# GCSE Maths – Number

## Factors, Multiples and Primes

Worksheet

WORKED SOLUTIONS

This worksheet will show you how to work out different types of questions on factors, multiples and primes. Each section contains a worked example, a question with hints and then questions for you to work through on your own.

# Section A

## Worked Example

**Find the highest common factor of 40 and 24**

**Step 1:** Find all the factors of the first number.

*Factors of 40:*

*1 and 40 would be the definite 1st and last factors of 40 respectively.*

*Start finding factors from 1 working your way upwards - remember factors come in pairs.*

| | |
|---|---|
| 1 | 40 |
| 2 | 20 |
| 4 | 10 |
| 5 | 8 |
| 8 | 5 |

*Multiplying the numbers together in each row leads to the number 40.*
*8 and 5 are repeated, when this happens, all the factors have been found.*

*Therefore, the factors are: 1, 2, 4, 5, 8, 10, 20, 40*

**Step 2:** Repeat Step 1 for all other numbers in the question.

*Factors of 24:*

| | |
|---|---|
| 1 | 24 |
| 2 | 12 |
| 3 | 8 |
| 4 | 6 |
| 6 | 4 |

*6 and 4 are repeated which means all factors have been found.*

*Therefore, the factors are: 1, 2, 3, 4, 6, 8, 12, 24*

**Step 3:** Find all the common factors and then find the highest common factor (HCF)

*Common factors: 1, 2, 4, 8*

*Therefore, the highest common factor is 8.*

## Guided Example

**Find the highest common factor of 36, 12 and 78**

**Step 1:** Find all the factors of the first number.

36

1 x 36 = 36
2 x 18 = 36
3 x 12 = 36
4 x 9 = 36
6 x 6 = 36

**Step 2:** Repeat step one for all other numbers in the question.

12

1 x 12
2 x 6
3 x 4

78

1 x 78
2 x 39
3 x 26
6 x 13

**Step 3:** Find all the common factors and then find the highest common factor ( HCF )

common factors : 1, 2, 3, (6) — highest

HCF = 6

**Now it's your turn!**

If you get stuck, look back at the worked and guided examples.

1. Find the common factors of 27 and 45.

27
1 × 27
3 × 9

45
1 × 45
3 × 15
5 × 9

Common factors: 1, 3, 9

2. Find the highest common factor of 19, 39 and 52.

19
1 × 19
prime number

39
1 × 39
3 × 13

52
1 × 52
2 × 26
4 × 13

Common factors: (1)

HCF = 1

3. Find the lowest common factor of 88, 50, 65.

88
1 × 88
2 × 44
4 × 22
8 × 11

50
1 × 50
2 × 25
5 × 10

65
1 × 65
5 × 13

Common factors: (1)

LCF = 1

4. Find the highest common factor of $x$ and $y$ where:

$$x = 2 \times 2 \times 2 \times 3 \times 3 \times 5$$
$$y = 2 \times 3 \times 3 \times 5$$

$x = 2 \times 2 \times (2 \times 3 \times 3 \times 5)$

$y = (2 \times 3 \times 3 \times 5)$

both have $2 \times 3 \times 3 \times 5$, so HCF is $2 \times 3 \times 3 \times 5$

$2 \times 3 \times 3 \times 5 = 6 \times 15 = 90$

HCF = 90

# Section B

## Worked Example

**Find the lowest common multiple of 9 and 12**

**Step 1:** Write out multiples of the numbers until a common multiple is found.

| | | | | |
|---|---|---|---|---|
| *9* | *9* | *18* | *27* | ***36*** |
| *12* | *12* | *24* | ***36*** | *…* |

*Therefore, 36 is the lowest common multiple.*

## Guided Example

**Find the lowest common multiple of 2, 4 and 7**

**Step 1:** Write out multiples of the numbers until a common multiple is found.

2, 4, 6, 8, 10, 12, 14, 18, 20, 22, 24, 26, 28

4, 8, 12, 16, 20, 24, 28

7, 14, 21, 28

So the lowest common multiple is 28

**Now it's your turn!**

If you get stuck, look back at the worked and guided examples.

5. Find the lowest common multiple of 3, 4 and 9.

3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, (36)

4, 8, 12, 16, 20, 24, 28, 32, (36)

9, 18, 27, (36)

LCM = 36

6. Find the lowest common multiple of 45, 60 and 180.

45, 90, 135, (180)

60, 120, (180)

(180), 360

LCM = 180

7. Find two numbers with the lowest common multiple of 36.

6, 12, 18, 24, 30, (36)

(36), 72

6 and 36

Alt Answers...

- 2 and 36
- 3 and 36
- 12 and 36
- 18 and 36
- 18 and 12
- 4 and 9

8. A blue light flashes every 8 seconds, a red light flashes every 12 seconds and a green light flashes every 14 seconds.
   a) After how much time does all the three lights flash together?
   b) When will all the lights flash together for the third time?

a)

multiples of 8

8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96

104, 112, 120, 128, 136, 144, 152, 160, (168)

multiples of 12

12, 24, 36, 48, 60, 72, 84, 96, 108, 120, 132, 144, 156, (168)

multiples of 14

14, 28, 42, 56, 70, 84, 98, 112, 126, 140, 154, (168)

168 = 12 × 14

LCM = 168, so after 168 seconds, all three lights flash together

b) 168 × 3 = 504 ← As 168 is the LCM of 8, 12 and 14, multiplying it by 3 will get the third LCM.

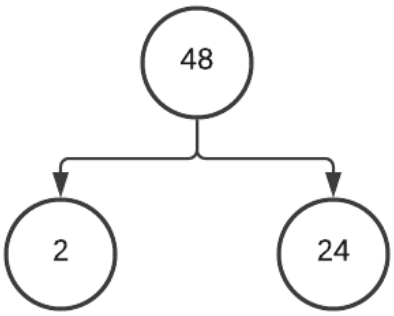
After 504 seconds

# Section C

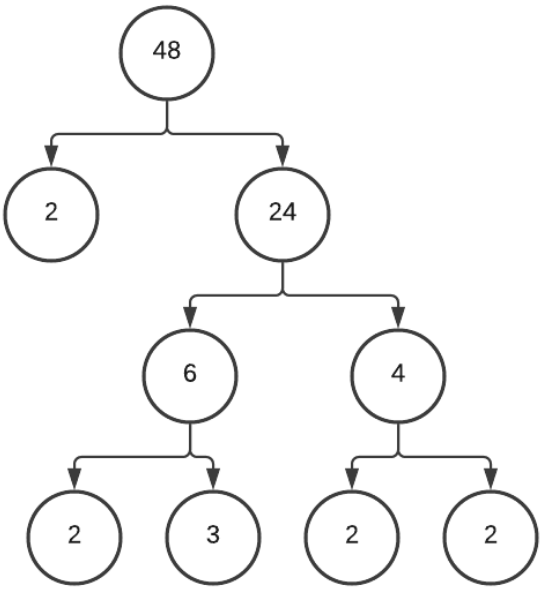
## Worked Example

**Using a factor tree, find the prime factorisation of 48**

**Step 1:** Divide the number into two factors.




**Step 2:** Divide these factors into further factors until each factor at the end of the tree is a prime factor which hence, cannot be divided further.



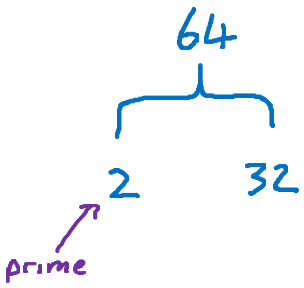

**Step 3:** Write out all the prime factors.

$$48 = 2 \times 2 \times 3 \times 2 \times 2 = \mathbf{3 \times 2^4}$$

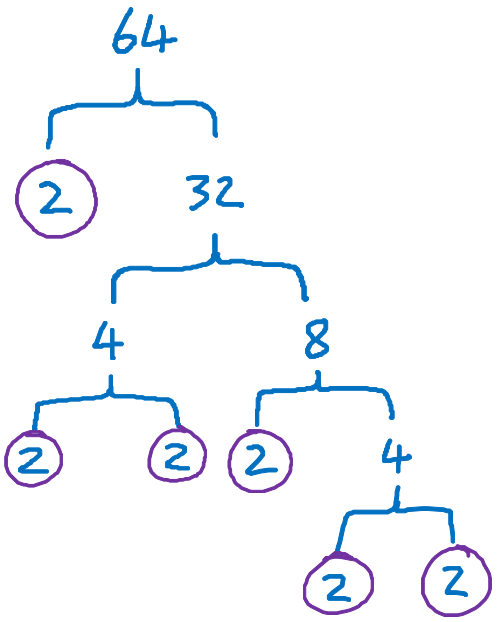
## Guided Example

**Find the prime factorisation of 64**

**Step 1:** Divide the number into two factors.




**Step 2:** Divide these factors into further factors until each factor at the end of the tree is a prime factor which, hence, cannot be divided further.




**Step 3:** Write out all the prime factors.

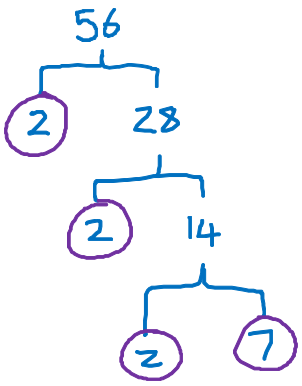
$$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$$
$$= 2^6$$

write as $2^n$

**Now it's your turn!**

If you get stuck, look back at the worked and guided examples.

9. Find the prime factorisation of 56.




$56 = 2 \times 2 \times 2 \times 7$

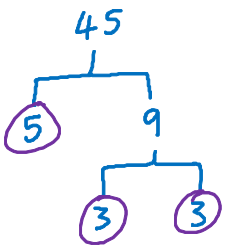
$= 2^3 \times 7$

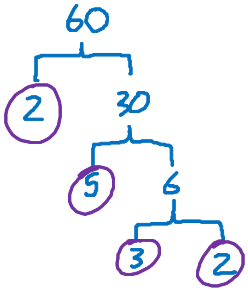
10.

a) Find the prime factorization of 45 and 60.

b) Using answer to part (a), find the highest common factor of 45 and 60.

a)




$45 = 5 \times 3 \times 3$

$= 5 \times 3^2$

$60 = 5 \times 3 \times 2 \times 2$

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

b) $45 = (5 \times 3) \times 3$

$60 = (5 \times 3) \times 2 \times 2$

$5 \times 3 = 15$

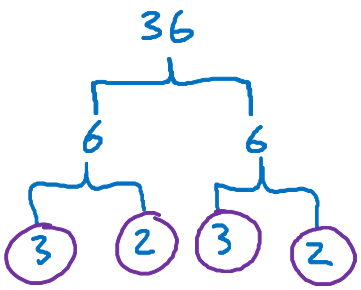
HCF = 15

11. Suppose $w = 2^2 \times 3 \times 5$.

Find the prime factorisation of $36w$.

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

$36w = 36 \times w$




prime factorisation of $36 = 3 \times 3 \times 2 \times 2$

$= 3^2 \times 2^2$

$36 \times w = 3^2 \times 2^2 \times 2^2 \times 3 \times 5$ (add, add)

$36w = 3^3 \times 2^4 \times 5$