National 4

Added Value

Calculator

Preparation Booklet

Algebra: Linear Equations and Simplifying

Core skills:

Question 1.

Multiply out the brackets:

   a) $3(x + 1)$ b) $5(y - 3)$ c) $7(9 - x)$ d) $2(4 + y)$

Question 2.

Simplify and solve:

   a) $4x + x + 12 = 22$ b) $2y + 18 + 3y = 38$

   c) $5m - m - 9 = 3$ d) $x + 60 + 2x - 30 = 180$

Question 3.

   a) $9a + 3 = 2a + 17$ b) $8x + 4 = 5x + 28$

   c) $13 + 20y = 11y + 76$ d) $37 + 2c = 100 - c$
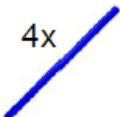
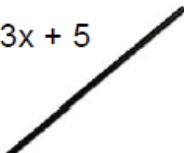   e) $2(x + 3) = x + 16$ f) $4(x + 6) = x + 36$

In Context:

Question 1.

The straws in each pair are equal in length. All measurements are in centimetres. For each pair:

   i)   Write an equation
   ii)   Solve the equation
   iii)   Find the length of the straws.

a) 4x   3x + 5   b)

30 – x   2x

Question 2.

Lisa is making pendants in the shape of stars out of wire.

1 star

5 pieces of wire

2 stars

10 pieces of wire

a) Copy and complete the table.

No of stars (s)	1	2	3	4		11
No of pieces of wire (w)	5					

b) Create the formula connecting s and w.

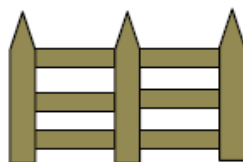c) If Lisa is making 16 stars how many pieces of wire does she need?

Question 2.

Joe is building a fence.

2 fence posts

3 panels

3 fence posts

6 panels

a) Copy and complete the table.

No of fence posts (F)	2	3	4	5		20
No of panels (P)	3					

b) Create the formula connecting **F** and **P**.

c) Joe has 25 panels,   (i)   how many fence posts does he need?
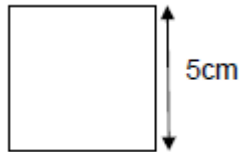
                                    (ii)   how many panels will he have left over?

Area

Core skills:

Question 1.

Find the area of this square

5cm

Question 2.

Find the area of a rectangle which has length 18 cm and breadth 6 cm.

Question 3.

Find the area of a circle which has radius of 9 cm.

Question 4.

Find the area of a triangle which has a base of 14 cm and height of 17 cm.
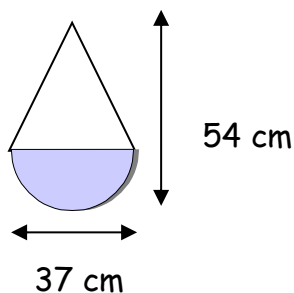
In Context:

Question 1.

Sam's desk top is 93 cm long and 64 cm broad.

Calculate its area.

Question 2.

Miss Jamieson is painting a pixie on the wall of nursery class. The face of the pixie is a semi-circle and the hat is a triangle. Calculate the area of the painting.

54 cm

37 cm

a) Calculate the area of the triangle.
b) Calculate the area of the semi-circle
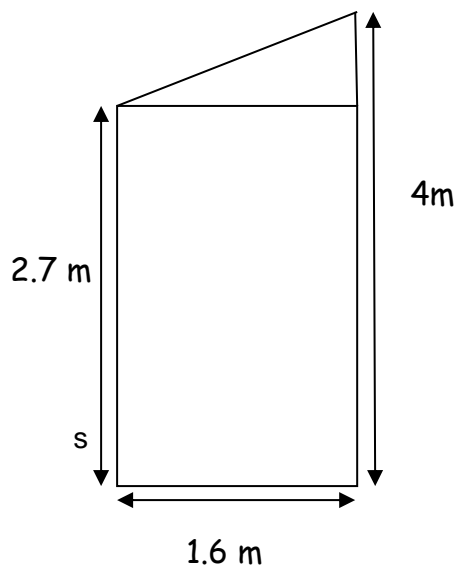c) Calculate the total area of the painting.

Question 3.

Ben is building a new shed. The side of the shed if made up of a square and an isosceles triangle. The dimensions are shown below:

13 m

8 m
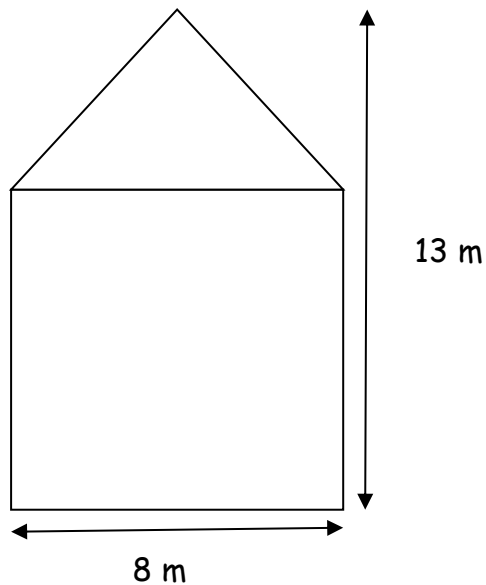
a) Calculate the area of the square.
b) Calculate the area of the triangle.
c) Calculate the total area of the shed.

Question 4.

The door in to Kenny's loft is made up of a rectangle and a right angled triangle to avoid being blocked by the ceiling, see the diagram below for the dimensions

4m

2.7 m

s

1.6 m

a) Calculate the area of the rectangle.
b) Calculate the area of the triangle.
c) Calculate the total area of the door.

Distance, Speed, and Time

Core skills:

Question 1.

Find the missing value:

  a) Speed = 70 km/hr, Time = 5 hours; Distance = …….?
  b) Distance = 150 km/hr, Time = 5 hours; Speed = …….?
  c) Distance = 200 km/hr, Speed = 40 km/hr; Time = …….?

In Context:

Question 1.

A lorry travels 100 miles in 2 hours 30 minutes. Find its average speed in miles per hour.

Question 2.

Emily has learnt to fly a light aircraft and on her latest trip she flew with an average speed 150 km/hr for 337.5 km.

How long was she flying? (Give your answer in hours and minutes)

Question 3.

Hazel can walk to school in 30 minutes. The distance from her house to the school is 2 miles.

  a) Calculate Hazel's average speed in mph.

  She can cycle twice as fast as she can walk.

 b) How many minutes will it take her to cycle to school?

Question 4.

A message in a bottle floats harmlessly on the surface of the ocean at a steady speed of 0.4 kilometres per hour. It floated for 130 hours before being picked up by a boy on the beach. How far will it have floated?

Pythagoras' theorem

Core skills:

Question 1.

Calculate the value of the letter in each diagram, correct to 1 d.p.

a
36
a
15

b
60
b
21

c
19
14
c

d
52
d
30

e
23
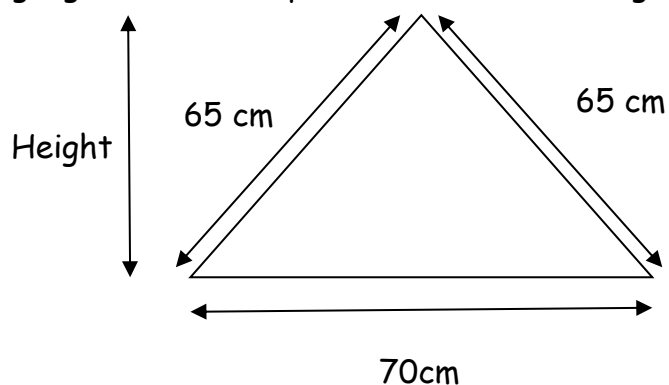10
e
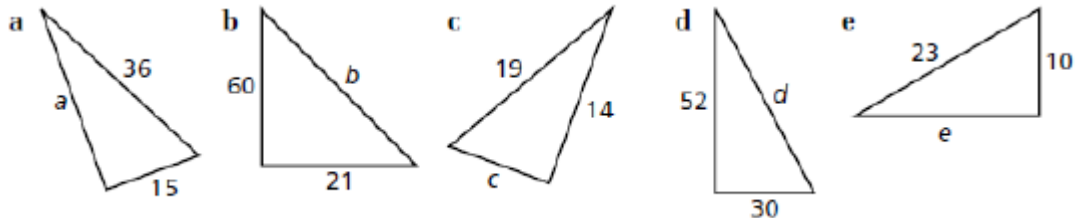
In Context:

Question 1.

The local Scotland Rugby Supporters Club has ordered a new flag.

80 cm

170 cm

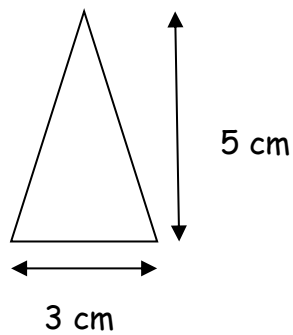Calculate the length of one of the white diagonals.

Question 2.

A warning sign is in the shape of an isosceles triangle.

Height

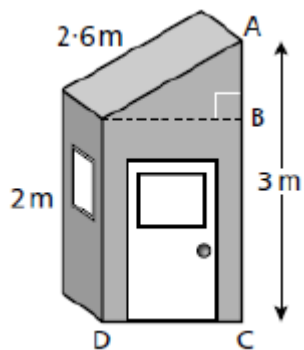65 cm

65 cm

70cm

Calculate the height of the sign.

Question 3.

An earring in the shape of an isosceles triangle is made from silver wire.
The dimensions of the earring are shown on the diagram below.

5 cm

3 cm

Calculate the length of silver wire needed to make a **pair** of earrings.
Do not use a scale drawing.

Question 4.

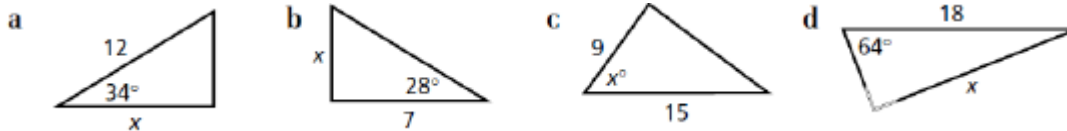Calculate the length of: a) AB   b) DC

Trigonometry

Core skills:

Question 1.

    a) For each triangle, decide which ratio will help you calculate x.

    b) Calculate x.

a 12 34° x

b x 28° 7

c 9 $x°$ 15

d 18 64° x

In Context:

Question 1.

A boat elevator is used to take a boat from the lower canal to the uppercanal.
The boat elevator is in the shape of a triangle.
The length of the hypotenuse is 111 meters.
The height of the triangle is 44 meters.

111 m   47 m $x°$
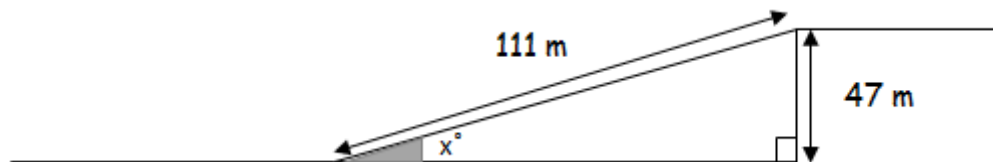
Calculate the size of the shaded angle x °.

Question 2.

Larry has invented a device for checking that ladders are positioned at the correct angle. His design for the device is given below.
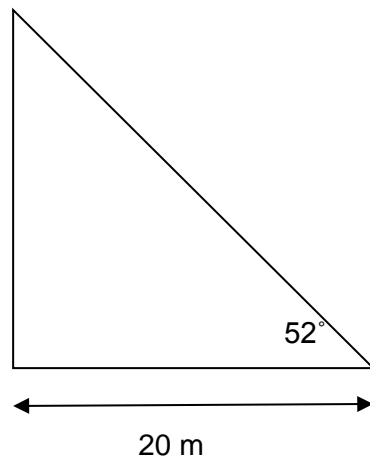
14 cm

Calculate the size of the shaded angle.

4 cm
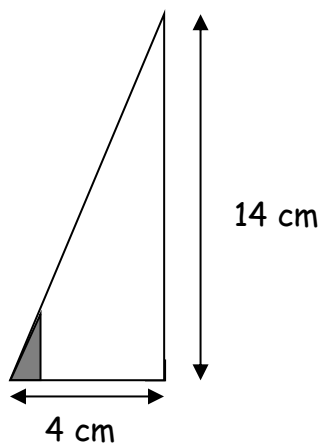
Question 3.

A surveyor has to calculate the height of a mobile phone mast.
From a point 20 meters from the base of the mast, the angle of elevation to the top is 52 °.
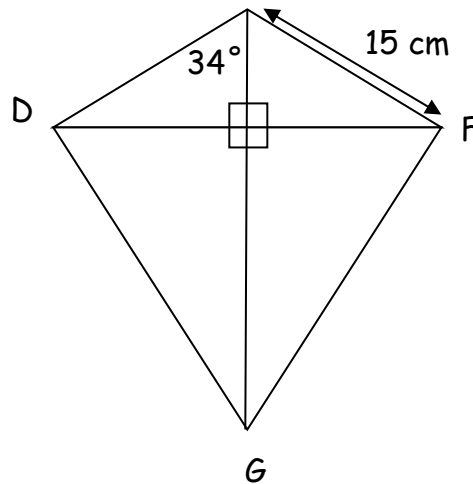

52°

20 m

Calculate the height of the mobile phone mast.
Round your answer to 1 decimal place.   Do not use a scale drawing.

Question 4.

DEFG is a kite:
   • angle DEG = 34 °
   • EF = 15 centimetres.

34°

15 cm
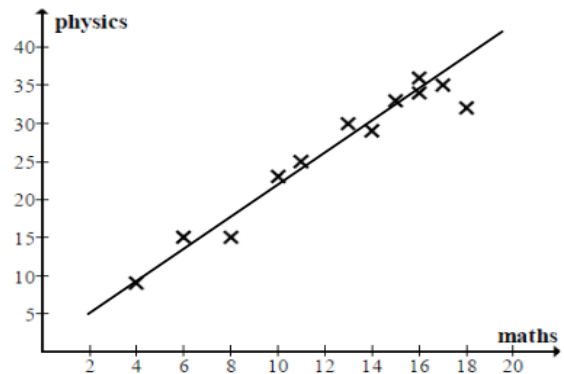
D

F

G

Calculate the length of DF

Scatter Graph

Core skills:

Question 1.

The scattergraph shows the marks obtained by 12 pupils in maths and physics tests.

a) Describe the relationship between the results in maths and physics.
b) Amanda scored 19 in maths. Use a line of best fit to estimate her physic mark.

In Context:

Question 1.

The table below shows the marks scored by pupils in French and Italian exams.

Pupil	A	B	C	D	E	F	G	H
French Mark	15	23	50	38	40	42	70	82
Italian Mark	28	31	62	54	45	55	85	95

a) Using these marks, draw a scattergraph.
b) Draw a best fitting line on the graph.
c) A pupil who scored 65 in his French exam was absent from the Italian exam. Use the line of best fit to estimate this pupil's Italian mark.
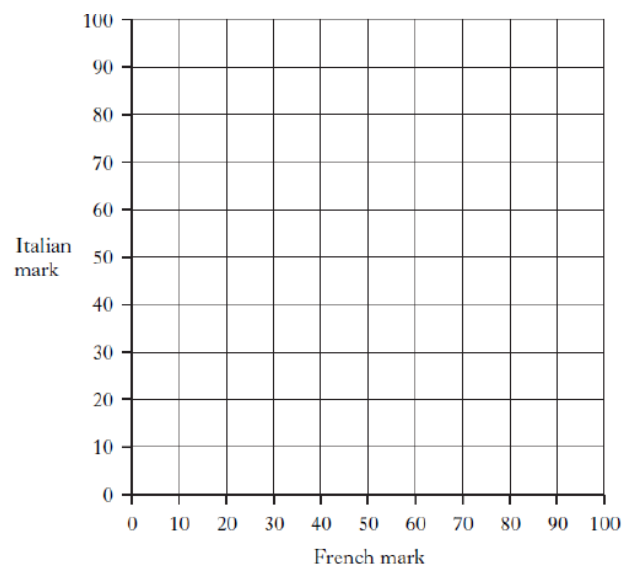
Question 2.

The number of hours of sunshine and the temperature were recorded for a week. The results are shown in the table.

a) Draw a scattergraph of these results.
b) Draw a best fitting line for this graph.
c) Using your line of best fit state the number of hours of sunshine if the temperature was 20°C.

Hours of Sunshine	Temperature(°C)
8	17
6.5	19
10	22
9	19
10	21
8	18
12	24

Question 3.

A teacher recorded the number of absences and end of term test mark for each student.

The table below shows the results.

Pupil	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Test Mark	34	28	32	26	24	28	34	36	30	32	30	24	28	36
Absences	0	7	3	6	5	3	4	2	6	4	1	6	5	1

a) Plot the results on a graph.
b) Draw a line of best fit through the points on the graph.
c) Use your line of best fit to estimate the mark of a pupil who had 8 absences.
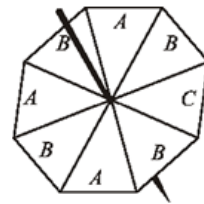
Probability

Core skills:

Question 1.

The diagram shows a fair spinner in the shape of a
rectangular octagon.
The spinner can land on A or B or C.
Marc spins the spinner.
Write down the probability that the spinner will land on A.

Question 2.

There are eight marbles in a bag. Four marbles are blue (B),
two marbles are red (R) and two marbles are green (G).

Steve takes a marble at random from the bag.

What is the probability that Steve will take a blue marble.

In Context:

Question 1.

Joshua rolls an ordinary dice once. It has faces marked 1, 2, 3, 4, 5 and 6.

Write down the probability that he gets

   a) a 6,
   b) an odd number,
   c) a number less than 3,
   d) an 8.

Question 2.

Emily has a bag of 20 fruit flavour sweets. 7 of the sweets are strawberry flavour, 11 are lime flavour, 2 are lemon flavour. Emily takes at random a sweet from the bag.

Write down the probability that Emily

  a) takes a strawberry flavour sweet,
  b) does not take a lime flavour sweet,
 c) takes an orange flavour sweet.

Question 3.

The police line up 10 people in an identity parade; only one of the people is the criminal. A witness does not recognise the criminal and so choses a person at random. What is the probability that:

  a) the criminal is chosen,
  b) the criminal is *not* chosen?

Question 4.

Some of the pupils in a class write down the first letter of their surname on a card; these cards are shown below:
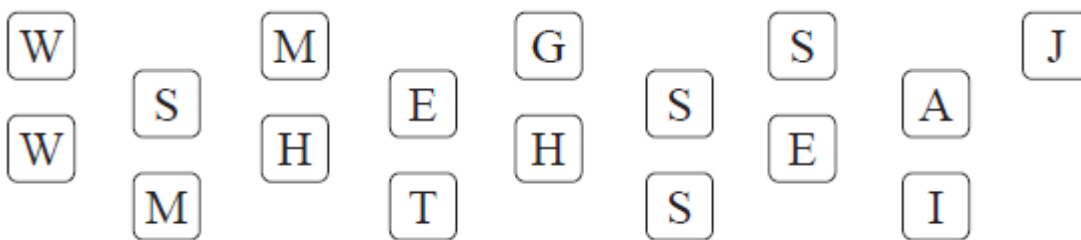
One of these cards is taken at random. What is the probability that the letter on it is:

  a) W,
  b) S or T,
  c) J or M,
  d) Not H,
  e) a vowel?