



Multiples, factors and primes

- Finding lowest common multiples
- Finding highest common factors
- Finding prime factors
- Using prime factors to find HCF and LCM

Keywords

You should know

explanation 1

- 1 a** The blue squares are multiples of which number?
- b** What is the next multiple of this number that is not shown on this 10 by 10 grid?
- c** The numbers circled in red are the last two multiples of a number on the grid. What is this number?
- d** What is the lowest common multiple (LCM) of your answers to parts **a** and **c**?
- e** What is the smallest common multiple of these two numbers that is not shown on the grid?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- 2** Find the lowest common multiple (LCM) of each set of numbers.

a 2, 5

b 4, 14

c 6, 9

d 3, 7

e 12, 15

f 3, 5, 6

g 4, 10, 12

h 5, 8, 10

- 3 a** The LCM of two numbers is 30, what might the numbers be?

b Find three numbers whose LCM is 36.

explanation 2

4 Write down all the factors of these numbers.

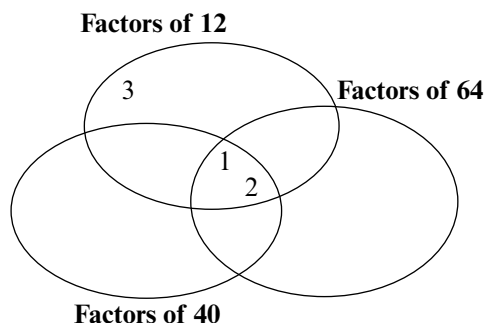
- a** 26 **b** 32 **c** 27 **d** 40 **e** 48

5 Sally is placing the factors of 12, 40 and 64 in a diagram.

She starts with the factors of 12.

1 and 2 are factors of all three numbers so she writes 1 and 2 in the area where the three ovals overlap.

3 is a factor of 12 only so she writes 3 in the area for factors of 12 only.



a Copy and complete the diagram by placing all the factors of 12, 40 and 64 in the correct place.

b What are the common factors of 12, 40 and 64?

c What is the highest common factor of 12, 40 and 64?

d Find the common factors and highest common factors of each set of numbers.

- i** 30, 18 **ii** 45, 63, 72 **iii** 52, 65, 91 **iv** 64, 84, 104

6 Copy the table and then put one number in each space until the table is filled.

5, 6, 10, 15, 24, 25, 27, 40 and 80

Use each number once.

	Factor of 30	Multiple of 8	Odd number
Multiple of 3			
Factor of 40			
Multiple of 5			

How fast can you complete this table? Time yourself.

explanation 3a

explanation 3b

- 7 a** Complete this list of the first fifteen prime numbers.

2, 3, 5, 7, ...

- b** What digits do the prime numbers other than 2 and 5 end in?

- c** Explain your answer to part **b**.

- 8** Which of the following numbers are prime?

a 53

b 78

c 87

d 91

e 121

f 147

g 151

h 173

i 203

- 9** Write down three prime numbers which, when their digits are reversed, are also prime. For example, 79 is a prime number and so is 97.

- 10** Colin has read on the internet that if p is any prime number and n is any integer, the number $n^p - n$ is always divisible by p .

Try this for different values of n and p .

Is this true for all the values you tried?

$$10^3 - 10 = 1000 - 10 \\ = 990$$

990 is divisible by 3

- 11 a** Copy the table and put these numbers in the correct places.

1, 2, 3, 7, 9, 12, 14, 21 and 63

Use each number once and only put one number in each space.

	Factor of 42	Multiple of 3	Prime number
Multiple of 2			
Factor of 27			
Multiple of 7			

- b** Design a similar table of your own and challenge a friend to complete it.

12 This number machine generates prime numbers for certain integer inputs.

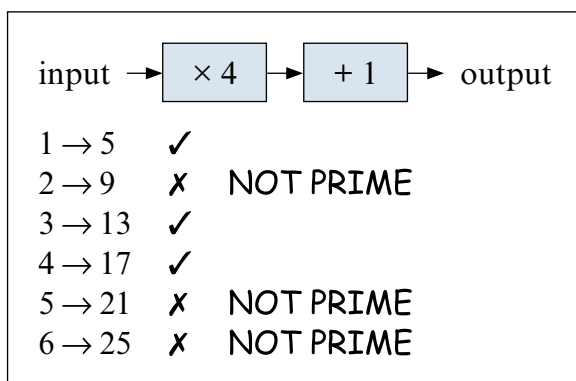
a Does an input of 7 generate a prime number?

b List the prime numbers generated by this number machine that are less than 100.

c Elizabeth notices that these prime numbers can also be expressed as the sum of two square numbers.

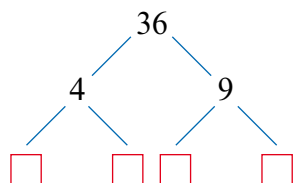
For example, $5 = 2^2 + 1^2$, $13 = 3^2 + 2^2$.

Is this true for all the prime numbers you have listed?



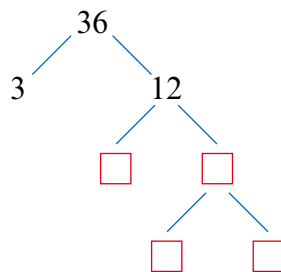
explanation 4

13 a Copy and complete these factor trees.



$$36 = \square \times \square \times \square \times \square$$

$$36 = \square^{\square} \times \square^{\square}$$



$$36 = \square \times \square \times \square \times \square$$

$$36 = \square^{\square} \times \square^{\square}$$

b What does your answer to part **a** tell you about the factors you use to start the factor tree?

14 Use a factor tree to write each of these numbers as a product of its prime factors.

a 72

b 100

c 81

d 48

e 124

f 250

g 400

h 550

explanation 5a

explanation 5b

15 Richard is writing 80 as a product of prime factors.

a Copy and complete his working.

b Use this method to write each of these numbers as a product of prime factors.

$$\begin{aligned} 80 &= 2 \times 40 \\ &= 2 \times 2 \times 20 \\ &= \end{aligned}$$

i 180

ii 16

iii 495

iv 2600

v 440

vi 900

vii 860

viii 528

ix 14 400

x 1080

16 a The number $2904 = 2^3 \times 3 \times 11^2$.
Explain why 8 is a factor of 2904.

b Write down the first ten factors of 2904 in order of size.

17 a Write 308 as a product of prime factors.

b Use your answer to part **a** to write all of the factors of 308.

18 a Work out 7×13 in your head.

b Write 364 as a product of prime factors.

c Write 3080 as a product of prime factors.

d The teacher simplified the fraction $\frac{350}{616}$ like this:

$$\frac{350}{616} = \frac{2 \times 5^2 \times 7}{2^3 \times 7 \times 11} = \frac{5^2}{2^2 \times 11} = \frac{25}{44}$$

Explain this method.

e Use this method to simplify these fractions.

i $\frac{364}{3080}$

ii $\frac{126}{150}$

iii $\frac{210}{252}$

explanation 6a

explanation 6b

19 a Write each number as the product of prime factors.

$$80 = \square \times \square \times \square \times \square \times \square$$

$$24 = \square \times \square \times \square \times \square$$

b Circle the common factors of 80 and 24.

c Multiply the common factors together to find the highest common factor (HCF).

20 a Write 60 as a product of prime factors.

b Write 72 as a product of prime factors.

c Write the lowest number that contains all the factors in parts **a** and **b**.

d Write the lowest common multiple of 60 and 72.

21 a Write 12 and 15 as products of prime factors.

b Find the highest common factor of 12 and 15.

c Find the lowest common multiple of 12 and 15.

22 Find the prime factors of the numbers in each group and use them to find

i the highest common factor

ii the lowest common multiple

a 25, 30

b 32, 48

c 36, 45

d 55, 66

e 84, 96

f 130, 165

g 30, 60, 90

h 12, 15, 18

i 28, 84, 147