

Factors & Primes



Find all the Factors of a number

List Multiples of a number

Find the Highest Common Factor (H.C.F.)

Find the Lowest Common Multiple (L.C.M.)

Identify Prime numbers

Vocabulary

Integer

A whole number. Such as 1 , 2 , 3 , ...

0.6 and $\frac{3}{4}$ are not integers

Factor

An integer that divides exactly into another integer.

3 is a factor of 12.

Prime Number

A positive integer with exactly two factors.

Multiple

An integer that is found by multiplying another number.
12 is a multiple of 3.

Divisible

A number is divisible by a smaller number if it is a multiple of the smaller number.

Factors : Key Facts

All integers have factors.

A factor of a number is an integer that divides exactly into that number.

1 is a factor of every number.

Every number is a factor of itself.

Example

Find all the factors of 24.

Solution

$$24 = 1 \times 24$$

$$24 = 2 \times 12$$

$$24 = 3 \times 8$$

$$24 = 4 \times 6$$

Tip:

- Find the factors in pairs.

Why can we stop here?

The factors of 24 are: **1 , 2 , 3 , 4 , 6 , 8 , 12 and 24**

Standard Exercise

Find all the factors of the numbers below:

1) 1

2) 2

3) 3

4) 4

5) 5

6) 6

Find all the factors of the numbers below:

1) 11

2) 12

3) 14

4) 18

5) 19

Find all the factors of the numbers below:

1) 28

2) 36

3) 51

4) 53

Standard Exercise

Find all the factors of the numbers below:

- 1) 1 **1**
- 2) 2 **1, 2**
- 3) 3 **1, 3**
- 4) 4 **1, 2, 4**
- 5) 5 **1, 5**
- 6) 6 **1, 2, 3, 6**

Find all the factors of the numbers below:

- 1) 11 **1, 11**
- 2) 12 **1, 2, 3, 4, 6, 12**
- 3) 14 **1, 2, 7, 14**
- 4) 18 **1, 2, 3, 6, 9, 18**
- 5) 19 **1, 19**

Find all the factors of the numbers below:

- 1) 28 **1, 2, 4, 7, 14, 28**
- 2) 36 **1, 2, 3, 4, 6, 9, 12, 18, 36**
- 3) 51 **1, 3, 17, 51**
- 4) 53 **1, 53**

Further Exercise

Find all the factors of the numbers below:

1) 34

2) 10

3) 7

4) 87

5) 25

6) 59

Find all the factors of the numbers below:

1) 20

2) 100

3) 49

4) 91

5) 89

Find all the factors of the numbers below:

1) 132

2) 87

3) 441

4) 421

Challenge:

Which numbers have an odd number of factors?

Further Exercise

Find all the factors of the numbers below:

1) 34 **1, 2, 17, 34**

2) 10 **1, 2, 5, 10**

3) 7 **1, 7**

4) 87 **1, 3, 29, 87**

5) 25 **1, 5, 25**

6) 59 **1, 59**

Find all the factors of the numbers below:

1) 20 **1, 2, 4, 5, 10, 20**

2) 100 **1, 2, 4, 5, 10, 20, 25, 50, 100**

3) 49 **1, 7, 49**

4) 91 **1, 7, 13, 91**

5) 89 **1, 89**

Find all the factors of the numbers below:

1) 132 **1, 2, 3, 4, 6, 11, 12, 22, 33, 44, 66, 132**

2) 87 **1, 3, 29, 87**

3) 441 **1, 3, 7, 9, 21, 49, 63, 147 and 441**

4) 421 **1, 421**

Challenge:

Which numbers have an odd number of factors?
Square numbers

Key Facts

A **prime number** is a number with exactly 2 factors.

(Note: 1 is **not** a prime number as it only has one factor.)

Exercise

Which of the numbers from 1 to 20 are prime numbers?

1

6

11

16

2

7

12

17

3

8

13

18

4

9

14

19

5

10

15

20

Exercise

1	Not Prime	6	Not Prime	11	Prime	16	Not Prime
2	Prime	7	Prime	12	Not Prime	17	Prime
3	Prime	8	Not Prime	13	Prime	18	Not Prime
4	Not Prime	9	Not Prime	14	Not Prime	19	Prime
5	Prime	10	Not Prime	15	Not Prime	20	Not Prime

Exercise

Which of the numbers below are prime numbers?

- 1) 4
- 2) 10
- 3) 7
- 4) 1
- 5) 25
- 6) 36

Which of the numbers below are prime numbers?

- 1) 100
- 2) 41
- 3) 87
- 4) 91
- 5) 101
- 6) 89

Which of the numbers below are prime numbers?

- 1) 1001
- 2) 111,111,111
- 3) 14,641
- 4) 1,003
- 5) 1,009

Solutions

Which of the numbers below are prime numbers?

- 1) 4 **Not Prime**
- 2) 10 **Not Prime**
- 3) 7 **Prime**
- 4) 1 **Not Prime**
- 5) 25 **Not Prime**
- 6) 36 **Not Prime**

Which of the numbers below are prime numbers?

- 1) 100 **Not Prime**
- 2) 41 **Prime**
- 3) 87 **Not Prime**
- 4) 91 **Not Prime**
- 5) 101 **Prime**
- 6) 89 **Prime**

Which of the numbers below are prime numbers?

- 1) 1001 **Not Prime**
- 2) 111,111,111 **Not Prime**
- 3) 14,641 **Not Prime**
- 4) 1,003 **Not Prime**
- 5) 1,009 **Prime**

Exploring Prime Numbers

Is 1 a prime number?

Why?

Find the first 10 prime numbers.

Can you find a run of 3 consecutive non-prime numbers?

A run of 5?

A run of 7?

Solutions

Is 1 a prime number?

Why?

No, because it only has one factor.

Find the first 10 prime numbers.

**2 , 3 , 5 , 7 , 11 , 13 ,
17 , 19 , 23 , 29**

Can you find a run of 3 consecutive non-prime numbers?

8 , 9 , 10

A run of 5?

24 , 25 , 26 , 27 , 28

A run of 7?

**90 , 91 , 92 , 93 , 94 ,
95 , 96**

Highest Common Factor

The factors of 98 are:

1 , 2 , 7 , 14 , 49 , 98

The factors of 42 are:

1 , 2 , 3 , 6 , 7 , 14 , 21 , 42

The common factors of 98 and 42 are 1 , 2 , 7 , and 14.

The **highest common factor** of 98 and 42 is **14**.

Highest Common Factor

Find the highest common factor of:

- 1) 8 and 12
- 2) 3 and 5
- 3) 6 and 9
- 4) 8 and 1
- 5) 16 and 12
- 6) 6 and 24

Find the highest common factor of:

- 1) 12 and 15
- 2) 13 and 17
- 3) 21 and 27
- 4) 48 and 66
- 5) 96 and 132

Find the highest common factor of:

- 1) 96 and 128
- 2) 91 and 117
- 3) 16 , 48 and 92

Solutions

Find the highest common factor of:

1) 8 and 12 **4**

2) 3 and 5 **1**

3) 6 and 9 **3**

4) 8 and 1 **1**

5) 16 and 12 **4**

6) 6 and 24 **6**

Find the highest common factor of:

1) 12 and 15 **3**

2) 13 and 17 **1**

3) 21 and 27 **3**

4) 48 and 66 **6**

5) 96 and 132 **12**

Find the highest common factor of:

1) 96 and 128 **32**

2) 91 and 117 **13**

3) 16 , 48 and 92 **4**

Multiples

The **multiples** of a number are obtained by multiplying the number by 1 , 2 , 3 , ...

The multiples of 8 are:

$$1 \times 8 = 8$$

$$2 \times 8 = 16$$

$$3 \times 8 = 24$$

$$4 \times 8 = 32$$

.....

The list of multiples of any number never ends.

Example

Write down the first six multiples of 5.

Solution

Write down the first six multiples of 5. **5 , 10 , 15 , 20 , 25 , 30**

Exercise

Find the first four multiples of:

1) 10

2) 2

3) 7

4) 1

5) 11

6) 40

Find the first four multiples of:

1) 15

2) 101

3) 19

4) 17

Find the first four multiples of:

1) 99

2) 198

Solutions

Find the first four multiples of:

1) 10 **10 , 20 , 30 , 40**

2) 2 **2 , 4 , 6 , 8**

3) 7 **7 , 14 , 21 , 28**

4) 1 **1 , 2 , 3 , 4**

5) 11 **11 , 22 , 33 , 44**

6) 40 **40 , 80 , 120 , 160**

Find the first four multiples of:

1) 15 **15 , 30 , 45 , 60**

2) 101 **101 , 202 , 303 ,
404**

3) 19 **19 , 38 , 57 , 76**

4) 17 **17 , 34 , 51 , 68**

Find the first four multiples of:

1) 99 **99 , 198 , 297 , 396**

2) 198 **198 , 396 , 594 ,
792**

Lowest Common Multiple

The first 20 multiples of 4 are:

4 , 8 , 12 , 16 , 20 , 24 , **28** ,
32 , 36 , 40 , 44 , 48 , 52 , **56** ,
60 , 64 , 68 , 72 , 76 , 80

The first 20 multiples of 7 are:

7 , 14 , 21 , **28** , 35 , 42 , 49 ,
56 , 63 , 70 , 77 , **84** , 91 , 98 ,
105 , 112 , 119 , 126 , 133 , 140

The common multiples of 4 and 7 are 28 , 56 , 84 , and 112 ,

The **lowest common multiple** of 4 and 7 is 28.

Example

Find the lowest common multiple of 5 and 8.

Solution

Find the lowest common multiple of 5 and 8.

Multiples of 5

5 , 10 , 15 , 20 , 25 , 30 , 35 , **40** , 45 , 50 , 55 , 60 , 65 , 70 , 75 , 80 , 85....

Multiples of 8

8 , 16 , 24 , 32 , **40** , 48 , 56 , 64 , 72 , 80 , 88 , 96 , 104 , 112 , 120 , 128 ...

Lowest common multiple of 5 and 8 is 40

Exercise

Find the Lowest
Common Multiple of:

- 1) 2 and 3
- 2) 3 and 5
- 3) 6 and 9
- 4) 8 and 1
- 5) 16 and 12
- 6) 6 and 24

Find the Lowest
Common Multiple of:

- 1) 12 and 15
- 2) 13 and 26
- 3) 18 and 27
- 4) 48 and 66
- 5) 96 and 132

Find the Lowest
Common Multiple of:

- 1) 96 and 128
- 2) 17 and 91
- 3) 16 , 48 and 92

Solutions

Find the Lowest
Common Multiple of:

- 1) 2 and 3 **6**
- 2) 3 and 5 **15**
- 3) 6 and 9 **18**
- 4) 8 and 1 **8**
- 5) 16 and 12 **48**
- 6) 6 and 24 **24**

Find the Lowest
Common Multiple of:

- 1) 12 and 15 **60**
- 2) 13 and 26 **26**
- 3) 18 and 27 **54**
- 4) 48 and 66 **528**
- 5) 96 and 132 **1056**

Find the Lowest
Common Multiple of:

- 1) 96 and 128 **384**
- 2) 17 and 91 **1 547**
- 3) 16 , 48 and 92 **1104**

Investigation

The L.C.M. of 4 and 6 is 12.

The L.C.M. of 8 and 10 is 40.

The H.C.F. of 4 and 6 is 2.

The H.C.F. of 8 and 10 is 2.

Can you find a link between the H.C.F. and L.C.M. of a pair of numbers

Puzzle

Only one of these numbers is a multiple of 1 , 2 , 3 , 4 , 5 & 6.
Can you find the number?

20 320

30 450

40 320

Challenge:

What is the smallest number
that is a multiple of:

1 , 2 , 3 , 4 , 5 & 6

Solution

20 320 is a multiple of 1 , 2 , 4 , & 5

30 450 is a multiple of 1 , 2 , 3 , 5 & 6

40 320 is a multiple of 1 , 2 , 3 , 4 , 5 & 6 

Challenge:

60

Divisibility Rules

All integers are divisible by 1.

An integer is divisible by 2 if its last digit is 0, 2, 4, 6, or 8.

An integer is divisible by 3 if its digits sum to 3, 6 or 9.

An integer is divisible by 4 if its last two digits are divisible by 4.

An integer is divisible by 5 if its last digit is 0 or 5.

An integer is divisible by 6 if it is divisible by 2 & 3.

Investigation

There is a special group of numbers which have exactly 5 factors.

Can you find any?

What is special about these numbers?

Exam Style Question

- a) Find the highest common factor (HCF) of 72 and 90

- b) Find the lowest common multiple of 14 and 18

- c) Write down two prime numbers between 20 and 30.

Solution

- a) Find the highest common factor (HCF) of 72 and 90 **18**
- b) Find the lowest common multiple of 14 and 18 **126**
- c) Write down two prime numbers between 20 and 30. **23 , 29**