



**eClassroom**

GCSE Mathematics

# **Primes, Factors & Multiples**

## **Questions**

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Pearson Edexcel GCSE & iGCSE Mathematics



## Section A — Foundation

### Worked Examples

#### [Fluency]

List all the factors of 18.

Factors are numbers that divide exactly into 18:

1, 2, 3, 6, 9, 18

#### [Reasoning]

Explain why 1 is not a prime number.

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

The number 1 has only **one** factor (itself), so it is not prime.

#### [Problem Solving]

Two lights flash together. Light A flashes every 6 seconds, Light B every 8 seconds. How long before they flash together again?

Find LCM(6, 8):

$$6 = 2 \times 3 \quad 8 = 2^3$$

$$\text{LCM} = 2^3 \times 3 = 24 \text{ seconds}$$

#### [Fluency]

1. List all the factors of 24.

(2 marks)

#### [Fluency]

2. Write down the first five multiples of 7.

(1 mark)

#### [Fluency]

3. Determine whether 51 is a prime number. Show your working.

(2 marks)

#### [Fluency]

4. Write 36 as a product of its prime factors. Give your answer in index notation.

(2 marks)

#### [Fluency]

5. Find the Highest Common Factor (HCF) of 18 and 24.

(2 marks)

**[Fluency]**

6. Find the Lowest Common Multiple (LCM) of 4 and 6.

(2 marks)

**[Reasoning]**

7. Write 60 as a product of its prime factors. Give your answer in index notation.

(2 marks)

**[Reasoning]**

8. Find the HCF and LCM of 12 and 18.

Show your prime factorisations clearly.

(3 marks)

**[Problem Solving]**

9. Three buses leave a bus station at the same time.

Bus A leaves every 8 minutes.

Bus B leaves every 12 minutes.

Bus C leaves every 20 minutes.

After how many minutes will all three buses next leave the station together?

(3 marks)

**[Problem Solving]**

10. Two numbers have a Highest Common Factor of 6 and a Lowest Common Multiple of 60.

One of the numbers is 12.

Find the other number. Show your working.

(3 marks)



## Section B — Higher

### Worked Examples

#### [Fluency]

Write 360 as a product of prime factors in index notation.

Use a factor tree or repeated division:

$$360 \div 2 = 180 \rightarrow 180 \div 2 = 90 \rightarrow 90 \div 2 = 45 \rightarrow 45 \div 3 = 15 \rightarrow 15 \div 3 = 5$$

$$360 = 2^3 \times 3^2 \times 5$$

#### [Reasoning]

Given  $A = 2^3 \times 3 \times 5$  and  $B = 2^2 \times 3^2$ , find HCF(A, B) and LCM(A, B).

HCF: take the **lowest** power of each common prime factor:

$$\text{HCF} = 2^2 \times 3 = 12$$

LCM: take the **highest** power of each prime factor:

$$\text{LCM} = 2^3 \times 3^2 \times 5 = 360$$

#### [Problem Solving]

$A = 2^2 \times 3 \times 5$ ,  $B = 2^3 \times 5^2$ . Show that  $A \times B = \text{HCF}(A, B) \times \text{LCM}(A, B)$ .

$$A = 60, B = 200 \rightarrow A \times B = 12\,000$$

$$\text{HCF} = 2^2 \times 5 = 20 \quad \text{LCM} = 2^3 \times 3 \times 5^2 = 600$$

$$\text{HCF} \times \text{LCM} = 20 \times 600 = 12\,000 \quad \checkmark$$

#### [Fluency]

1. Write 180 as a product of its prime factors. Give your answer in index notation.

(2 marks)

#### [Fluency]

2. Find the HCF and LCM of 84 and 126.

Show your prime factorisations clearly.

(4 marks)

#### [Fluency]

3. Find the Highest Common Factor of 120 and 168.

You must show your prime factorisation.

(3 marks)

**[Reasoning]**

4.  $a = 2^3 \times 3^2$     $b = 2^2 \times 3 \times 5$

Find (i) HCF(a, b)   (ii) LCM(a, b)   (iii) Show that  $a \times b = \text{HCF}(a, b) \times \text{LCM}(a, b)$ .

(4 marks)

**[Reasoning]**5.  $n$  is a positive integer.Explain why  $n(n + 1)$  is always even, for all positive integer values of  $n$ .

(2 marks)

**[Reasoning]**6. Two numbers  $p$  and  $q$  are given in prime factor form:

$$p = 2^3 \times 3 \times 5^2 \quad q = 2^2 \times 3^3$$

- (a) Find the HCF of  $p$  and  $q$ .   (1)  
(b) Find the LCM of  $p$  and  $q$ .   (2)  
(c) Hence find the value of  $p \times q$ .   (1)

(4 marks)

**[Problem Solving]**

7. Three alarms sound together at 9:00 am.

Alarm A sounds every 24 minutes.

Alarm B sounds every 36 minutes.

Alarm C sounds every 48 minutes.

At what time will all three alarms next sound together?

(3 marks)

**[Problem Solving]**8. The HCF of two numbers  $m$  and  $n$  is 8 and their LCM is 240.

One of the numbers is 48.

Find all possible values of the other number.

(3 marks)

**[Problem Solving]**9.  $n$  is a positive integer greater than 1.Prove that  $n^2 - 1$  is never prime for any integer  $n > 2$ .

(3 marks)

**[Problem Solving]**

10.  $m = 2^a \times 3^b$     $n = 2^c \times 3^d$    where  $a, b, c, d$  are positive integers with  $a > c$  and  $b < d$ .

- (a) Write an expression for HCF( $m, n$ ) in terms of  $a, b, c, d$ .   (1)
- (b) Write an expression for LCM( $m, n$ ) in terms of  $a, b, c, d$ .   (1)
- (c) Show that  $m \times n = \text{HCF}(m, n) \times \text{LCM}(m, n)$ .   (2)

(4 marks)