Mathematics 10C

Unit AN: Algebra and number

Factors and roots

Tiles that finish a square

- Twelve tiles make a 3 by 4 rectangle.
- Thirty-six tiles make a 6 by 6 square.

Factors and multiples

- The prime factors of 12 are 2 and 3.
- The edge of a 6 by 6 tile square is 6.

Key terms

prime factor

A prime number that appears in a product equaling a whole number. ($84 = 2^2 \times 3 \times 7$)

greatest common factor

The largest whole number that divides each number in a set. (GCF)

least common multiple

The smallest positive whole number that is a multiple of each number in a set. (LCM)

square root

The non-negative number which multiplies by itself to give n, when n is a perfect square in this lesson. ($\sqrt{n}$)

Key terms

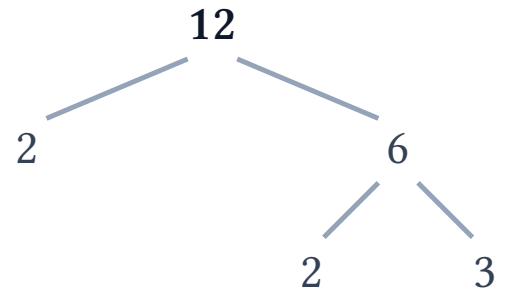
cube root

The number which multiplies by itself twice more to give n, when n is a perfect cube in this lesson. ($\sqrt[3]{n}$)

Factoring 12 and 18

- Start with $12 \div 2 = 6$, then $6 \div 2 = 3$, then $3 \div 3 = 1$.
- The prime factorization of 12 is $2^2 \times 3$.
- Start with $18 \div 2 = 9$, then $9 \div 3 = 3$, then $3 \div 3 = 1$.
- The prime factorization of 18 is 2×3^2.

Factor tree for 12



$12 = 2^2 \times 3$

GCF of 12 and 18

- The prime factorization of 12 is $12 = 2^2 \times 3$.
- The prime factorization of 18 is $18 = 2 \times 3^2$.
- The lowest shared powers are 2^1 and 3^1.
- The GCF is $2 \times 3 = 6$.

GCF from prime lists

$12 = 2^2 \times 3$

$18 = 2 \times 3^2$

$\text{GCF} = 2 \times 3 = 6$

LCM of 12 and 18

- The highest power of 2 is 2^2.
- The highest power of 3 is 3^2.
- The LCM is $2^2 \times 3^2 = 36$.

LCM from prime lists

Highest 2 power: 2^2

Highest 3 power: 3^2

LCM = $4 \times 9 = 36$

Why 0 and 1 have no prime factors

- The only positive factor of 1 is 1, and 1 sits outside the primes.
- Every product of primes is 2 or larger, so 0 has no prime factors.

0 and 1

1 has only factor 1 (not prime)

0 has every integer factor

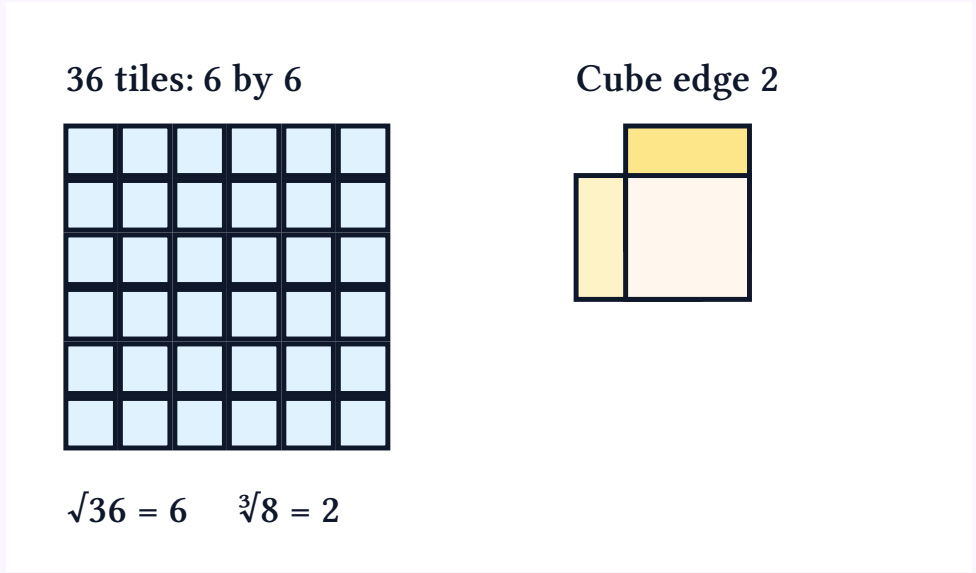
Prime factors start at 2

GCF and LCM of 84 and 90

- The factorization of 84 is $2^2 \times 3 \times 7$.
- The factorization of 90 is $2 \times 3^2 \times 5$.
- The GCF is $2 \times 3 = 6$.
- The LCM is $2^2 \times 3^2 \times 5 \times 7 = 1260$.

A square of 36 tiles

- Thirty-six tiles form a 6 by 6 square.
- The square root of 36 is 6, and $6 \times 6 = 36$.

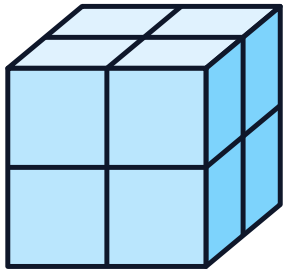


A cube of 8 and a leftover 50

- Eight unit cubes form a $2 \times 2 \times 2$ cube, so the cube root is 2.
- Fifty sits past $7^2 = 49$ and short of $8^2 = 64$.
- Fifty also sits past $3^3 = 27$ and short of $4^3 = 64$.

$2 \times 2 \times 2$ cube

8 unit cubes



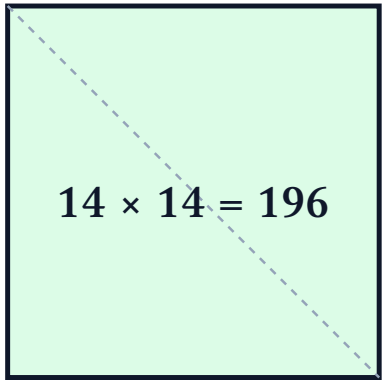
$\sqrt[3]{8} = 2$, since $2^3 = 8$

Each edge is 2 units long

A patio of 196 stones

- The product 14 × 14 = 196.
- The square root of 196 is 14.

14 by 14 patio



√196 = 14

A crate of 216 boxes

- The product $6 \times 6 \times 6 = 216$.
- The cube root of 216 is 6.

Quick check

- The GCF of 60 and 42 is $2 \times 3 = 6$.
- Twenty-seven unit cubes form a $3 \times 3 \times 3$ cube, so the cube root is 3.

Prime factorization

- The GCF of 12 and 18 is 6.
- The square root of 36 is the side 6.