PRODUCT OF PRIMES

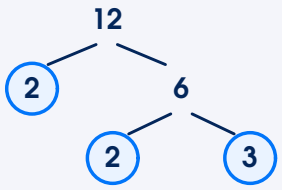
BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

Split the number into two factors. Keep splitting until every branch ends in a prime. Circle the primes.

$12 = 2 \times 2 \times 3$



1 Circle all the prime numbers.

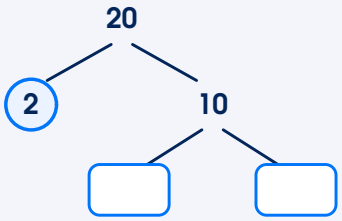
A prime number has exactly two factors: 1 and itself.

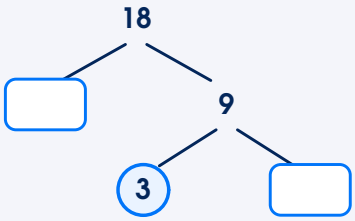
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30

2 Split each number into two factors. Do not use 1.



3 Complete each factor tree. Then write each number as primes multiplied together.





20 = ☐ × ☐ × ☐

18 = ☐ × ☐ × ☐

4 Multiply the primes. What number do they make?

a) $2 \times 3 \times 5 =$ ☐

b) $2 \times 2 \times 7 =$ ☐

c) $3 \times 3 \times 2 =$ ☐

d) $2 \times 2 \times 2 \times 3 =$ ☐

PRODUCT OF PRIMES

SUPPORT

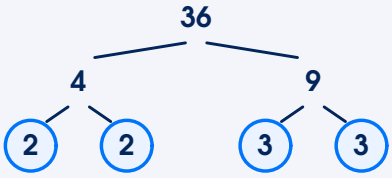
NAME _____ CLASS _____ DATE _____

KEY IDEA

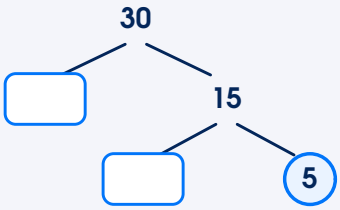
$36 = 2 \times 2 \times 3 \times 3$

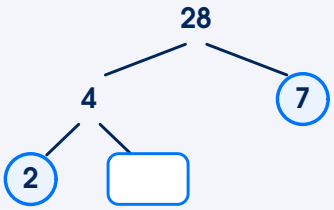
$= 2^2 \times 3^2$

2×2 is written 2^2 (index notation). Primes go smallest first.



1 Complete each factor tree. Write each number as a product of primes.





30 = ☐ × ☐ × ☐

28 = ☐ × ☐ × ☐

2 Draw a factor tree for each number. Write it as a product of primes.

40

45

40 = ...

45 = ...

3 Write each product using index notation.

a) $2 \times 2 \times 2 \times 5 =$ ☐

b) $3 \times 3 \times 7 \times 7 =$ ☐

c) $2 \times 3 \times 3 \times 3 =$ ☐

4 Jo writes $24 = 2 \times 3 \times 4$. Explain Jo's mistake. Then write 24 correctly.

.....

24 = ☐

PRODUCT OF PRIMES

CORE

NAME _____ CLASS _____ DATE _____

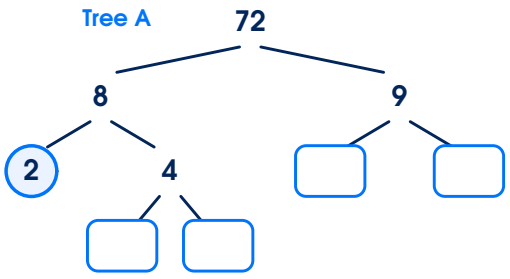
FLUENCY

1 Write each number as a product of prime factors in index form. Use the space for a factor tree.

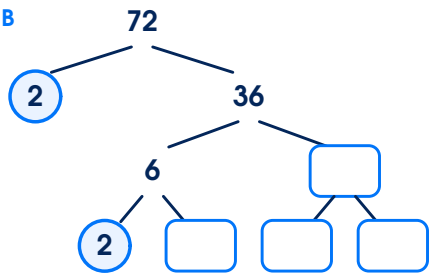
56	84	150	196
a)	b)	c)	d) .....

2 Two students start factor trees for 72 in different ways. Complete both trees.

Tree A



Tree B



So 72 = ☐

What do you notice about the two trees?

REASONING

3 Work out the value of each number.

a) $2^3 \times 3 \times 5 =$ ☐ b) $2^2 \times 3^2 \times 7 =$ ☐ c) $3 \times 5^2 \times 7 =$ ☐

4 $210 = 2 \times 3 \times 5 \times 7$. Use this to write each number as a product of primes.

a) 420 = ☐ b) 105 = ☐

c) Explain how you used the fact about 210.

.....

PRODUCT OF PRIMES

GREATER DEPTH

NAME _____ CLASS _____ DATE _____

REASONING

1 Is each statement always, sometimes or never true? Circle your answer.

If it is sometimes true, give an example of when it is true and when it is not.

a) A prime is a product of two or more primes. ALWAYS SOMETIMES NEVER

b) A number with prime factors 2 and 3 is a multiple of 6. ALWAYS SOMETIMES NEVER

c) The prime factors of an odd number include 2. ALWAYS SOMETIMES NEVER

d) A number written as a product of primes has three or more prime factors. ALWAYS SOMETIMES NEVER

PROBLEM SOLVING

2 $1260 = 2^2 \times 3^2 \times 5 \times 7$. Use this to write each number as a product of primes.

a) 630 = ☐

b) 2520 = ☐

c) 126 = ☐

3 a and b are whole numbers. Find a and b in each.

a) $2^a \times 3^b = 72$ a = ☐ b = ☐

b) $2^a \times 5^b = 400$ a = ☐ b = ☐

c) $2^a \times 3^b \times 7 = 252$ a = ☐ b = ☐

★ CHALLENGE FOR ALL

4 Products of primes

a) Which numbers from 100 to 120 are a product of three different primes?

b) What is the smallest number that is the product of four different primes? ☐

PRODUCT OF PRIMES

ANSWERS

BUILDING BLOCKS

1 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

2 $10 = 2 \times 5$ · $15 = 3 \times 5$ · $14 = 2 \times 7$ · $21 = 3 \times 7$ (either order)

3 20: boxes 2, 5; $20 = 2 \times 2 \times 5$ · 18: boxes 2, 3; $18 = 2 \times 3 \times 3$

4 a) 30 · b) 28 · c) 18 · d) 24

SUPPORT

1 30: boxes 2, 3; $30 = 2 \times 3 \times 5$ · 28: box 2; $28 = 2 \times 2 \times 7$

2 $40 = 2 \times 2 \times 2 \times 5 = 2^3 \times 5$ · $45 = 3 \times 3 \times 5 = 3^2 \times 5$

3 a) $2^3 \times 5$ · b) $3^2 \times 7^2$ · c) 2×3^3

4 4 is not prime, so it must be split again ($4 = 2 \times 2$). $24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$

CORE

1 a) $2^3 \times 7$ · b) $2^2 \times 3 \times 7$ · c) $2 \times 3 \times 5^2$ · d) $2^2 \times 7^2$

2 A: 4 → 2, 2; 9 → 3, 3 · B: 6 → 2, 3; second 6 → 2, 3 · $72 = 2^3 \times 3^2$ · both trees give the same primes

3 a) 120 · b) 252 · c) 525

4 a) $2^2 \times 3 \times 5 \times 7$ · b) $3 \times 5 \times 7$ · c) $420 = 2 \times 210$ (one more 2); $105 = 210 \div 2$ (remove a 2)

GREATER DEPTH

1 a) never (a prime's only prime factor is itself) · b) always · c) never · d) sometimes: $12 = 2 \times 2 \times 3$ but $15 = 3 \times 5$

2 a) $2 \times 3^2 \times 5 \times 7$ · b) $2^3 \times 3^2 \times 5 \times 7$ · c) $2 \times 3^2 \times 7$

3 a) $a = 3, b = 2$ · b) $a = 4, b = 2$ · c) $a = 2, b = 2$

4 a) 102 ($2 \times 3 \times 17$), 105 ($3 \times 5 \times 7$), 110 ($2 \times 5 \times 11$), 114 ($2 \times 3 \times 19$) · b) $210 = 2 \times 3 \times 5 \times 7$