Y10 Foundation Algebra

1 Write down: **i** the next number and **ii** the term-to-term rule for sequences **a** and **b**.
a 23, 17, 11, ... **b** 2.4, 3.7, 5.0, ...

2 **a** Draw x- and y-axes from −4 to 4.
b Plot and label the points $A(-3, 1)$, $B(0, 4)$ and $C(2, 2)$
c $ABCD$ is a rectangle. Mark point D on your diagram.
d Write down the coordinates of D.

3 John takes t minutes to cycle to school.
a It takes him three times as long to walk to school. Write down, in terms of t, how long it takes him to walk to school.
b When John goes to school by bus, it takes him 10 minutes longer than when he cycles.
Write down, in terms of t, how long it takes him to go to school by bus.
c One week John cycles to school on two days and goes by bus on three days. Write down, in terms of t, the total time he spends travelling to school that week.
Simplify your answer as far as possible.
d If t = 14, use your answer to **c** find the total time that John spends travelling to school that week.

4 The cost, in pounds, of hiring a cement mixer is worked out using the rule:

multiply the number of days by 6 and add 15

a Write the rule as a formula to find the cost, C, when the cement mixer is hired for n days.
b Use your formula to find the cost of hiring the cement mixer for 7 days.
c Geoff was charged £81 for the hire of the cement mixer. For how many days did he hire it?

5 Solve each of the following equations.

a $3x + 7 = 13$ **b** $\frac{c}{2} = 8$ **c** $5q = 2q - 12$ **d** $6k - 13 = 4k + 5$

6 **a** Copy and complete this table of values for $2x + y = 4$

x	−2	0	3
y			

b Draw the graph of $2x + y = 4$ for values of x from −2 to 3.

7 Write down the equation of the line which goes through the points (3, 3) and (−5, −5).

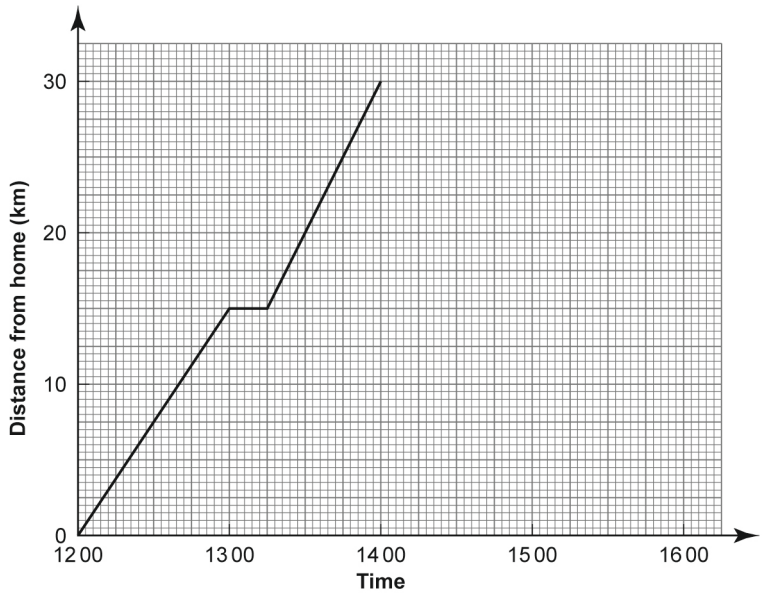
8 Mark thinks of a number, multiplies it by 4 and adds 3.
The answer is 27.
Write down an equation and solve it to find Mark's number.

9 **a** Write down all of the whole number values of x, such that $-5 < x \leq 3$
b Represent the inequality $-5 < x \leq 3$ on a number line.

10 The nth term of a sequence is $7n - 3$
Write down the first three terms of the sequence.

11 Factorise:
a $12a + 8b$ **b** $xy - 2x$ **c** $2k^2 + 6k$ **d** $3pq^2 - 12p^2r$

12 Ranvir goes for a cycle ride. The distance–time graph shows her ride.



She sets off from home at 12 00 and has a flat tyre at 14 00.
During her ride she stops for a rest.

a **i** At what time does Ranvir stop for a rest?
ii At what speed does she travel before her rest?

It takes Ranvir 30 minutes to repair the flat tyre. She then cycles home at 20 km per hour.

b Copy the distance–time graph and complete it to show Ranvir's journey home.

13 Remove the brackets and then simplify:

a $3(5x + y) + 2(3y - 2x)$ **b** $5(2m + 3) - 3(4 - m)$

14 Here are the first five numbers of a sequence:

3, 9, 15, 21, 27

a Write down the next two numbers in the sequence.
b Write down, in words, the term-to-term rule to continue this sequence.
c Write down an expression for the nth term of this sequence.
d What will the 20th term of the sequence be?

15 Solve the inequality $6y - 4 \leq 2y + 7$

16 Solve the following equations:

a $4(a + 3) = 6(a - 1)$ **b** $\frac{x+1}{2} - \frac{2x-3}{5} = 1$

17 Starting with $x = 4$, use a trial and improvement method to find, correct to one decimal place, a solution to the equation $x^3 + x = 84$

Show all your working.

18 a Copy and complete the table for $y = x^2 - 2x - 2$

x	−2	−1	0	1	2	3	4
y	6		−2			1	

b Draw x- and y-axes with the x-axis from −2 to 4 and the y-axis from −4 to 6. On the axes, draw the graph of $y = x^2 - 2x - 2$ for values of x from −2 to 4.

c Write down the equation of the line of symmetry of the graph.

d Write down the coordinates of the minimum point on the graph.

e Use your graph find the values of x when $y = 0$.

Y10 Foundation Essential skills

1 A three-digit number is multiplied by a two-digit number.
How many digits could your answer have? Explain.

2 Peter says that half a number is always less than the number itself.
Is he correct? Explain your answer.

3 A teacher said to a student:

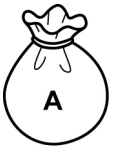
'To the nearest per cent, $\frac{1}{7}$ is 14%'

The student said:

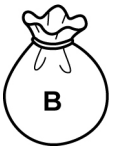
'So, to the nearest per cent, $\frac{2}{7}$ must be 28%'

Show that the student is wrong.

4 I have two bags of counters.
Bag A contains 8 red counters and 12 yellow counters.



Bag B contains 7 red counters and 9 yellow counters.

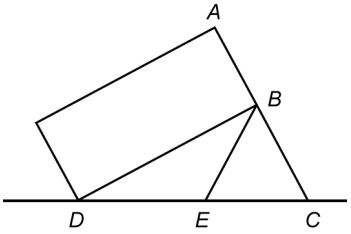


I am going to take a counter at random from either Bag A or Bag B.

Which bag will give the higher probability of choosing a red counter?

Explain your answer.

5 The diagram shows a rectangle just touching an equilateral triangle BCE so that ABC is a straight line.



What kind of a triangle is BED?
Explain your answer fully.

6 Madhav wanted to calculate $(14 \times 3)^2$
He pressed these buttons on his calculator:

He got the answer 126, which is not correct.

a Explain what is wrong with Madhav's method.

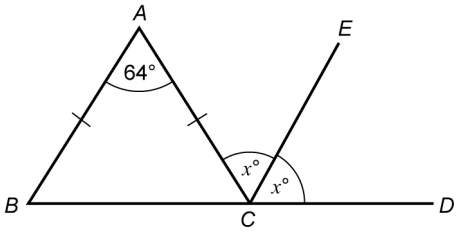
b What is the correct answer?

7 **a** Look at this equation:
$p + 2 = q - 3$
Which of p and q is greater and by how much?

b Look at this equation:
$5 - c = 3 - d$
Which of c and d is greater and by how much?

8 A kilogram of salmon costs £6.25.
Niki buys 4.2 kg of salmon for a party.
She is told it will cost £23.75.
Explain how you can easily see that this is not correct.

9 In the diagram, BCD is a straight line.
Angles ACE and ECD are equal.
By finding the value of x, show that AB and CE are not parallel.



10 Explain why a number which ends in '3' cannot be a multiple of 4.

11 The ratio of boys to girls in Josh's drama club is 1 : 3.
Josh says this means that one-third of the drama club members are boys.
Is he correct?

Explain your answer.

12 Geoff calculated that the mean age of the members of his badminton club was 16 years 8 months, and the range of their ages was 2 years 1 month.
A new member, aged 14 years 10 months, joins the club.

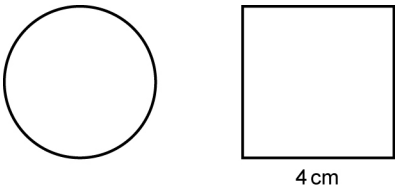
a Will the mean age of the members increase, decrease, stay the same, or is it impossible for you to tell?

Explain your answer.

b Will the range of ages increase, decrease, stay the same, or is it impossible for you to tell?

Explain your answer.

13 The circumference of the circle and the perimeter of the square are equal.
Calculate the radius of the circle.
Show your method.



14 Show that $3^2 + 2^3 = (3^2)^2 - 4^3$

15 Look at these expressions

$6y - 4$	$2y + 3$
First expression	Second expression

What value of y makes the first expression **twice** as great as the second expression?
Show your working.

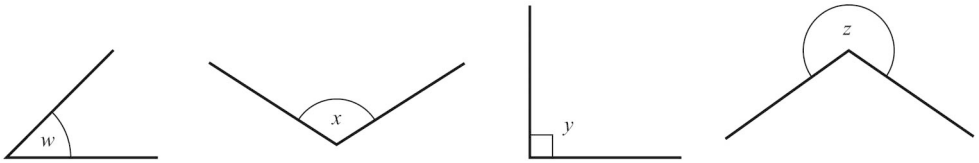
16 Holly wrote the following:

$$\frac{1}{p} + \frac{1}{q} = \frac{1}{p+q}$$

Show that Holly's statement is not correct.

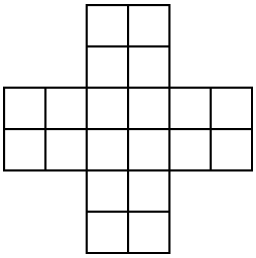
Y10 Foundation Geometry

1



Which of the angles shown is: **a** an obtuse angle **b** an acute angle **c** a reflex angle?

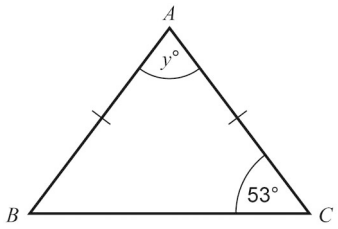
2 Make four copies of this diagram.



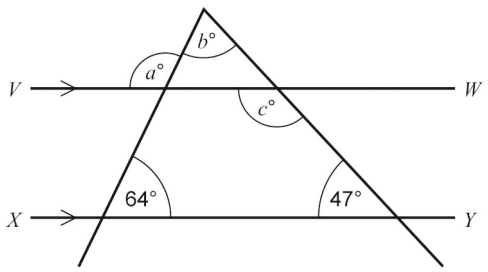
On each copy shade 4 squares to make:
- **a** a shape with 4 lines of symmetry
- **b** a shape with only 2 lines of symmetry
- **c** a shape with rotational symmetry of 4, but different from your shape in **a**
- **d** a shape with no rotational symmetry.

3 Zara needs one-and-a-quarter pounds of flour to make a cake. She has a 500 gram bag of flour. Will she have enough flour? Explain your answer.

4 In triangle ABC, $AB = AC$ and angle C = 53º
- **a** Write down the special name for triangle ABC.
- **b** Work out the value of angle y.



6 The lines VW and XY are parallel. Find the values of angles a, b and c.



6 Copy the axes and the shape Q.

a Reflect Q in the y-axis. Label your image A.

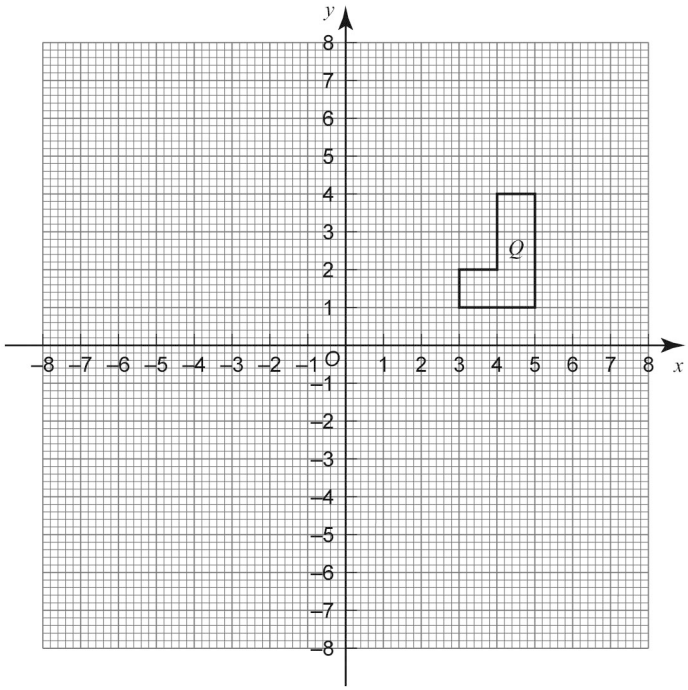
b Rotate Q through 90º clockwise about the origin.

Label your image B.

c Draw an enlargement of Q, using a scale factor of 4 and a centre of enlargement (6, 4). Label your image C.

d Translate Q through the vector $\begin{pmatrix} -7 \\ 4 \end{pmatrix}$

Label your image D.

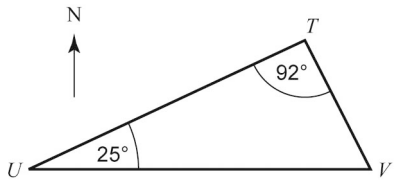


7 The diagram shows three airports U, T and V. V is due east of U.
Angle VUT is 25º and angle UTV is 92º.

a What is the bearing of T from U?

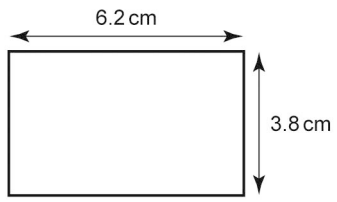
b Calculate the angle UVT. Show your working.

c Calculate the bearing of T from V.



8 Find the area of each of these shapes.

a



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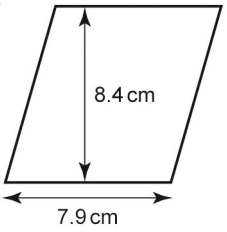

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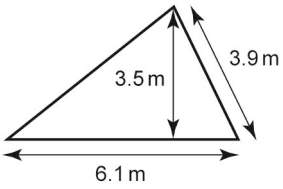

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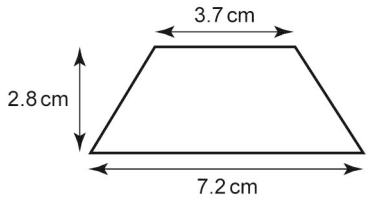
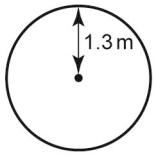


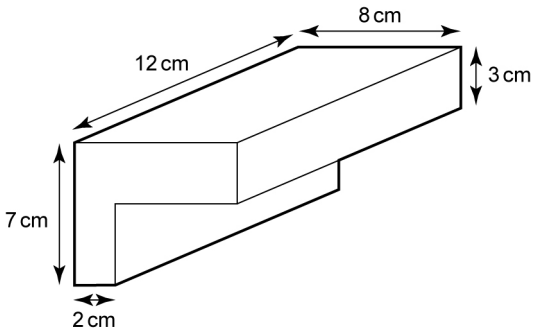
e



9 The diagram shows a prism with a cross-section in an L-shape.

Find:

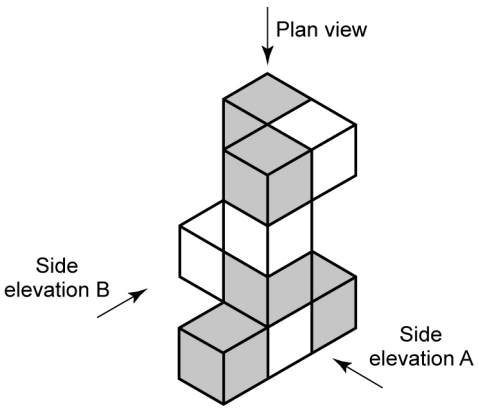
a the area of the L-shaped cross-section
b the volume of the prism
c the surface area of the prism.



10 Henry completed a 30 km marathon in 3 hours 20 minutes.
What was his average speed in kilometres per hour?

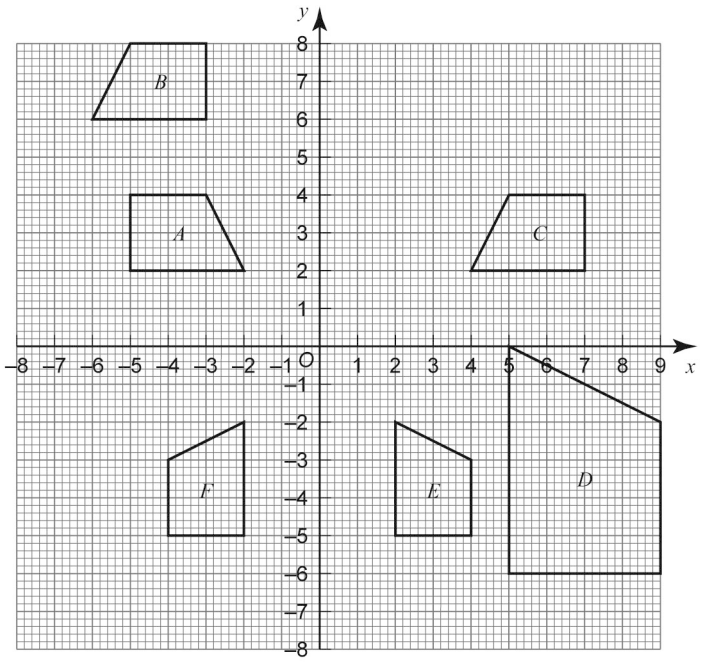
11 The diagram shows a model made with nine cubes.
Five of the cubes are grey. The other four cubes are white.
Draw each of the following, shading the correct cubes:

a the side elevation A
b the side elevation B
c the plan view.



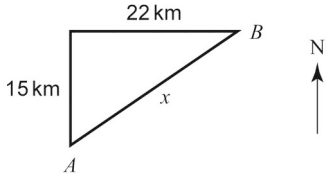
12 Describe fully the transformation that maps shape:

a A on to F
b B on to C
c E on to D
d E on to A
e A on to C.

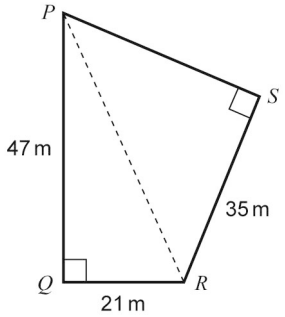


13 **a** Construct a triangle ABC with AB = 11 cm, AC = 8 cm and BC = 9.5 cm
b Construct the locus of points 5 cm from A.
c Construct the locus of points equidistant from BA and BC.
d Label the point P inside triangle ABC, where the two loci intersect.
e Measure and write down the length of PC.

14 A ship sails 15 km due North from point A and then 22 km due East to point B. How far is point B from the ship's starting point?



15 The diagram shows a park $PQRS$.
PQ is 47 m long.
QR is 21 m long.
RS is 33 m long.
Angles PQR and RSP are right angles.
There is a path PR running across the park.



a Calculate the length of the path, PR.
b Calculate the length of the side of the park, PS.