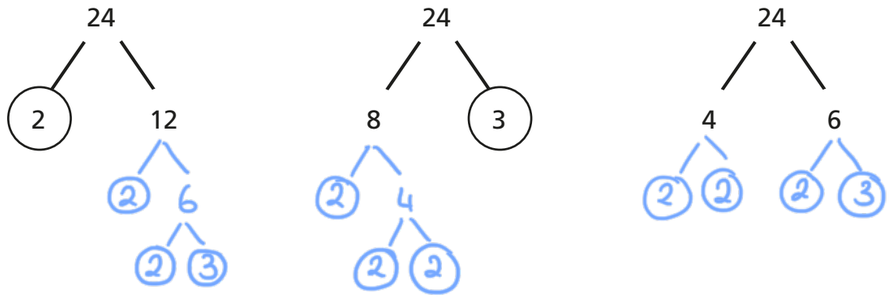
Write a number as a product of its prime factors

1 **a)** Complete the factor trees for the number 24

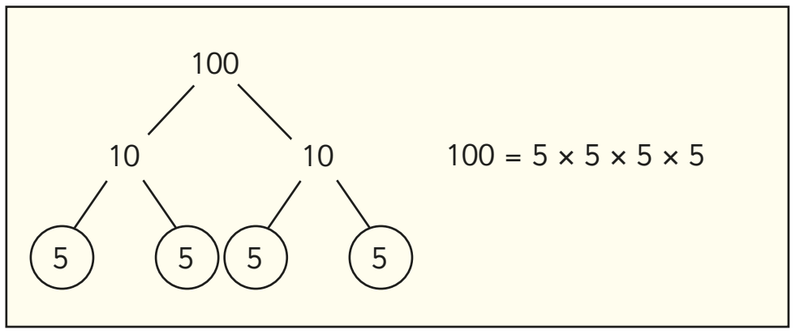


b) What is 24, as a product of its prime factors?

24 = 2 × 2 × 2 × 3

c) Discuss with a partner what you notice about your factor trees in part a).

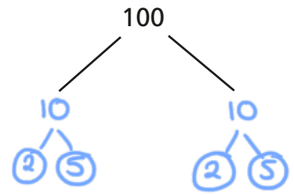
2 Scott completes a factor tree for the number 100



a) What mistake has he made?

He has found two prime numbers that have a total of 10 not a product of 10

b) Correct Scott's mistake.

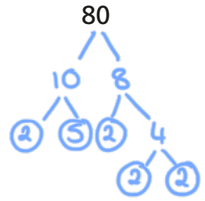


100 = 2 × 2 × 5 × 5

3 Complete a factor tree for each number.

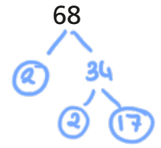
Write each number as a product of its prime factors.

a)



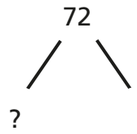
80 = 2×2×2×2×5 (= $2^4 \times 5$)

b)



68 = 2×2×17 (= $2^2 \times 17$)

4 **a)** What number could replace the question mark in the factor tree?



e.g. 36

b) Discuss your answer with a partner.

Is there more than one solution?

c) Write 72 as a product of its prime factors.

2×2×2×3×3

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

5 Write the numbers as products of their prime factors.

a) 9 = 3×3 (3^2)

18 = $2 \times 3 \times 3$ (2×3^2)

36 = $2 \times 2 \times 3 \times 3$ $(2^2 \times 3^2)$

81 = $3 \times 3 \times 3 \times 3$ (3^4)

b) 8 = $2 \times 2 \times 2$ (2^3)

32 = $2 \times 2 \times 2 \times 2 \times 2$ (2^5)

64 = $2 \times 2 \times 2 \times 2 \times 2 \times 2$ (2^6)

128 = $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$ (2^7)

What do you notice about your answers?

6 Four numbers have been written on cards as the product of their prime factors.

$2 \times 3 \times 3 \times 5$	$2 \times 2 \times 2 \times 3 \times 5$	$2 \times 3 \times 5 \times 5$	$2 \times 2 \times 3 \times 5$
90	120	150	60

The greatest number is the second card, as that has the most prime factors.

a) Do you agree with Whitney? No

Explain your answer.

More factors doesn't necessarily mean greater value.

b) Write the numbers in ascending order.

$2 \times 2 \times 3 \times 5$, $2 \times 3 \times 3 \times 5$, $2 \times 2 \times 2 \times 3 \times 5$, $2 \times 3 \times 5 \times 5$

7 Dani works out $450 = 2 \times 3 \times 3 \times 5 \times 5$

Use this information to write these numbers as a product of their prime factors.

900 = $2 \times 2 \times 3 \times 3 \times 5 \times 5$

225 = $3 \times 3 \times 5 \times 5$

4,500 = $2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 5$

150 = $2 \times 3 \times 5 \times 5$

8 A number has been written as the product of its prime factors.

The answer is $2^2 \times 3 \times 11^2$

Is 66 a factor of this number? yes

Explain how you know.

9 **a)**

f and g are prime numbers.
$5fg = 275$ and $g > f$

What is the value of g?

$g =$ 11

b)

$192 = 2^a b$
a and b are prime numbers.

Find the values of a and b.

$a =$ 6 $b =$ 3

c)

495 can be written as c^2de.

What are the values of c, d and e?

$c =$ 3 $d =$ 5 $e =$ 11

10

$A = 5^2 \times 7^2 \times 11^3 \times 13$

$B = 5^2 \times 7^3 \times 11^3 \times 13$

How many times greater is B than A? 7

Explain how you know.

$B = 5^2 \times 7^3 \times 11^3 \times 13 = 7 \times (5^2 \times 7^2 \times 11^3 \times 13) = 7A$