HCF AND LCM USING VENN DIAGRAMS

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

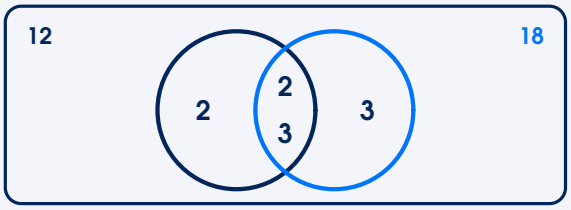
KEY IDEA

$12 = 2 \times 2 \times 3$

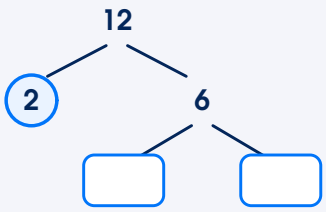
$18 = 2 \times 3 \times 3$

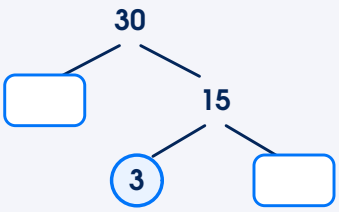
Shared primes go in the middle, once.

HCF = middle: $2 \times 3 = 6$



1 Complete each factor tree.





2 Here are the prime factors of 12 and 30. Which primes do they share?

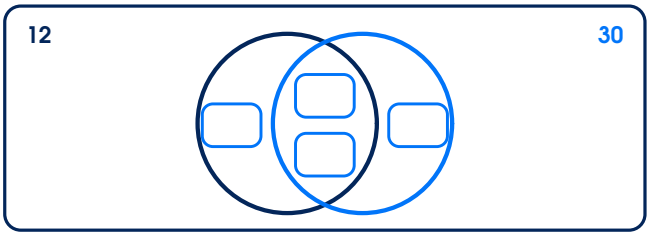
12: 2 2 3

30: 2 3 5

Draw a line between primes that match.

Shared primes: ☐ **and** ☐

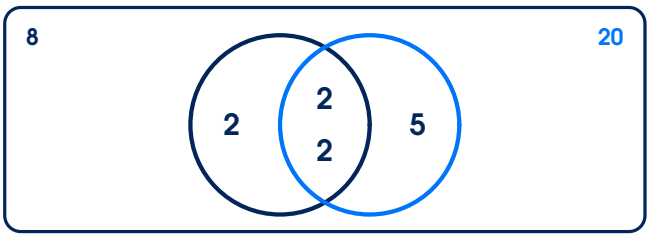
3 Put the prime factors of 12 and 30 in the Venn diagram.



Shared primes go in the middle.

The other primes go on their own side.

4 This Venn diagram shows the prime factors of 8 and 20.



HCF: multiply the middle.

☐ × ☐ = ☐

LCM: multiply them all.

☐ × ☐ × ☐ × ☐ = ☐

HCF AND LCM USING VENN DIAGRAMS

SUPPORT

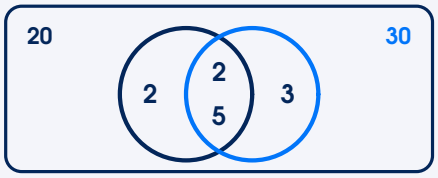
NAME _____ CLASS _____ DATE _____

KEY IDEA

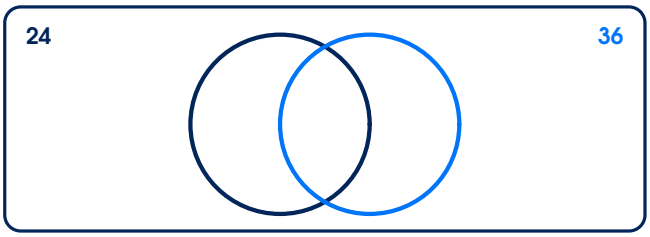
$20 = 2 \times 2 \times 5$ $30 = 2 \times 3 \times 5$

HCF = $2 \times 5 = 10$ (multiply the intersection)

LCM = $2 \times 2 \times 5 \times 3 = 60$ (multiply everything)



1 Put the prime factors in the Venn diagram. Then find the HCF and LCM of 24 and 36.



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

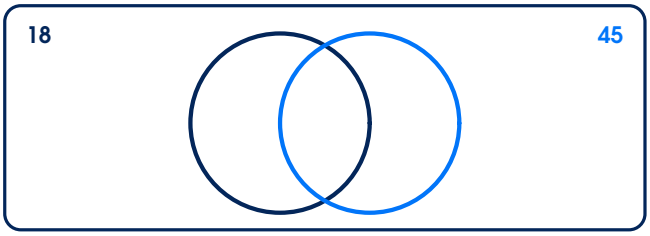
$36 = 2 \times 2 \times 3 \times 3$

a) HCF = ☐

b) LCM = ☐

2 Write 18 and 45 as products of primes. Use a Venn diagram to find their HCF and LCM.

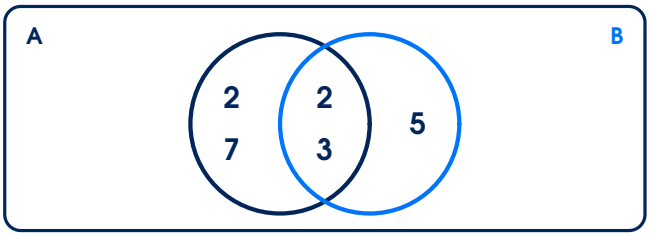
$18 =$ ☐ × ☐ × ☐ $45 =$ ☐ × ☐ × ☐



a) HCF = ☐

b) LCM = ☐

3 The Venn diagram shows the prime factors of two numbers, A and B.



a) A = ☐ b) B = ☐

c) HCF of A and B = ☐

d) LCM of A and B = ☐

4 Raj says the LCM of 24 and 36 is $2 \times 2 \times 2 \times 3 \times 2 \times 2 \times 3 \times 3 = 864$. Explain his mistake.

.....

.....

HCF AND LCM USING VENN DIAGRAMS

CORE

NAME _____ CLASS _____ DATE _____

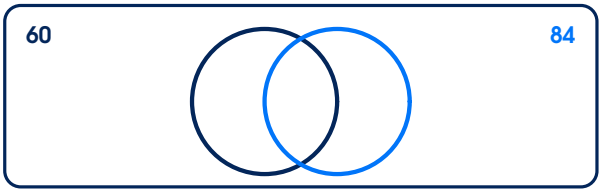
KEY IDEA

Write both numbers as products of primes. Shared primes go in the intersection once. HCF = product of the intersection. LCM = product of every prime in the diagram.

FLUENCY

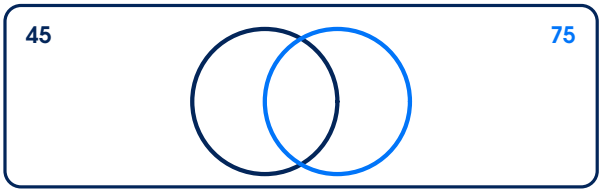
1 Use a Venn diagram to find the HCF and LCM of each pair of numbers.

a) 60 and 84



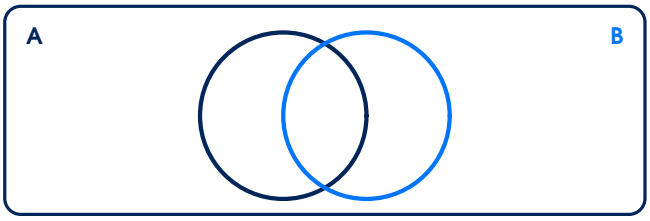
HCF ☐ LCM ☐

b) 45 and 75



HCF ☐ LCM ☐

2 A = $2^3 \times 3 \times 5$ and B = $2^2 \times 3^2 \times 7$. Complete the Venn diagram of prime factors.



a) HCF = ☐

b) LCM = ☐

Leave answers in index form.

REASONING

3 Use the facts in the box.

$28 = 2^2 \times 7$ $42 = 2 \times 3 \times 7$ HCF = 14 LCM = 84

a) Find the HCF and LCM of 56 and 42. HCF = ☐ LCM = ☐

b) Explain how $56 = 2 \times 28$ changes the Venn diagram.

.....

4 Use the Venn diagram idea to explain why the LCM of two numbers is not always their product.

.....

.....

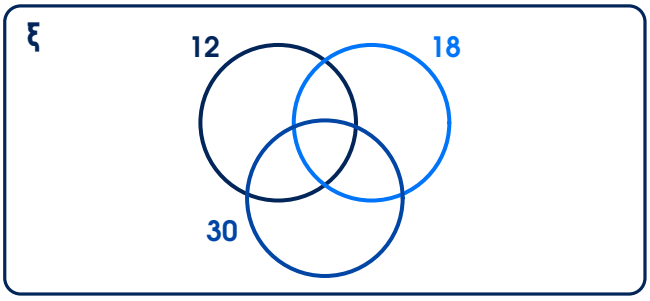
HCF AND LCM USING VENN DIAGRAMS

GREATER DEPTH

NAME _____ CLASS _____ DATE _____

REASONING

1 A three-circle Venn diagram works for three numbers.



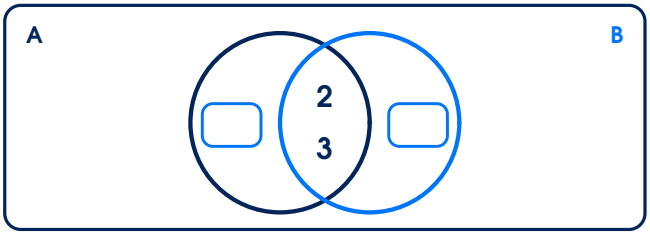
Put the prime factors of 12, 18 and 30 in the diagram.

a) HCF = ☐

b) LCM = ☐

PROBLEM SOLVING

2 The HCF of A and B is 6 and their LCM is 180. Complete the Venn diagram and find A and B.



A is a multiple of 4.
A is less than B.

a) A = ☐

b) B = ☐

3 Cog A has 24 teeth and cog B has 40 teeth. A mark on each cog starts lined up.

a) How many turns does cog A make before the marks line up again? ☐

b) How many turns does cog B make? ☐

★ CHALLENGE FOR ALL

4 Two numbers less than 100 have an HCF of 12 and an LCM of 360.

a) **The numbers are** ☐ **and** ☐

b) Explain why no two numbers have an HCF of 4 and an LCM of 30.

.....

HCF AND LCM USING VENN DIAGRAMS

ANSWERS

BUILDING BLOCKS

1. 12: boxes 2, 3 · 30: boxes 2, 5
2. 12: 2, 2, 3 · 30: 2, 3, 5 · shared primes 2 and 3
3. 12 only: 2 · middle: 2, 3 · 30 only: 5
4. HCF = 2 × 2 = 4 · LCM = 2 × 2 × 2 × 5 = 40

SUPPORT

1. 24 only: 2 · middle: 2, 2, 3 · 36 only: 3 · a) 12 · b) 72
2. 18 = 2 × 3 × 3 · 45 = 3 × 3 × 5 · 18 only: 2 · middle: 3, 3 · 45 only: 5 · a) 9 · b) 90
3. a) 84 · b) 30 · c) 6 · d) 420
4. He has multiplied every prime, so the shared primes 2, 2, 3 are counted twice. LCM = 72.

CORE

1. a) $60 = 2^2 \times 3 \times 5$, $84 = 2^2 \times 3 \times 7$: HCF 12, LCM 420 · b) $45 = 3^2 \times 5$, $75 = 3 \times 5^2$: HCF 15, LCM 225
2. A only: 2, 5 · middle: 2, 2, 3 · B only: 3, 7 · a) $2^2 \times 3 = 12$ · b) $2^3 \times 3^2 \times 5 \times 7 = 2520$
3. a) HCF 14, LCM 168 · b) $56 = 2^3 \times 7$ adds one more 2 to the 56-only region: the intersection (HCF) stays the same, the LCM doubles
4. Primes that both numbers share sit in the intersection once. The product counts them twice, so it is only the LCM when there are no shared primes (HCF = 1).

GREATER DEPTH

1. $12 = 2^2 \times 3$, $18 = 2 \times 3^2$, $30 = 2 \times 3 \times 5$ · centre: 2, 3 · 12 and 18 only: none · 12 only: 2 · 18 only: 3 · 30 only: 5 · a) 6 · b) 180
2. A only: 2 · B only: 3, 5 · a) A = 12 · b) B = 90
3. LCM(24, 40) = 120 teeth · a) 5 turns · b) 3 turns
4. a) 60 and 72 · b) The HCF must be a factor of the LCM, and 4 is not a factor of 30.