbers were really big (for example in the thousands) then it may take us quite a long time to find the prime factors that would work.

In the next example, we will look at a more systematic way of finding the prime factors.

Example 1

Write 56 as the product of prime factors.



We draw a **factor tree** with 56 at the top

We then find any two numbers that multiply to get 56

If any of them are prime, we circle them

We carry on the process for 8

We keep going until the end of all branches have been circled

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

The circled numbers are called prime factors

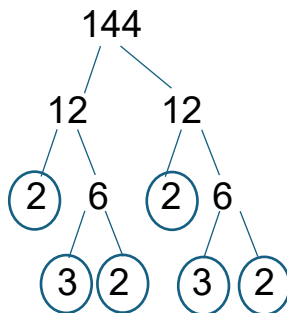
We write the prime factors as a **product**

NOTE: If you multiply $2 \times 2 \times 2 \times 7$ you should get 56 as the answer. You should always check your answer at the end.

Example 2

Write 144 as the product of prime factors.

Give your answer in **index form**.



$$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

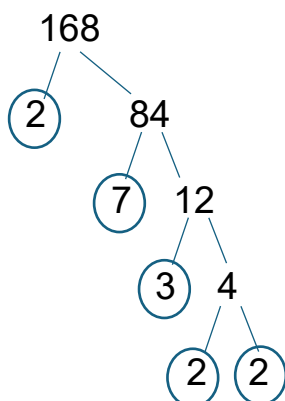
But, this time it asks us to write in index form. This means write it using powers.

$$\text{Answer} = 2^4 \times 3^2$$

Example 3

Write 168 as the product of prime factors.

Give your answer in index form.



$$\text{Answer} = 2 \times 2 \times 2 \times 3 \times 7$$

$$= 2^3 \times 3 \times 7$$