

FACTORS, MULTIPLES AND PRIMES

Key Concept

Factors:

Find these in pairs

12
1, 12
2, 6
3, 4

Multiples:

Start with the number itself
7 – 7, 14, 21, 28, ...

Key Words

Factor: The numbers which fit into a number exactly.

Multiple: The numbers in the times table.

Prime: Numbers which have only two factors which are 1 and itself.

Highest Common Factor: The highest factor which is common for both numbers.

Lowest Common Multiple: The smallest multiple which is common to both numbers.

Examples

Lowest Common Multiple (LCM)

Q - Find the LCM of 6 and 7:

6 – 6, 12, 18, 24, 30, 36, **42**, 48, 54, 60, ...

7 – 7, 14, 21, 28, 35, **42**, 49, 56, ...

LCM = 42

Highest Common Factor (HCF)

Q – Find the HCF of 18 and 24

18 – 1, 2, 3, **6**, 9, 18

24 – 1, 2, 3, 4, **6**, 8, 12, 24

HCF = 6

sparx

M462

M823

M322

Tip

There is only one even prime number which is the number 2. This can be used to help solve lots of problems.

Questions

- 1) List the first 5 multiples of: a) 7 b) 12 c) 50
- 2) List the factors of: a) 12 b) 15 c) 16
- 3) a) Find the LCM of 5 and 7 b) Find the HCF of 20 and 16

ANSWERS: 1) a) 7, 14, 21, 28, 35 b) 12, 24, 36, 48, 60 c) 50, 100, 150, 200, 250
2) a) 1, 2, 3, 4, 6, 12 b) 1, 3, 5, 15 c) 1, 2, 4, 8, 16
3) a) 35 b) 4

Year 10 Higher

FACTORS, MULTIPLES AND PRIMES

Key Concepts

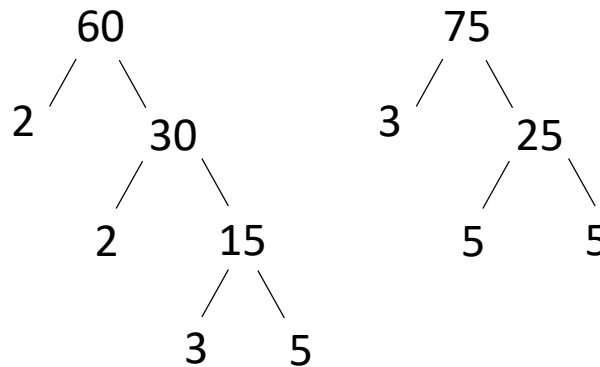
Prime factor decomposition
Breaking down a number into its prime factors

Highest common factor
Finding the largest number which divides into all numbers given

Lowest common multiple
Finding the smallest number which both numbers divide into

Examples

Find the **highest common factor** and **lowest common multiple** of 60 and 75:

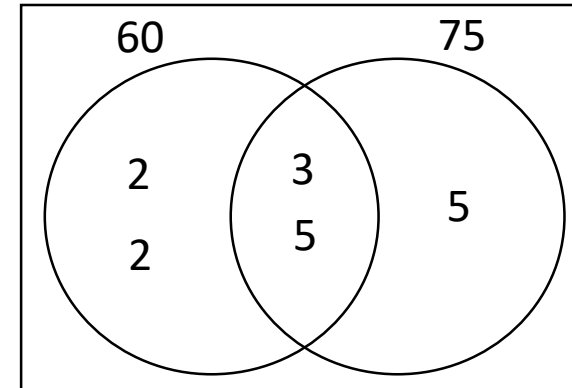


$$2 \times 2 \times 3 \times 5$$

$$2^2 \times 3 \times 5$$

$$3 \times 5 \times 5$$

$$3 \times 5^2$$



HCF – Multiply all numbers in the intersection
 $= 3 \times 5 = 15$

LCM – Multiply all numbers in the Venn diagram
 $= 2 \times 2 \times 3 \times 5 \times 5 = 300$

hegartymaths

29 – 32,34,35

DELTA
Academies Trust

Key Words

Factor
Multiple
Prime
Highest Common Factor
Lowest Common Multiple

Questions

- 1) Write 80 as a product of its prime factors
- 2) Write 48 as a product of its prime factors
- 3) Find the LCM and HCF of 80 and 48

ANSWERS: 1) $2^4 \times 5$ 2) $2^4 \times 3$ 3) LCM = 240 HCF = 16

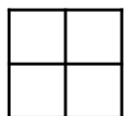
POWERS AND ROOTS

Key Concept

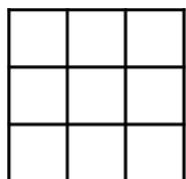
Square numbers



$$1^2 \\ 1 \times 1 = 1$$



$$2^2 \\ 2 \times 2 = 4$$



$$3^2 \\ 3 \times 3 = 9$$

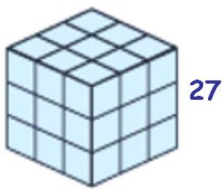
Cube numbers



$$1^3 \\ 1 \times 1 \times 1$$



$$2^3 \\ 2 \times 2 \times 2$$



$$3^3 \\ 3 \times 3 \times 3$$

Key Words

Square: A square number is the result of multiplying a number by itself.

Cube: A cube number is the result of multiplying a number by itself twice.

Root: A root is the reverse of a power.

Prime number: A prime is a number that has only two factors which are 1 and itself.

Reciprocal: This is found by doing 1 divided by the number.

Factor: A number that fits into another number exactly.

Tip

A number with an odd amount of factors must be a square number.

Examples

What is 2^4 ?

$$2 \times 2 \times 2 \times 2 = 16$$

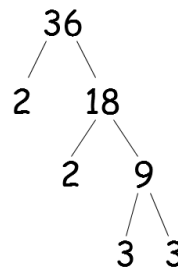
What is $\sqrt{64}$?

$$8^2 = 64, \text{ so } \sqrt{64} = \pm 8$$

What is the reciprocal of 5?

$$\frac{1}{5}$$

Write 36 as a product of prime factors



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

Product means 'multiply'

sparx

M823, M322
M108

Questions

- a) 2^5 b) 3^3 c) 1^{17} d) $\sqrt{81}$ e) $\sqrt{16}$ f) $\sqrt[3]{64}$
- Find the reciprocal of: a) 4 b) $\frac{1}{3}$ c) 0.25
- Write 72 as a product of primes.

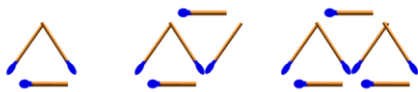
ANSWERS: 1) a) 32 b) 27 c) 1 d) ± 9 e) ± 4 f) 4
2) a) $\frac{1}{4}$ b) 3 c) 4
3) $2^3 \times 3^2$

SEQUENCES

Key Concept

Types of Sequence

Sequence as pictures:



Linear sequence:

4, 7, 10, 13, 16, ...



Fibonacci sequence:

(add the previous two terms)

1, 1, 2, 3, 5, 8, ...

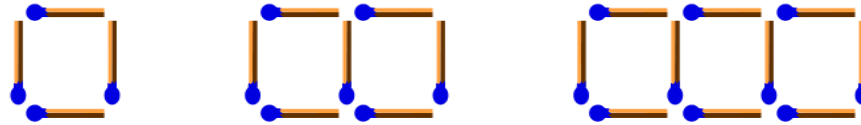
Key Words

Sequence: A list which is in a particular order following a pattern.

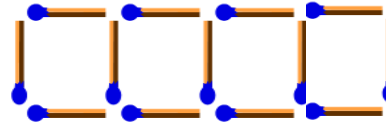
Term: Each particular part of a sequence.

Linear sequence: A sequence which is formed by adding or subtracting the same amount each time.

Examples



Next pattern is:



Sequence = 4, 7, 10, 13, ...

Term to term rule = + 3

Nth term

$$4, 7, 10, 13, 16, \dots = 3n + 1$$

sparx

M241, M381,
M991

Tip

If a sequence is decreasing, the 'n' term will be negative.

Eg, 15, 11, 7, 3, ...

Nth term = $-4n + 19$

Questions

1) Find the next two terms and the term to term rule

a) 9, 13, 17, 21, ... b) 7, 12, 17, 22, ... c) 9, 7, 5, 3, ... d) 3, 4, 7, 11, 18

2) Find the nth term a) 7, 9, 11, 13, ... b) 8, 13, 18, 23, ...

c) 15, 12, 9, 6, ... d) 1, -3, -7, -11, ...

ANSWERS: 1) a) 25, 29 Rule = +4 b) 27, 32, Rule = +5 c) 1, -1, Rule = -2 d) 29, 47, Rule = add previous 2 numbers 2) a) $2n + 5$ b) $5n + 3$ c) $-3n + 18$ d) $-4n + 5$

Year 10 Higher SEQUENCES

Key Concepts

Arithmetic sequences
increase or decrease by a common amount each time.

Quadratic sequences have a common 2nd difference.

Fibonacci sequences
Add the two previous terms to get the next term

Geometric series has a common multiple between each term

Linear sequences:

4, 7, 10, 13, 16.....

a) State the nth term

$3n + 1$
Difference ← ← The 0th term

Examples

b) What is the 100th term in the sequence?

$$3n + 1$$

$$3 \times 100 + 1 = 301$$

c) Is 100 in this sequence?

$$3n + 1 = 100$$

$$3n = 99$$

$$n = 33$$

Yes as 33 is an integer.

Quadratic sequences:

$a + b + c$	3	9	19	33	51
$3a + b$	6	10	14	18	
$2a$	4	4	4		

First difference
Second difference

$$2a = 4 \quad 3a + b = 6 \quad a + b + c = 3$$

$$a = 2 \quad 3 \times 2 + b = 6 \quad 2 + 0 + c = 3$$

$$b = 0 \quad c = 1$$

$$2n^2 + 0n + 1 \rightarrow 2n^2 + 1$$

hegartymaths
198, 247-250,
264



Key Words

Linear
Quadratic
Arithmetic
Geometric
Sequence
Nth term

A) 1, 8, 15, 22,

1) Find the nth term b) Calculate the 50th term c) Is 120 in the sequence?

B) Find the nth term for:

1) 5, 12, 23, 38, 57, ... 2) 3, 11, 25, 45, 71,