

Prime Factors, HCF & LCM

Types of Numbers / Prime Factor Decomposition / Uses of Prime Factor Decomposition / HCF & LCM

Easy (16 questions)	/39
Medium (23 questions)	/76
Hard (16 questions)	/57
Total Marks	/172

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Easy Questions

1 Write 525 as a product of its prime factors.

(3 marks)

2 Express 56 as the product of its prime factors.

(2 marks)

3 Write 36 as a product of its prime factors.

(2 marks)

4 Trams leave Piccadilly

to Eccles every 9 minutes

to Didsbury every 12 minutes

A tram to Eccles and a tram to Didsbury both leave Piccadilly at 9 am.

At what time will a tram to Eccles and a tram to Didsbury next leave Piccadilly at the same time?

(3 marks)

- 5 Write 600 as a product of powers of its prime factors.
Show your working clearly.

(3 marks)

- 6 Write 3.6×10^3 as a product of powers of its prime factors.
Show your working clearly.

(3 marks)

- 7 Write 800 as a product of its prime factors.
Show your working clearly.

(2 marks)

- 8 Write 880 as a product of powers of its prime factors.
Show your working clearly.

(3 marks)

- 9 Find the Highest Common Factor (HCF) of 140 and 245.

(2 marks)

- 10** Write 200 as a product of prime factors.
Give your answer in index form.

(3 marks)

- 11** Choose the lowest common multiple (LCM) of 5, 15 and 25.

- A.** 5
- B.** 45
- C.** 75
- D.** 150

(1 mark)

- 12** Work out the lowest common multiple (LCM) of 20, 30 and 40

Choose the correct option.

- A.** 10
- B.** 120
- C.** 240
- D.** 24 000

(1 mark)

- 13** Write 36 as a product of prime factors.
Give your answer in index form.

(3 marks)

- 14** Write 75 as a product of its prime factors.

(2 marks)

15 Write 504 as the product of its prime factors.

(3 marks)

16 Carla runs every 3 days.
She swims every Thursday.
On Thursday 9 November, Carla both runs and swims.

What will be the next date on which she both runs and swims?

(3 marks)

Medium Questions

- 1 You are given that $177147 = 3^{11}$.

Write 177 147 000 000 as a product of its prime factors.

(3 marks)

- 2 (a) Write 720 as a product of its prime factors.
Show your working clearly.

(3 marks)

- (b) Find the smallest whole number that 720 can be multiplied by to give a square number.

(1 mark)

3 $A = 2^n \times 3 \times 5^m$

Write $8A$ as a product of powers of its prime factors.

(2 marks)

- 4 Buses to Acton leave a bus station every 24 minutes.
Buses to Barton leave the same bus station every 20 minutes.

A bus to Acton and a bus to Barton both leave the bus station at 9.00 am.

When will a bus to Acton and a bus to Barton next leave the bus station at the same time?

(3 marks)

- 5 Rita is going to make some cheeseburgers for a party.
She buys some packets of cheese slices and some boxes of burgers.

There are 20 cheese slices in each packet.

There are 12 burgers in each box.

Rita buys exactly the same number of cheese slices and burgers.

i) How many packets of cheese slices and how many boxes of burgers does she buy?

[3]

Rita wants to put one cheese slice and one burger into each bread roll.

She wants to use all the cheese slices and all the burgers.

ii) How many bread rolls does Rita need?

[1]

(4 marks)

6 Matt and Dan cycle around a cycle track.

Each lap Matt cycles takes him 50 seconds.

Each lap Dan cycles takes him 80 seconds.

Dan and Matt start cycling at the same time at the start line.

Work out how many laps they will each have cycled when they are next at the start line together.

(3 marks)

7 (a) Express 180 as a product of its prime factors.

(3 marks)

(b) Martin thinks of two numbers.

He says,

- The Highest Common Factor (HCF) of my two numbers is 6
- The Lowest Common Multiple (LCM) of my two numbers is a multiple of 15

Write down **two** possible numbers that Martin is thinking of.

(2 marks)

8 Find the highest common factor (HCF) of 72 and 90.

(2 marks)

9 (a) $N = 480 \times 10^9$

Write N as a product of powers of its prime factors.
Show your working clearly.

(3 marks)

(b) Find the largest factor of N that is an odd number.

(1 mark)

10 (a) $A = 3^2 \times 5^4 \times 7$ $B = 3^4 \times 5^3 \times 7 \times 11$

Find the highest common factor (HCF) of A and B .

(2 marks)

(b) Find the lowest common multiple (LCM) of A and B .

(2 marks)

11 $A = 3^5 \times 5 \times 7^3$
 $B = 2^3 \times 3 \times 7^4$

i) Find the Highest Common Factor (HCF) of A and B .

ii) Find the Lowest Common Multiple (LCM) of A and B .

(2 marks)

12 Work out the lowest common multiple (LCM) of 36 and 120.

(2 marks)

13 $A = 2^3 \times 3^2 \times 5^2 \times 11$
 $B = 2^4 \times 3 \times 5^4 \times 13$

Find the lowest common multiple (LCM) of A and B .

Give your answer as a product of powers of prime numbers.

(2 marks)

- 14** A machine has a buzzer that sounds every 50 minutes.
The machine also has a bell that sounds every 80 minutes.

The buzzer and the bell sound together at 10 am.

Find the time at which they next sound together.

(3 marks)

15 $c = 2^{10} \times 3 \times 5^6$

Work out $18c$.

Give your answer as a product of prime factors in index form.

(2 marks)

- 16** Work out the highest common factor (HCF) of 75 and 105.

(2 marks)

- 17** Work out the lowest common multiple (LCM) of 120 and 144.

(2 marks)

- 18 (a)** Write 252 as the product of its prime factors.

(2 marks)

(b) Written as the product of its prime factors

$$672 = 2^5 \times 3 \times 7$$

Work out the value of the highest common factor of 672 and 252.

(1 mark)

19 At a railway station, trains are either eastbound or westbound.

An eastbound train leaves the station every 25 minutes.

A westbound train leaves the station every 45 minutes.

An eastbound train and a westbound train both leave the station at 8am.

When is the next time that two trains leave the station together?

(4 marks)

20 (a) A bus timetable shows the following information.

- A bus following route T leaves for the train station every 20 minutes.
- A bus following route A leaves for the airport every 18 minutes.
- A bus following route T and a bus following route A both leave at 8.37 am.

When is the next time one of each bus is timetabled to leave at the same time?

(4 marks)

(b) Write down one assumption that was necessary to solve this problem.

(1 mark)

21 (a) i) Write 120 as a product of its prime factors.

[3]

ii) The lowest common multiple (LCM) of x and 120 is 360.
Find the smallest possible value of x .

[2]

(5 marks)

(b) Two numbers, A and B , are written as a product of prime factors.

$$A = 2^4 \times 3^2 \times 7^2 \quad B = 2^3 \times 3 \times 5 \times 7$$

Find the highest common factor (HCF) of A and B .

(2 marks)

22 Find the lowest common multiple (LCM) of 180 and 504.

(2 marks)

23 (a) Write 1260 as a product of its prime factors.

(3 marks)

(b) Find the Highest Common Factor (HCF) of 1260 and 540

(3 marks)

Hard Questions

1 (a) Find the lowest common multiple (LCM) of 40 and 56.

(2 marks)

(b)

$$A = 2^3 \times 3 \times 5 \quad B = 2^2 \times 3 \times 5^2$$

Write down the highest common factor (HCF) of A and B .

(1 mark)

2 Here are three lamps.

lamp A



lamp B



lamp C



Lamp **A** flashes every 20 seconds.

Lamp **B** flashes every 45 seconds.

Lamp **C** flashes every 120 seconds.

The three lamps start flashing at the same time.

How many times in one hour will the three lamps flash at the same time?

(3 marks)

3 Ali is planning a party.

He wants to buy some cakes and some sausage rolls.

The cakes are sold in boxes.

There are 12 cakes in each box.

Each box of cakes costs £2.50

The sausage rolls are sold in packs.

There are 8 sausage rolls in each pack.

Each pack of sausage rolls costs £1.20

Ali wants to buy more than 60 cakes and more than 60 sausage rolls.

He wants to buy exactly the same number of cakes as sausage rolls.

What is the least amount of money Ali will have to pay?

(5 marks)

4 John buys some boxes of pencils and some packets of pens for people to use at a conference.

There are 40 pencils in a box.

There are 15 pens in a packet.

John gives one pencil and one pen to each person at the conference.

He has no pencils left.

He has no pens left.

How many boxes of pencils and how many packets of pens did John buy?

(3 marks)

5 Liz buys packets of coloured buttons.

There are 8 red buttons in each packet of red buttons.

There are 6 silver buttons in each packet of silver buttons.

There are 5 gold buttons in each packet of gold buttons.

Liz buys equal numbers of red buttons, silver buttons and gold buttons.

How many packets of each colour of buttons did Liz buy?

..... packets of red buttons

..... packets of silver buttons

..... packets of gold buttons

(3 marks)

6

$$A = 5^2 \times 7^4 \times 11^p$$

$$B = 5^m \times 7^{n-5} \times 11$$

m , n and p are integers such that

- $m > 2$
- $n > 10$
- $p > 1$

Find the highest common factor (HCF) of A and B

Give your answer as a product of powers of its prime factors.

(2 marks)

7 (a) Find the highest common factor (HCF) of 96 and 120.

(2 marks)

$$A = 2^3 \times 5 \times 7^2 \times 11$$

(b) $B = 2^4 \times 7 \times 11$

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

Find the lowest common multiple (LCM) of A , B and C .

(2 marks)

$$A = 3^5 \times 5 \times 7^3$$

8 $B = 2^3 \times 3 \times 7^4$

$$C = 2^p \times 5^q \times 7^r$$

Given that

- the HCF of B and C is $2^3 \times 7$
- the LCM of A and C is $2^4 \times 3^5 \times 5^2 \times 7^3$

Find the value of p , the value of q and the value of r .

$$\begin{aligned} p &= \\ q &= \\ r &= \end{aligned}$$

(2 marks)

9 a is a common factor of 72 and 120

b is a common multiple of 6 and 9

Work out the highest possible value of $\frac{a}{b}$.

(4 marks)

10 N is a number.

As a product of prime factors in index form $N = 2 \times 3^4 \times y^3$

Work out $3N^2$ as a product of prime factors in index form.

Give your answer in terms of y .

(3 marks)

11 A clock chimes every 20 minutes.

A light flashes every 8 minutes.

The clock chimes and the light flashes together at 08:00.

How many times between 08:01 and 12:30 will the clock chime and the light flash together?

Show your working.

(5 marks)

12 Given that $168 = 2^3 \times 3 \times 7$, find the lowest common multiple (LCM) of 168 and 30.

(3 marks)

13 You are given that

$$90 = 3^2 \times 2 \times 5 \text{ and } 177147 = 3^{11}$$

Find the lowest common multiple (LCM) of 90 and 177147.

Give your answer using power notation and as an ordinary number.

using power notation

as an ordinary number

(2 marks)

14 (a) Two numbers, P and Q , are written as products of their prime factors

$$P = 2^5 \times 3^2 \times 5^3 \times 11 \quad Q = 2^4 \times 3 \times 5^4 \times 7$$

i) Find the lowest common multiple (LCM) of P and Q .

[2]

ii) The number C is written as the product of its prime factors.

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

Work out $P \div C$, leaving your answer as a product of powers of prime numbers.

[2]

(4 marks)

(b) i) Write 450 as a product of its prime factors.

[3]

ii) Find the highest common factor (HCF) of 270 and 450.

[3]

(6 marks)

15 Here are some properties of a number.

- It is a common factor of 288 and 360.
- It is a common multiple of 4 and 6.
- It is larger than 25.

Find the **two** possible numbers with these properties.

(4 marks)

16 Here is a list of five numbers.

$$98^{53} \quad 98^{64} \quad 98^{73} \quad 98^{88} \quad 98^{91}$$

Find the lowest common multiple of these five numbers.

(1 mark)