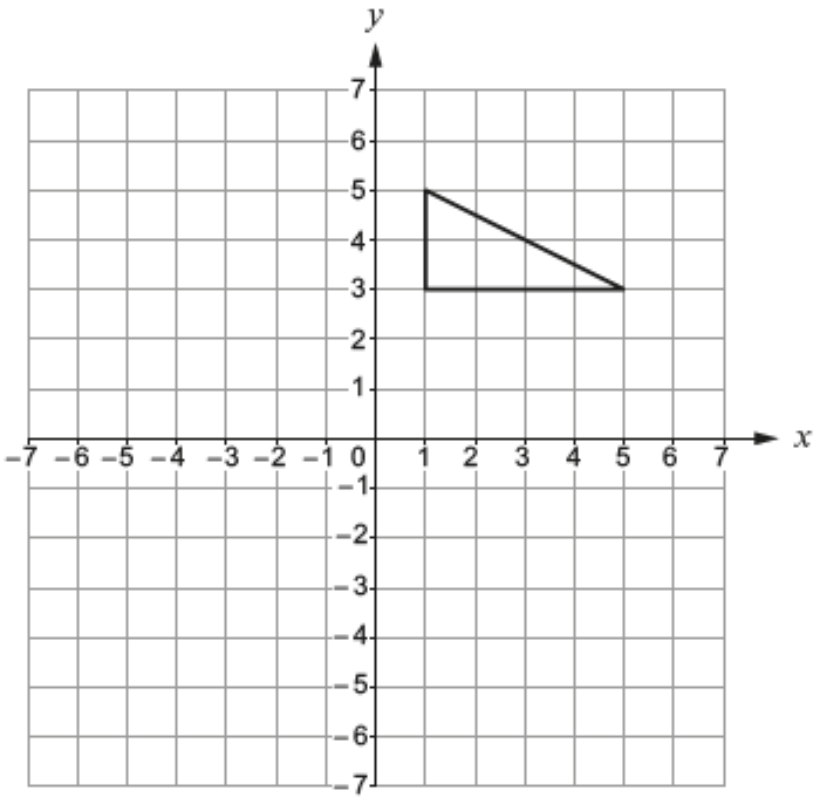
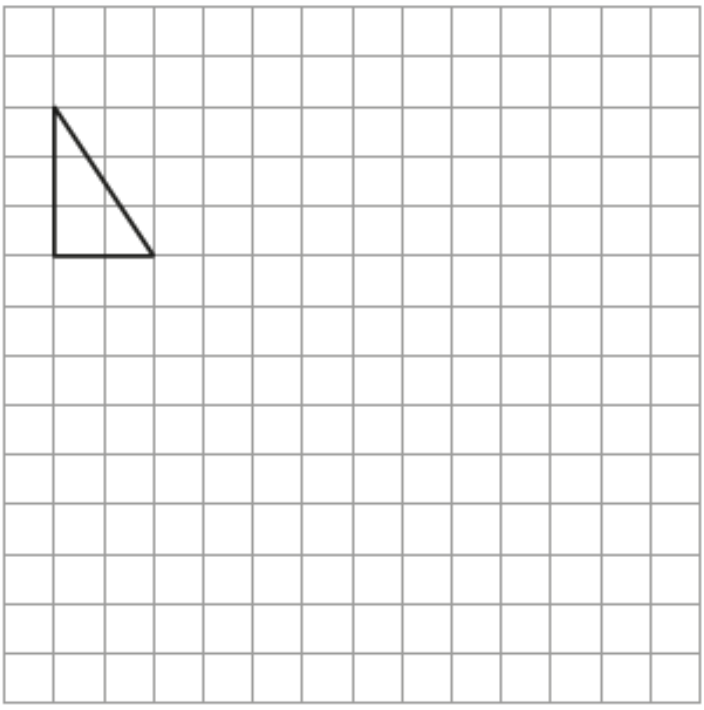
Shape and Measure

Maths Non-Calculator Past Paper Questions

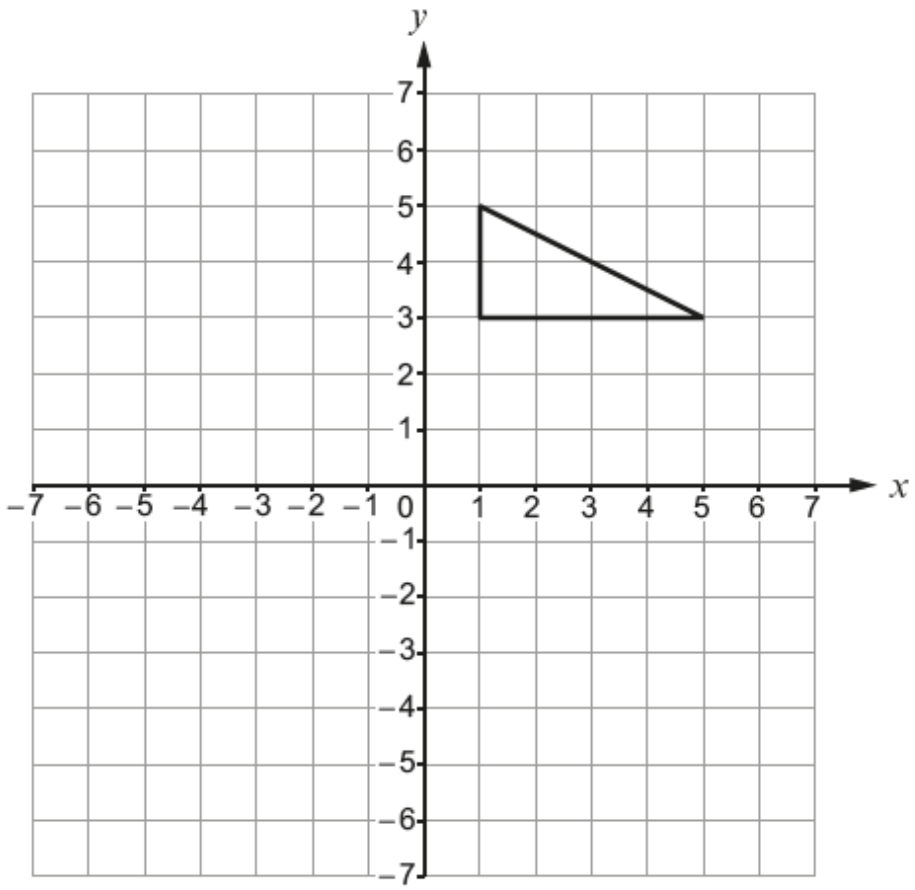
(a) Reflect the triangle below in the x-axis. [1]



(b) Enlarge the triangle below by a scale factor of 3. [2]



(c) Translate the triangle below 3 squares to the left and 2 squares down. [1]



In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

In the diagram below,

- *ABCD* is a rectangle, and
- *PQ* is parallel to *AD*.

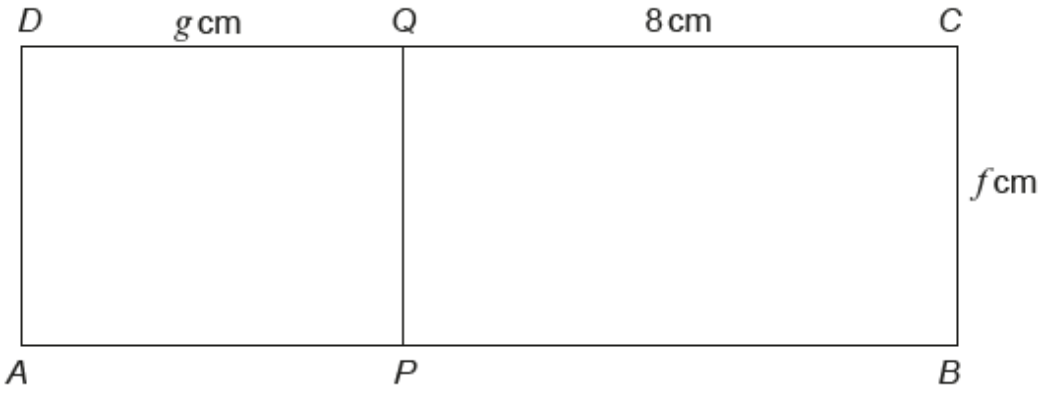


Diagram not drawn to scale

The area of *ABCD* is 52 cm^2.
The area of *APQD* is 20 cm^2.

Calculate the values of f and g.
You must show all your working. [5 + 2 OCW]

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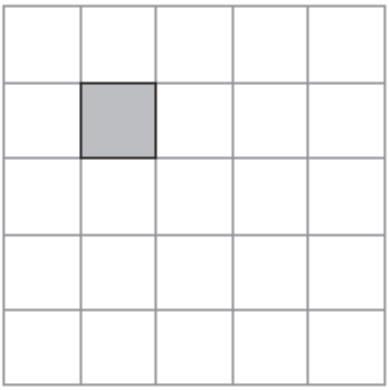
. In the following formulae, each measurement of length is represented by a letter.

Consider the dimensions implied by the formulae.
Write down, for each case, whether the formula could be for a length, an area, a volume or none of these.

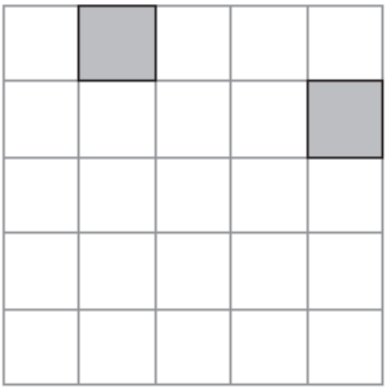
The first one has been done for you. [3]

Formula	Formula could be for
$d^3 - 3{\cdot}14r^2h$	volume
$d^2 + hw$	.....
$d + w + h$	.....
$2\pi r - \pi r^2$	.....
$(d + h)w$	.....
$d^3 + dwh$	.....

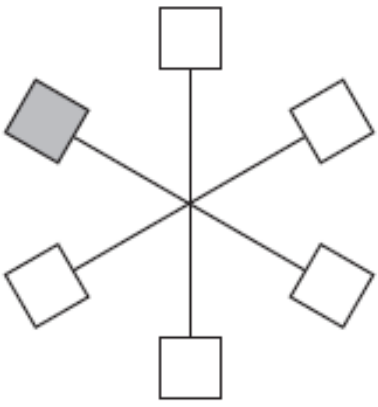
(a) Shade **one square** so that the diagram below has rotational symmetry of order 2. [1]



(b) Shade **two squares** so that the diagram below has rotational symmetry of order 4. [1]



(c) Shade **two squares** so that the diagram below has rotational symmetry of order 3. [1]



In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

In the diagram below, *ABCE* is a square and *CDE* is a right-angled triangle.
The length of *DE* is 4 cm and the area of triangle *CDE* is 14 cm^2.

Calculate the area of the **whole shape** *ABCDE*.
You must show all your working. [4 + 2 OCW]

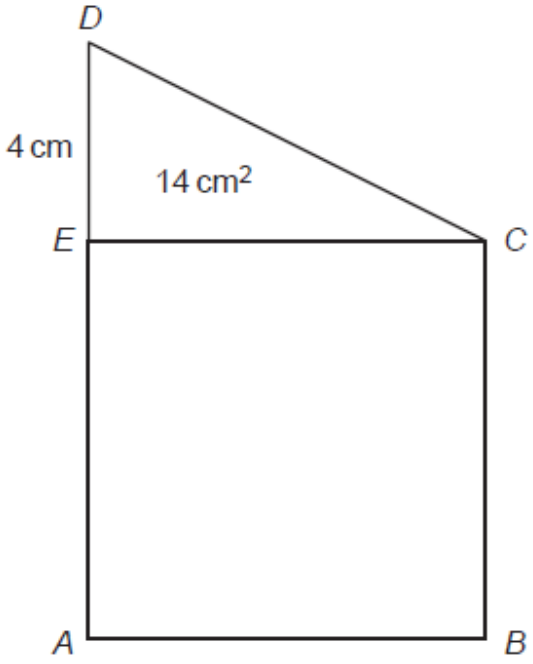


Diagram not drawn to scale

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ABCD is a rectangle.
AB is parallel to *EF*.
AC, *CE* and *DG* are straight lines.

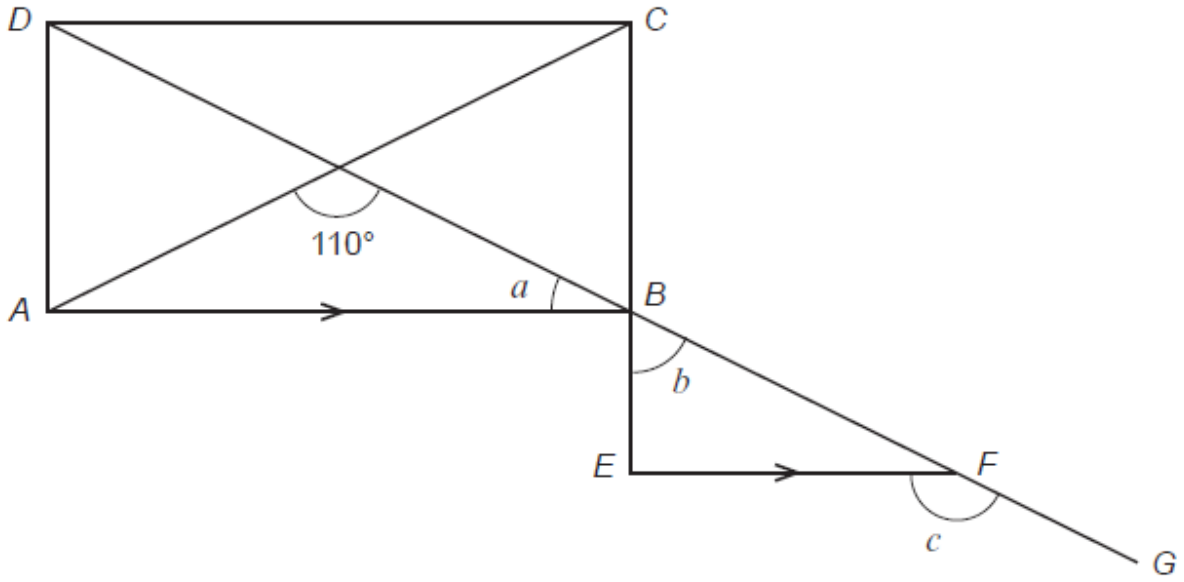

Diagram not drawn to scale

Find the size of each of the angles a, b and c. [4]

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A **regular** octagon with centre O is shown below.

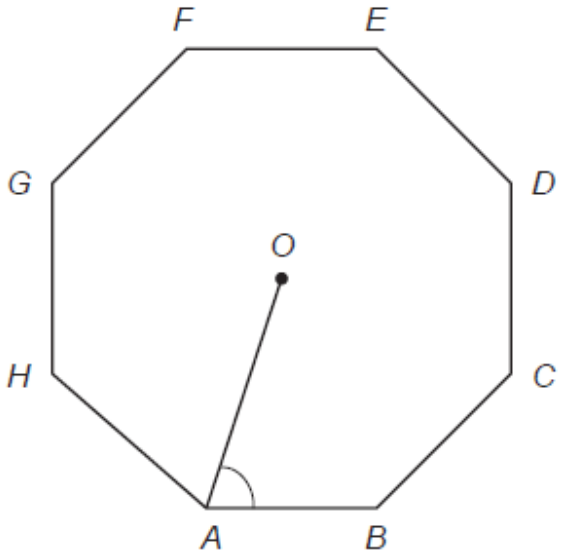

Diagram not drawn to scale

Calculate the exact size of $\hat{OAB}$.
You may choose to draw additional lines on the diagram to help you.
You must show all your working. [4]

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. *(a)* (i) A mass is written as 430 kg, correct to the nearest 10 kg.
Circle the **least** possible value of this mass. [1]

420 kg 425 kg 429·5 kg 426 kg 424·9 kg

(ii) A time period is written as 22 seconds, correct to the nearest second.
Circle the **least** possible value of this time period. [1]

22 s 20 s 21 s 21·5 s 21·4 s

(iii) A population is written as 85 people, correct to the nearest five people.
Circle the **least** possible value of this population. [1]

83 people 81 people 84 people 82 people 80 people

In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

A right-angled triangle *BCD* is joined to a rectangle *ABDE*, as shown below.

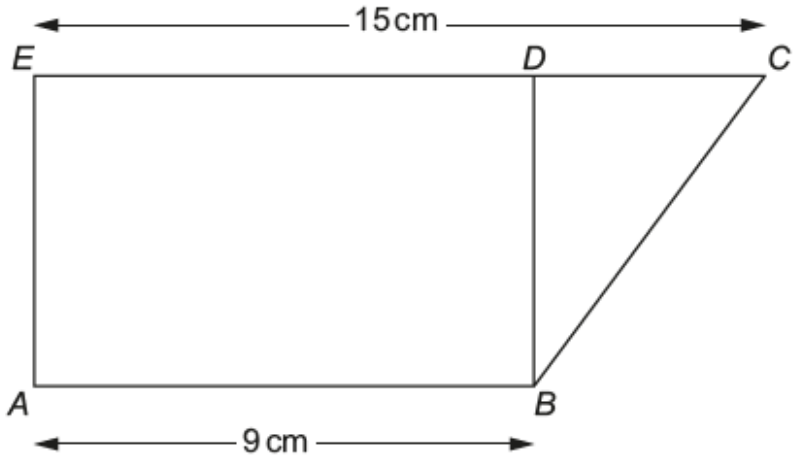

Diagram not drawn to scale

The area of the rectangle is 45 cm^2.

Calculate the area of the right-angled triangle.
You must show your working. [5 + 2 OCW]

A regular polygon has exterior angles of 45°.

(a) How many sides does this polygon have? [2]

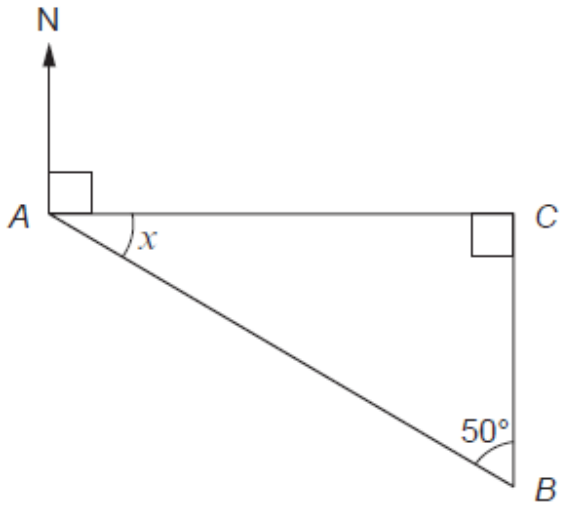

Diagram not drawn to scale

Calculate the size of angle x.
Hence, give the bearing of point B from point A. [3]

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x = ... ° Bearing of point B from point A = ... °

(a) What is the total mass when 534 g is added to 3·5 kg?
Circle the correct answer. [1]

4·034 g 4·034 kg 537·5 g 537·5 kg 884 g

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(b) What is the total length when 35 cm is added to 7·8 m?
Circle the correct answer. [1]

113 cm 42·8 m 42·8 cm 815 cm 815 m

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(c) How many mm^3 are there in 4 cm^3?
Circle the correct answer. [1]

0·4 mm^3 4 mm^3 40 mm^3 400 mm^3 4000 mm^3

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In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

The diagram below shows a rectangle *ABCF* and a trapezium *CDEF*.
AF = 7 cm, *ED* = 8 cm and the perpendicular distance between *FC* and *ED* is 6 cm.
The area of the rectangle *ABCF* is 91 cm^2.

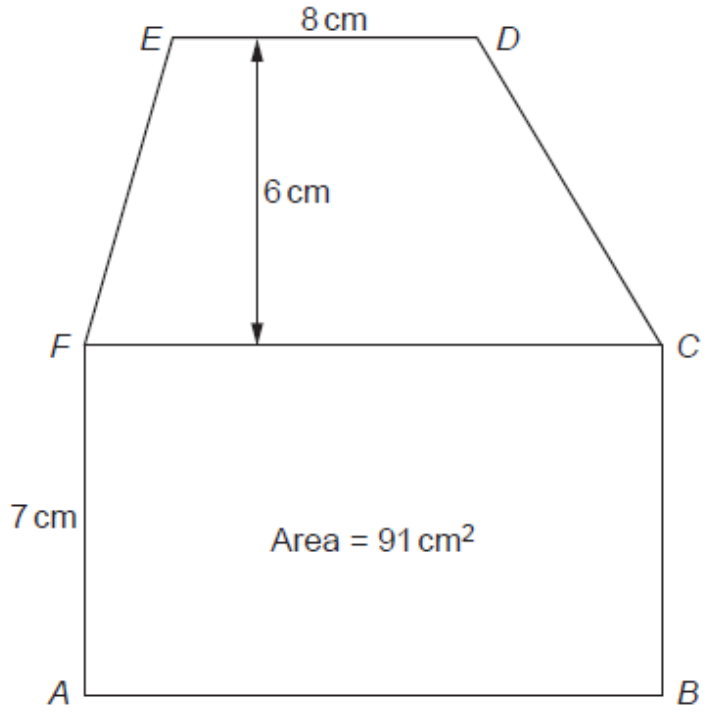

Diagram not drawn to scale

Calculate the area of the trapezium *CDEF*.
You must show all your working. [4 + 2 OCW]

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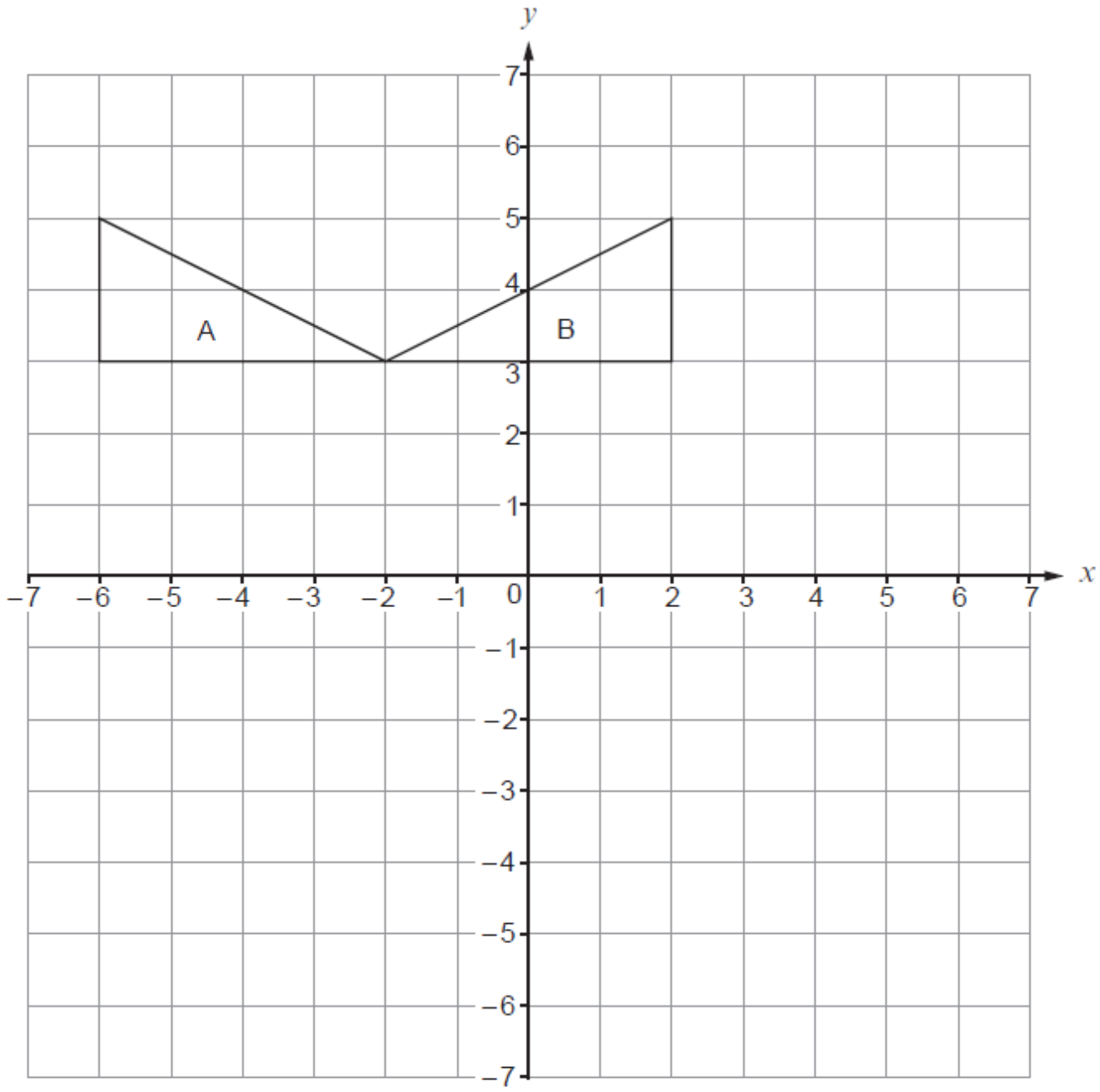
(a) Describe fully the single transformation that transforms triangle A onto triangle B. [2]



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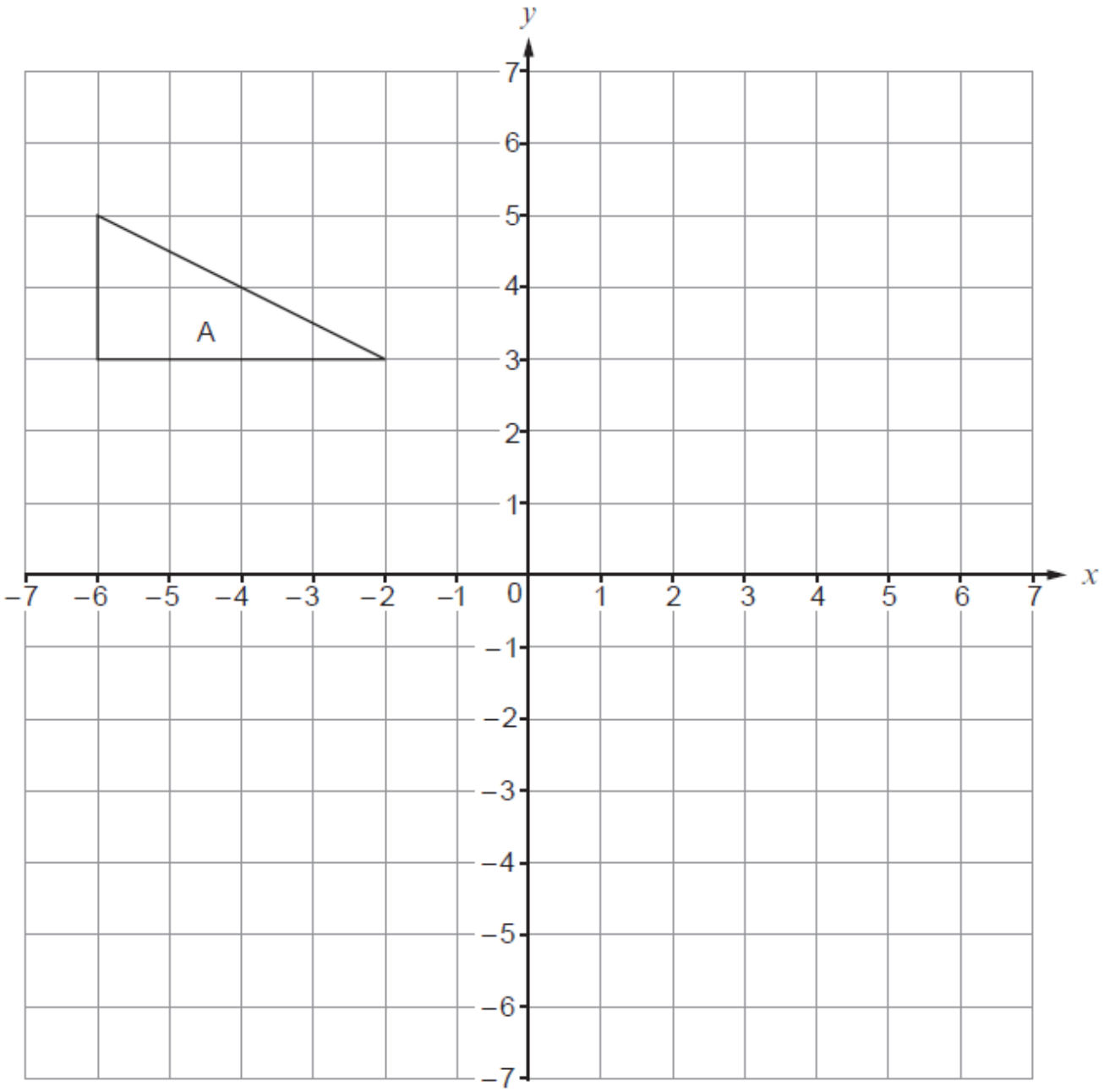
(b) (i) Translate triangle A using the column vector $\begin{pmatrix} 5 \\ -6 \end{pmatrix}$. [2]



(ii) Write down the column vector that will reverse the translation in part (i). [1]

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The exterior angle of a regular polygon is 36°.

(a) How many sides does the polygon have? [2]

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(b) Calculate the sum of all the interior angles of this regular polygon. [2]

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In the following formulae, each measurement of length is represented by a letter.

Consider the dimensions implied by the formulae.
For each case, write down whether the formula could be for a **length**, an **area**, a **volume** or **none of these**.

The first one has been done for you. [3]

Formula	Formula could be for
$3{\cdot}14r^2 - dw$	area
$w^3 + r^2d$	.....
$3w + 2d + h$	.....
$dhr + 5d^3$	.....
$4d + \pi r^2$	.....
$\frac{dwh}{r}$	.....

A cuboid has dimensions of 40 mm, 25 mm and 12 mm.
All of these measurements are correct to the nearest mm.

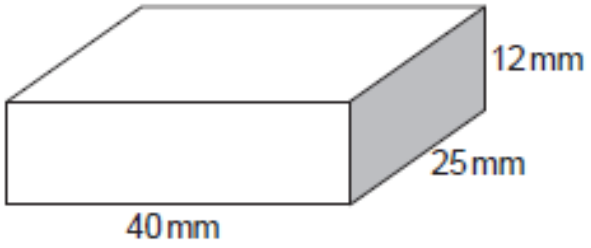

Diagram not drawn to scale

Four of these cuboids are stacked together as shown below.

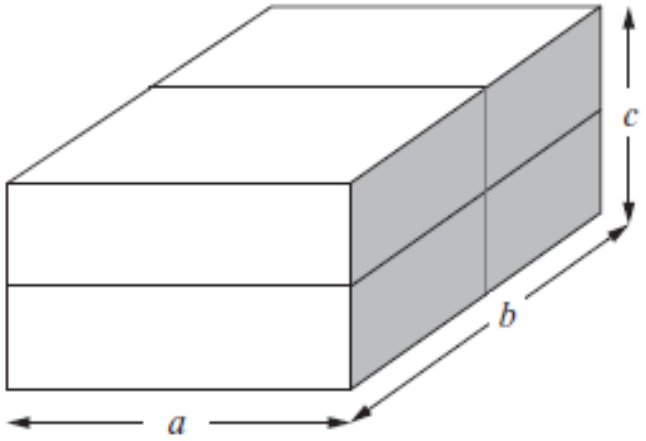

Diagram not drawn to scale

(a) Write down the **greatest** possible value of length a.
Give your answer in mm. [1]

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(b) Calculate the **greatest** possible value of length b.
Give your answer in mm. [1]

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(c) Calculate the **least** possible value of length c.
Give your answer in mm. [1]

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Shape and Measure

Maths Calculator Past Paper Questions

Circle either TRUE or FALSE for each of the following statements. [3]

A triangle with one angle equal to 70° could be an equilateral triangle.	TRUE	FALSE
A triangle with one angle equal to 70° could be an isosceles triangle.	TRUE	FALSE
A triangle with one angle equal to 70° could be a right-angled triangle.	TRUE	FALSE
An isosceles triangle could have one of its angles equal to 105°.	TRUE	FALSE
A right-angled triangle could have one of its angles equal to 105°.	TRUE	FALSE

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ABCDE is a regular pentagon with centre *O*.

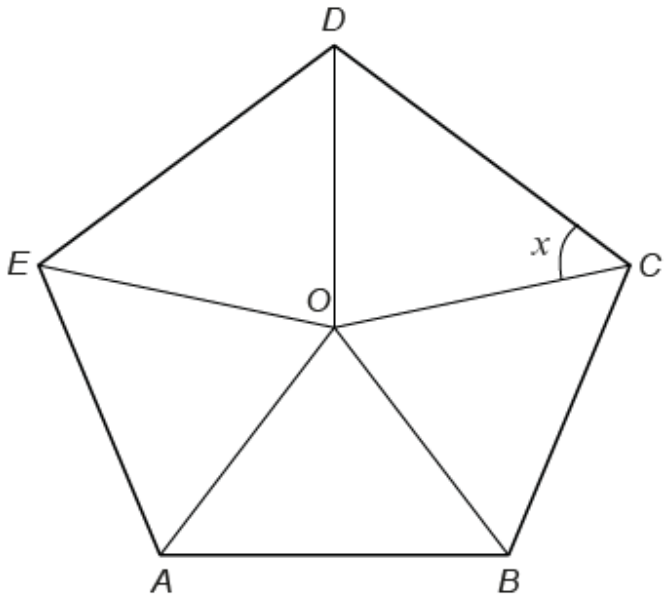

Diagram not drawn to scale

Calculate the size of angle x.
You must show all your working. [4]

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In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

ABCF is a rectangle.
CDEF is a trapezium.
BD is a straight line.

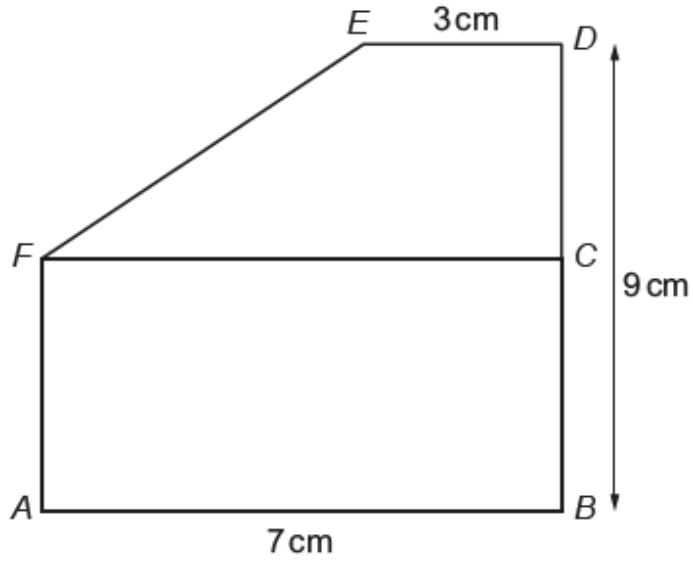

Diagram not drawn to scale

AB = 7 cm, *BD* = 9 cm and *DE* = 3 cm.

The perimeter of rectangle *ABCF* is 24 cm.

Calculate the **area** of the trapezium *CDEF*.
You must show all your working. [4 + 2 OCW]

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. A right-angled triangle *LMN* is shown below.
LN = 16·9 cm and *LM* = 6·5 cm.

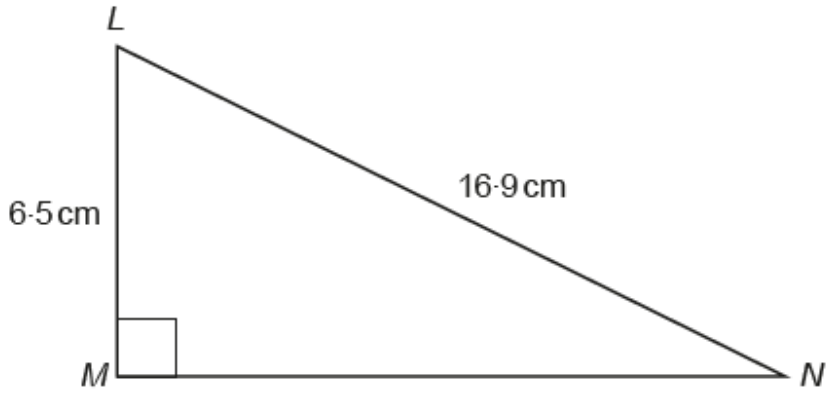

Diagram not drawn to scale

Calculate the length *MN*. [3]

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Calculate the length of the side QR in the triangle PQR shown below. [3]

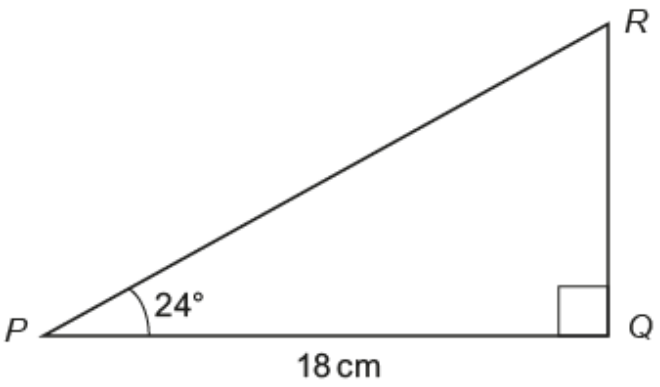

Diagram not drawn to scale

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The area of triangle ABD, shown in the diagram below, is $35\,cm^2$.
$AD = 5\,cm$ and $BC = 32\,cm$.
D is on the line AC, and BD is perpendicular to AC.

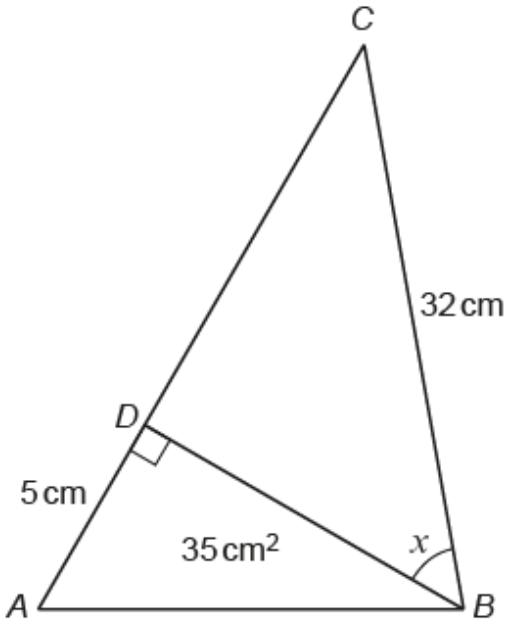

Diagram not drawn to scale

Calculate the size of angle x.
You must show all your working. [5]

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(a) Circle the longest time period from the list given below. [1]

180 minutes 4·5 hours 4 hours 45 minutes $4\frac{1}{4}$ hours $\frac{1}{6}$th of a day

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(b) Circle the longest distance from the list given below. [1]

30 000 mm 250 m 2 km 70 m 4 000 cm 2·4 km

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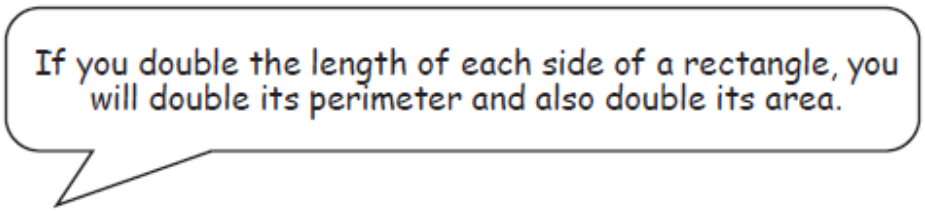
(c) Circle either TRUE or FALSE for each statement given below. [2]

STATEMENT		
7 kilometres is less than 5 miles	TRUE	FALSE
1 kilogram is less than 2 pounds (lb)	TRUE	FALSE
1 litre is less than 1 pint	TRUE	FALSE
8 litres is less than 900 cm^3	TRUE	FALSE

Catrin makes the following statement.



Is Catrin correct?
Show clearly, using an example, how you came to your decision. [5]

(a) The diagram shows two congruent triangles.
The coordinates of each vertex are shown.

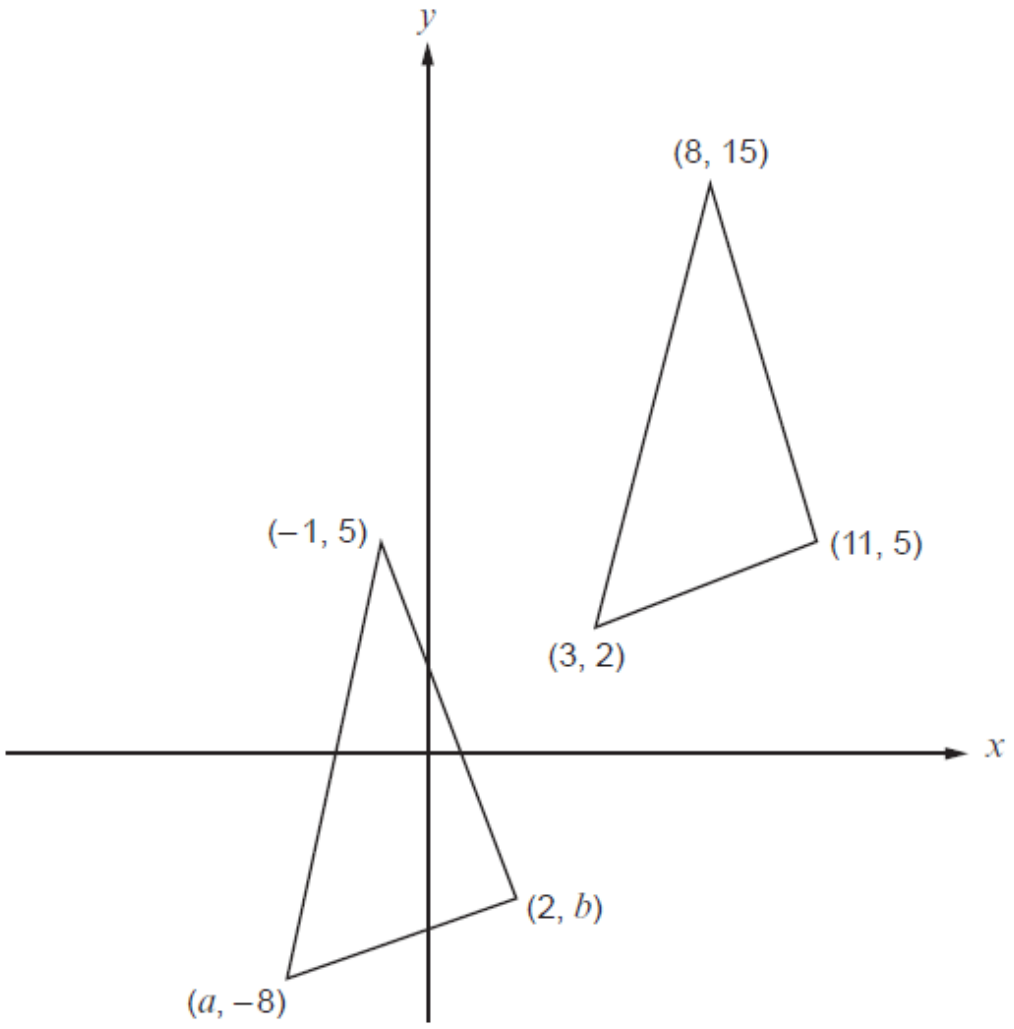


Diagram not drawn to scale

Find the value of a and the value of b. [2]

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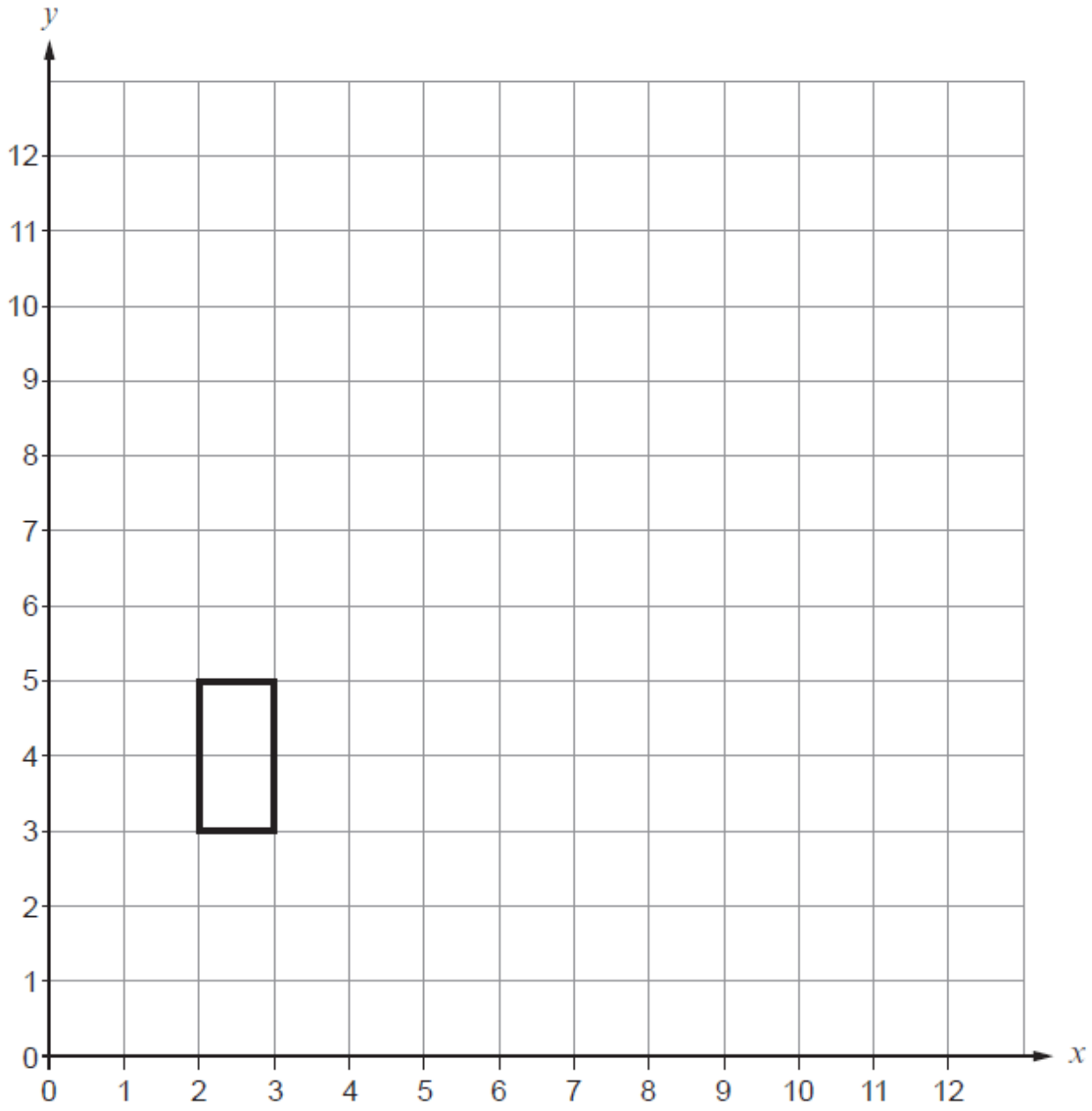
(b) Draw an enlargement of the rectangle below, using a scale factor of 3 and centre (1, 2).
[3]



Is it possible to draw a **right-angled** triangle with the measurements shown below?
You must use calculations (not a scale drawing) to support your answer.
You must show all your working. [4]

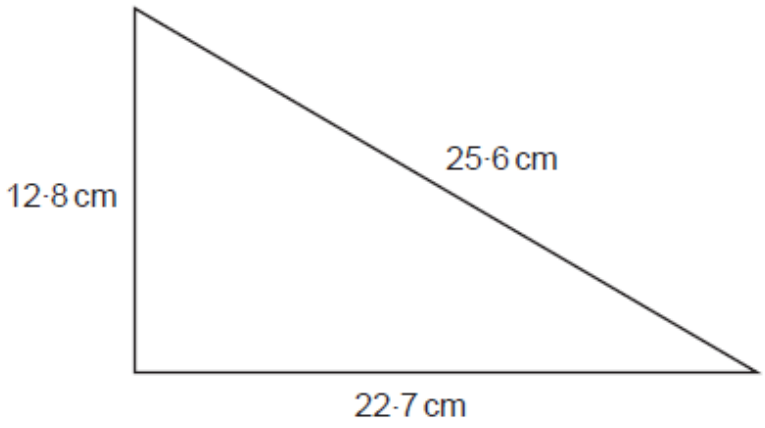


Diagram not drawn to scale

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PQR is a right-angled triangle.
$PR = 16{\cdot}7$ cm, $QR = 9{\cdot}6$ cm.

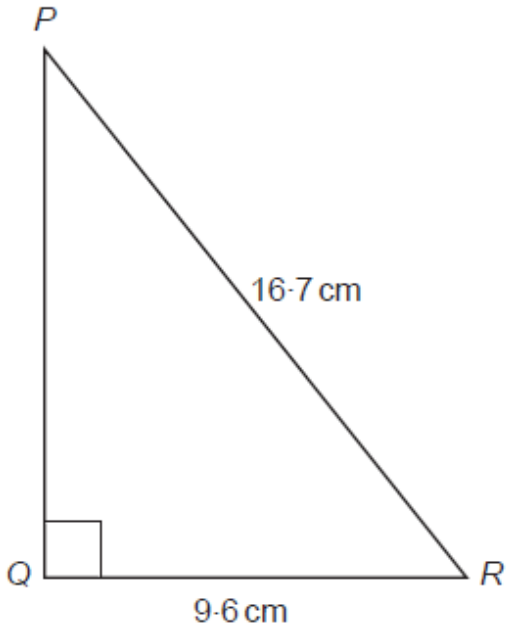

Diagram not drawn to scale

Calculate the size of $\hat{QPR}$. [3]

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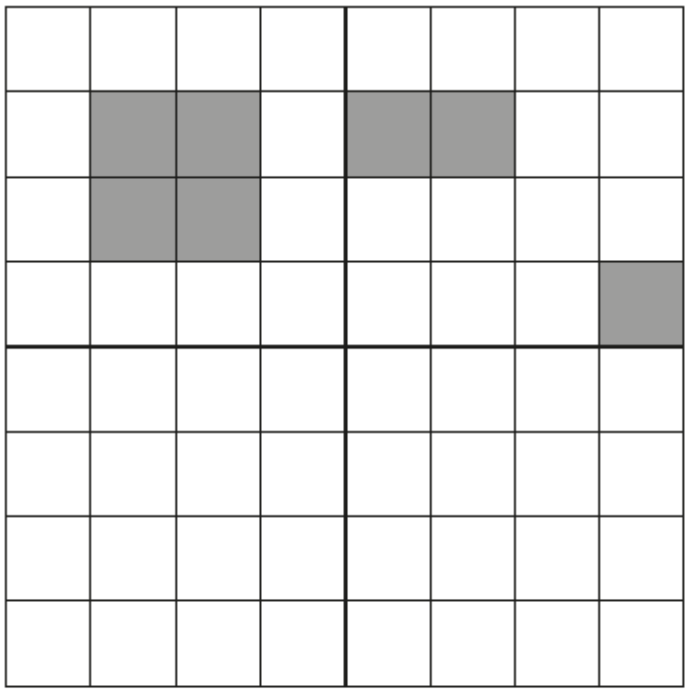
Shade the least number of squares in the lower two quadrants so that the grid has rotational symmetry of order 2. [3]

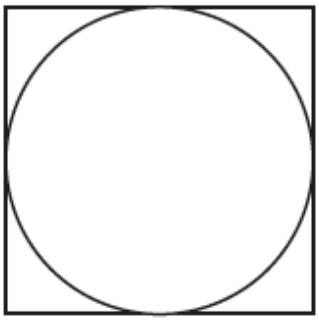


Circle either TRUE or FALSE for each statement given below. [2]

STATEMENT		
All equilateral triangles are congruent.	TRUE	FALSE
All squares with equal areas are congruent.	TRUE	FALSE
Circles with equal perimeters are congruent.	TRUE	FALSE
All regular octagons are congruent.	TRUE	FALSE

In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

A square has a perimeter of 80 cm.
A circle fits exactly inside the square, as shown in the diagram.



Calculate the circumference of the circle.
Give your answer correct to 1 decimal place.
You must show your working. [4 + 2 OCW]

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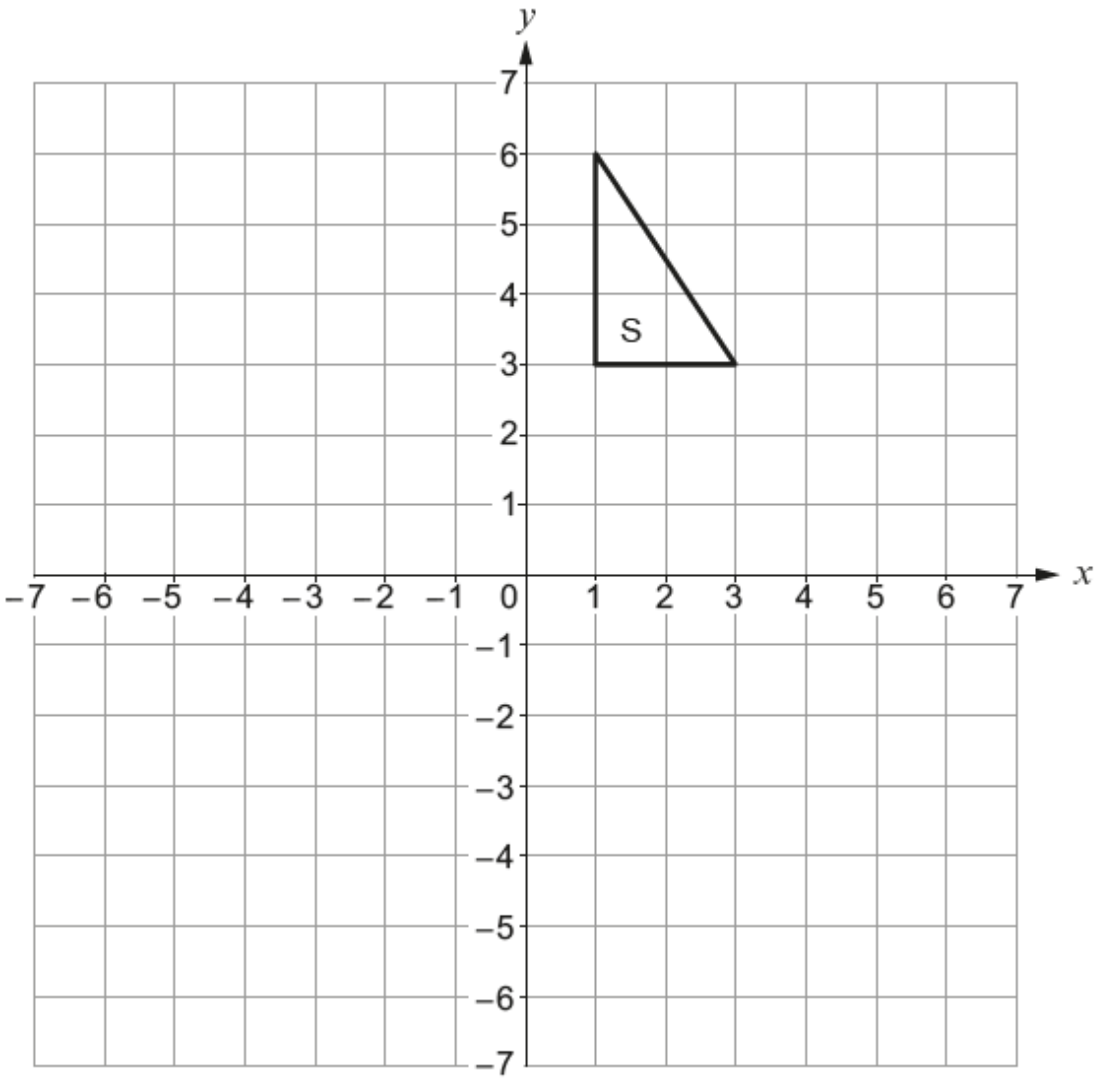
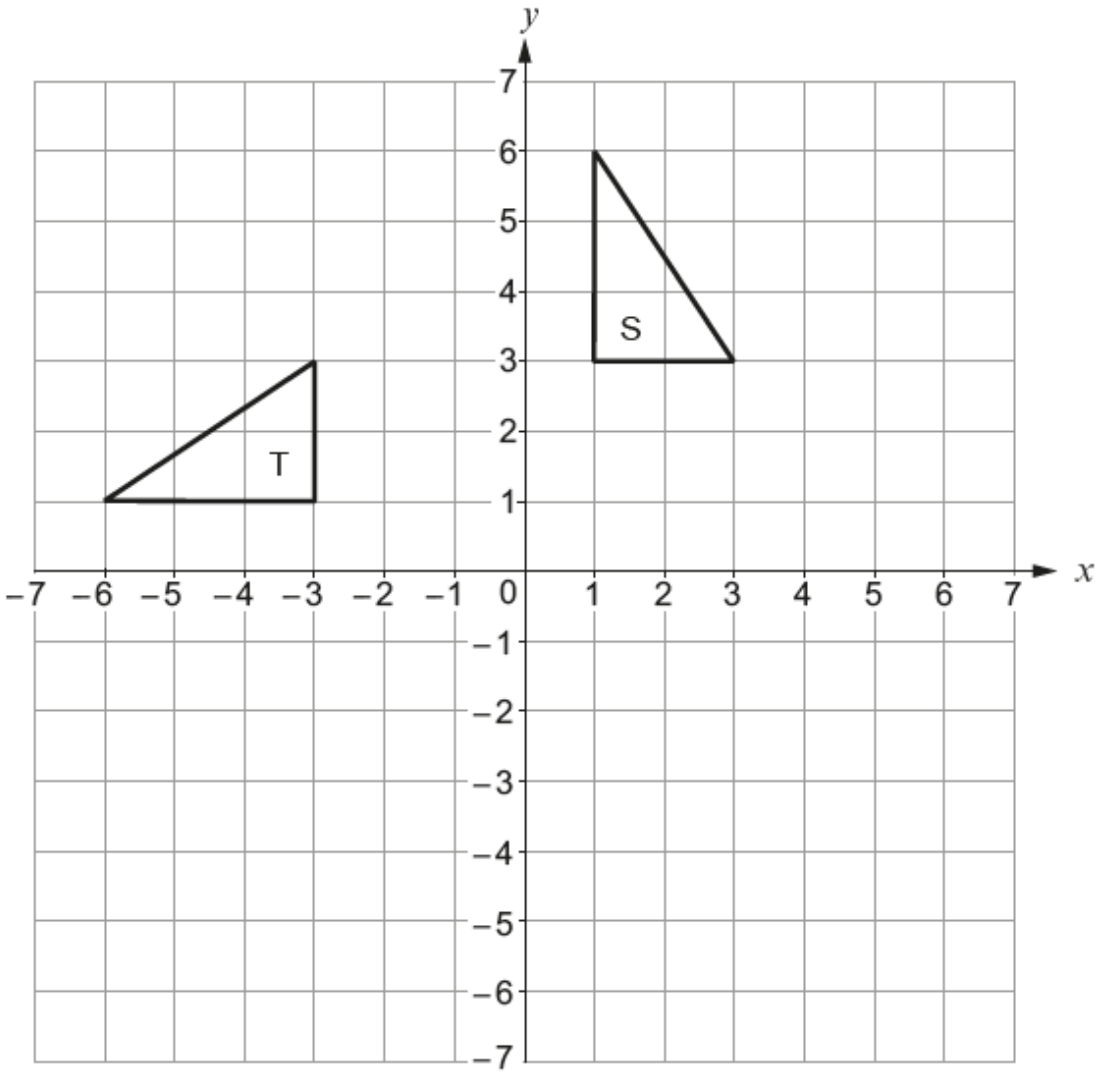
(a) Reflect the triangle S in the line $y = 2$. [2]



(b) Describe fully a single transformation that transforms triangle S onto triangle T. [3]



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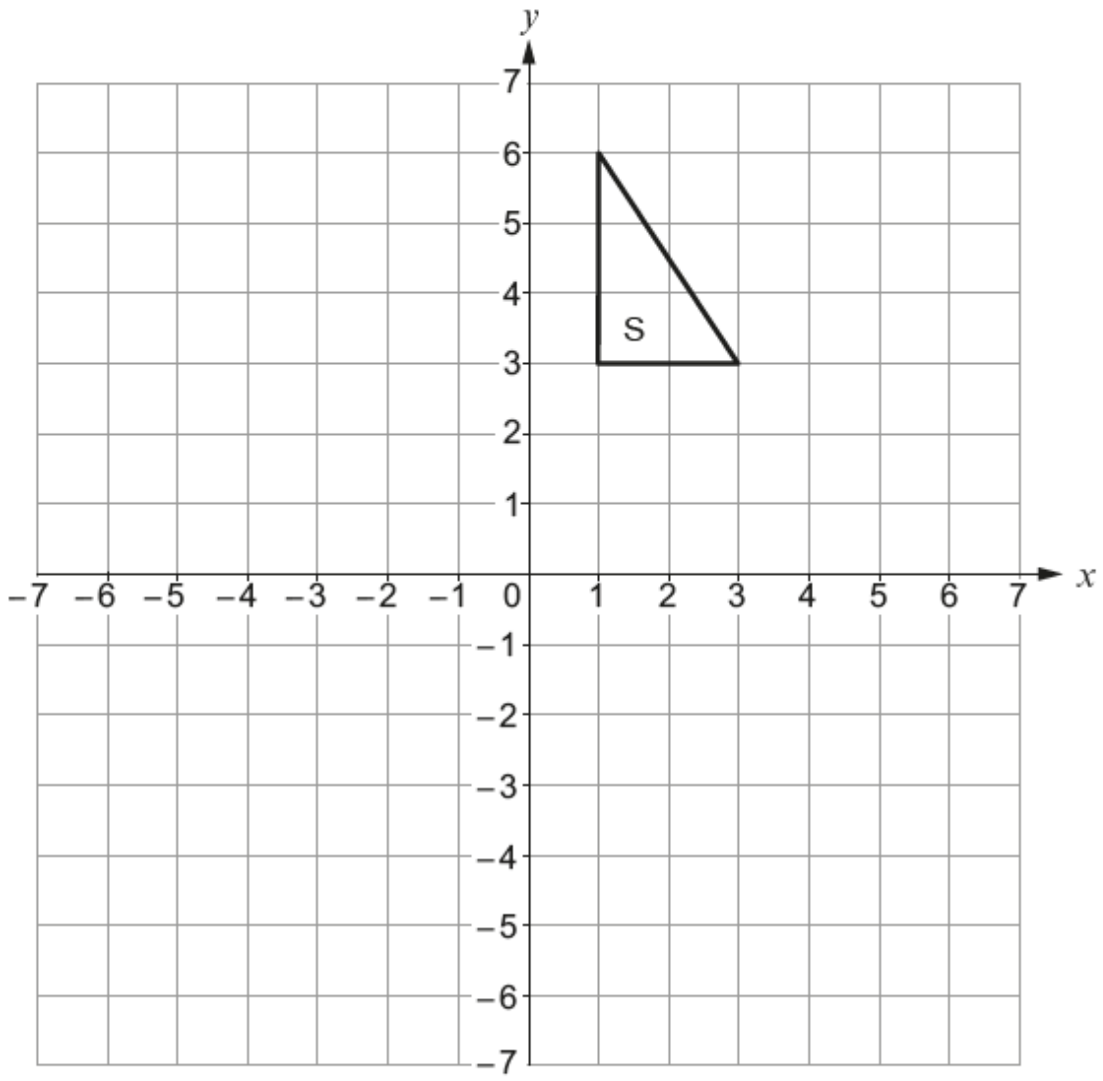
(c) (i) Translate the triangle S using the column vector $\begin{pmatrix} -5 \\ -4 \end{pmatrix}$. [1]



(ii) Write down the column vector that will reverse the translation in part (i). [1]

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A car travels x miles in 30 minutes.
Its average speed in miles per hour is [1]

$\frac{x}{2}$ $\frac{x}{30}$ $2x$ $\frac{2}{x}$ $30x$

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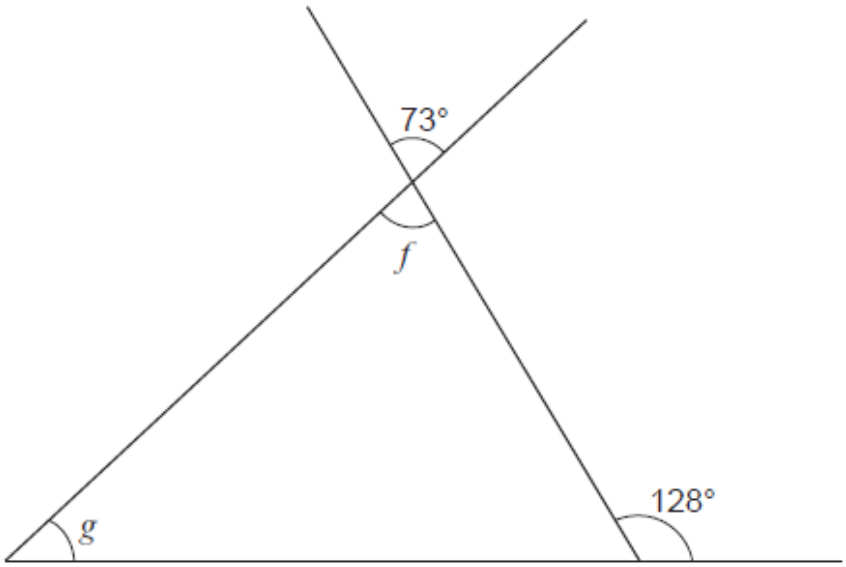

Diagram not drawn to scale

Calculate the size of each of the angles f and g. [3]

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f = ... ° g = ... °

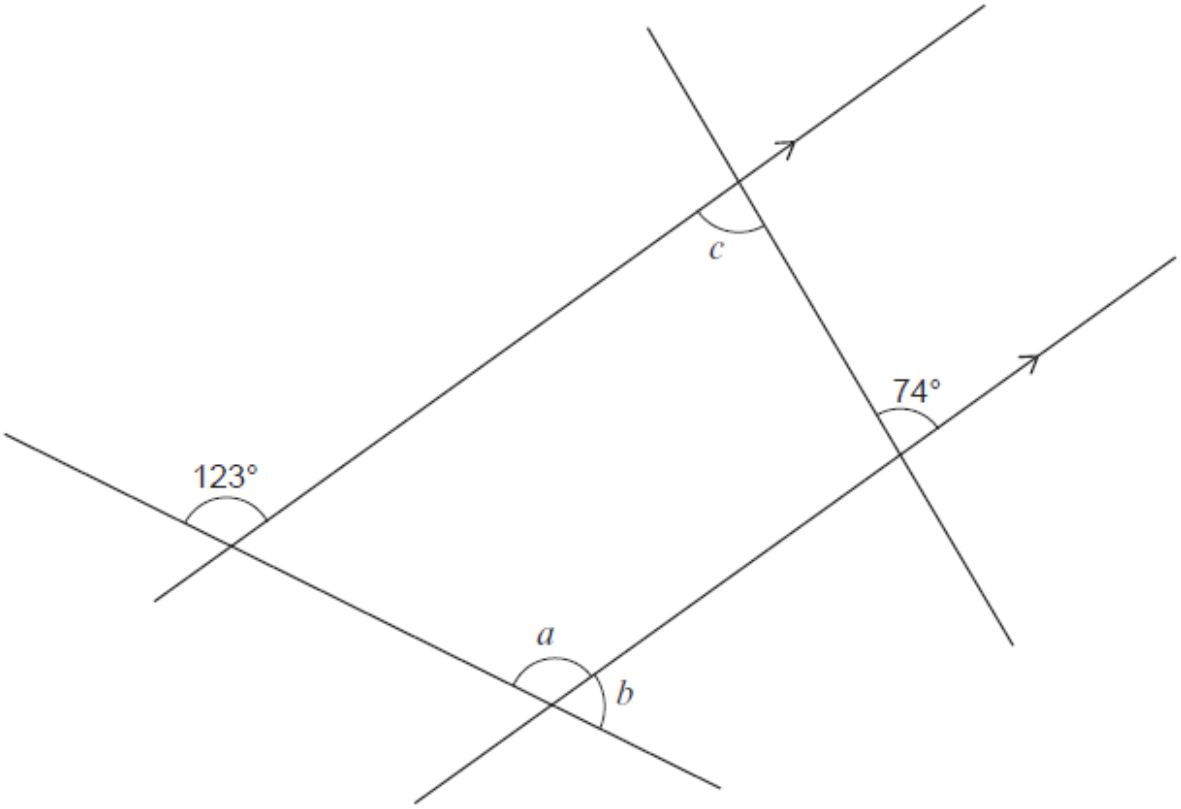

Diagram not drawn to scale

Find the size of each of the angles a, b and c. [3]

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a = ... ° b = ... ° c = ... °

Calculate the length of the side *MN* in the triangle *LMN* shown below. [3]

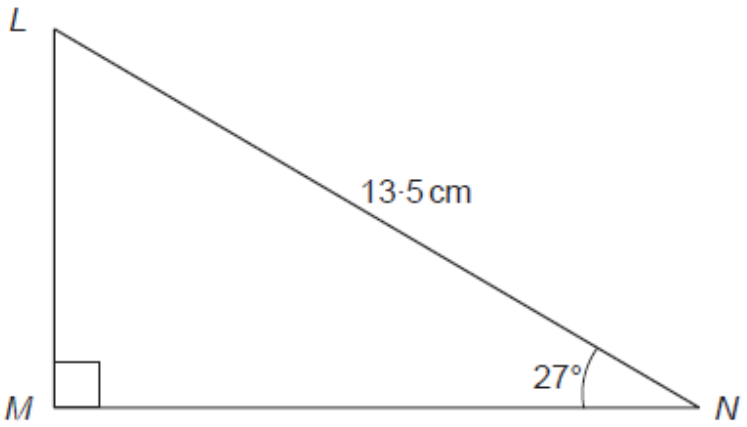

Diagram not drawn to scale

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. A solid object is made by drilling a cylindrical hole of radius 4 cm through a cuboid measuring 20 cm by 15 cm by 10 cm as shown below.

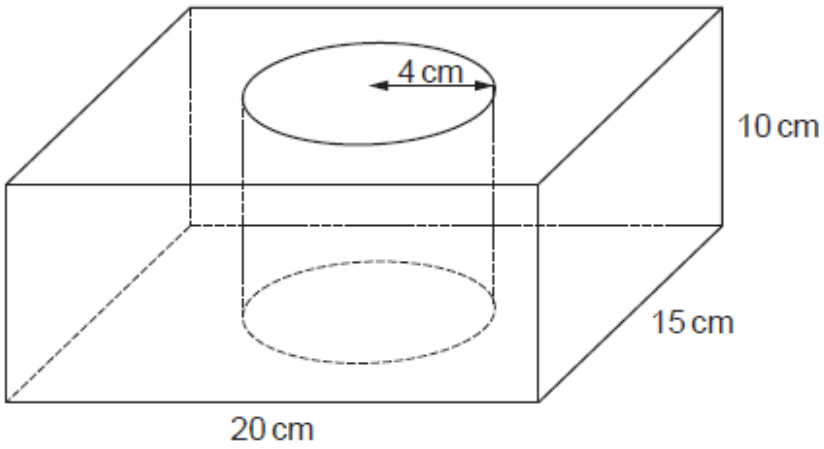

Diagram not drawn to scale

(a) Calculate the volume of the object.
Give your answer in cm^3. [3]

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Volume = ... cm^3

The right-angled triangle ABC has an area of $84\,cm^2$.
$AB = 24\,cm$.

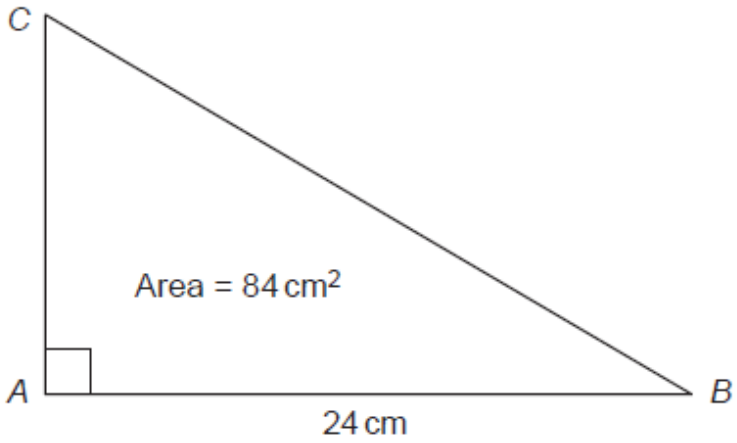

Diagram not drawn to scale

Calculate the perimeter of the triangle ABC.
You must show all your working. [6]

Shape and Measure

Numeracy Non-Calculator Past Paper Questions

(b) Gareth's luggage weighed 21·13 kg.
This was over the maximum of 20 kg allowed.

Gareth removed items from his luggage so that its mass was:

- as close to 20 kg as possible,
- **not greater** than 20 kg.

From the following list of items, which **two** items did Gareth remove?
You must show all your working. [3]

Coat	Headphones	Jumper	Book	Hat
820 g	300 g	320 g	340 g	200 g

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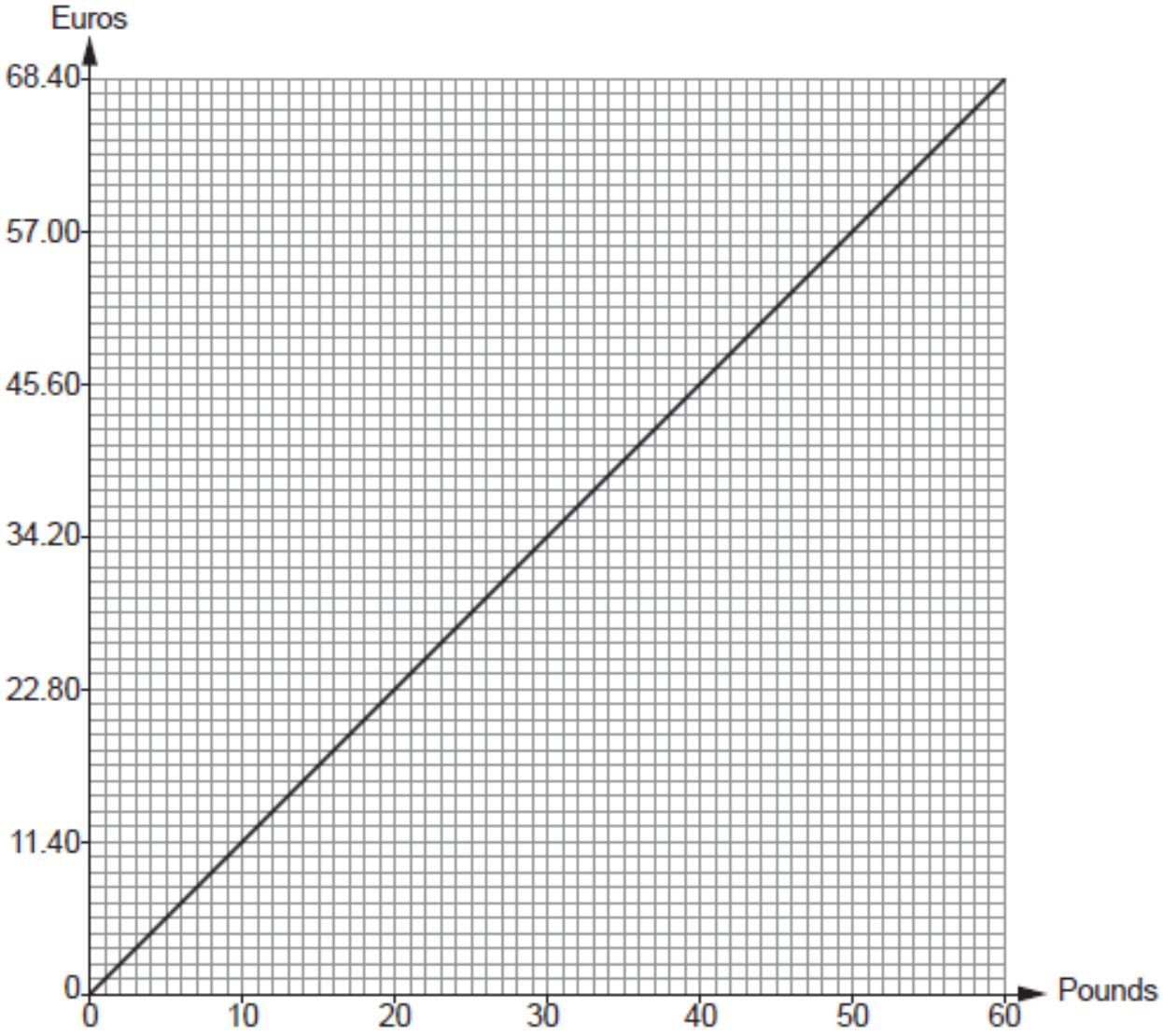
(c) Before going on holiday, Aled made a conversion graph to help him understand prices in euros.



Use Aled's conversion graph to answer the following questions.

(i) A camera costs £90.
How much is this in euros? [2]

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Camera costs ..... euros

(ii) A meal costs £25.
How much is this in euros? [2]

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Meal costs ..... euros

Rupert Shoes sells shoes online.

(a) The designer has drawn a sketch of a new label to stick on the shoeboxes.

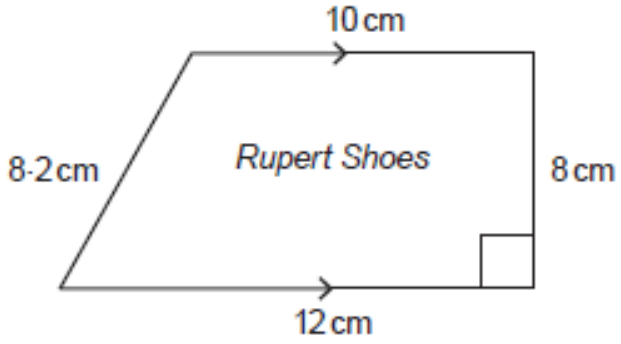

Diagram not drawn to scale

She takes the sketch to the printers.
The table shows the costs for printing 100 labels.

Area of label, to the nearest cm^2	Cost to print 100 labels
Up to 80 cm^2	£1.15
81 cm^2 to 85 cm^2	£1.25
86 cm^2 to 89 cm^2	£1.50
90 cm^2 or more	£1.75

How much will it cost to have 500 of the designer's label printed?
You must show all your working. [4]

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(b) Pairs of shoes are packed in shoeboxes.
The dimensions of the shoebox used are given on the diagram below.

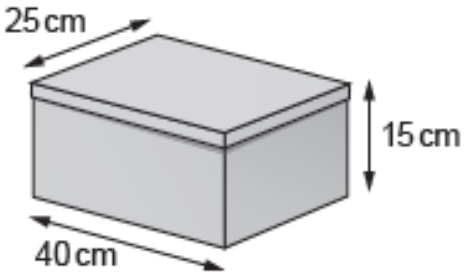

Diagram not drawn to scale

(i) What is the area of the smallest face of the shoebox?
Circle your answer. [1]

40 cm² 225 cm² 375 cm² 800 cm² 1000 cm²

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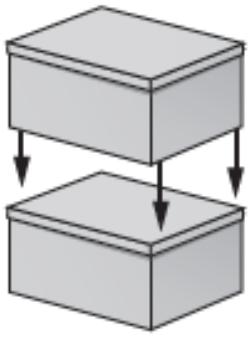
(ii) A customer orders 2 pairs of shoes.

The package for sending the shoes to the customer is made by:

- placing one box on top of the other, and
- taping the two boxes together.



This is shown in the diagram.

The cost for sending the package is calculated using the formula below. All dimensions are measured in cm.

$$\text{Cost in £} = \frac{1}{5} \times (S + F) \times 0{\cdot}02$$

S = value of the sum of the 3 dimensions of the package
F = value of the area of one of the **largest** faces of the package

How much does it cost *Rupert Shoes* to send the package?
Give your answer in pounds.
You must show all your working. [5]

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(b) The plan for the flight is shown below.

Journey	Average speed	Time
Milford Haven to Ruabon	90 mph	1 hour 20 minutes
Ruabon to Swansea	80 mph	1 hour 15 minutes

(i) Calculate the total distance of the flight.
Give your answer in miles.
You must show all your working. [4]

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Total distance is ..... miles

(ii) On average, the helicopter uses 0·4 gallons of fuel per minute.

Remember: 1 gallon = 4·55 litres

Use this information to calculate how many litres of fuel the helicopter would be expected to use for the flight planned in *(b)*(i).
You must show all your working. [5]

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You are given that:
1 gigalitre = 1 000 000 m^3
1 megalitre = 1 million litres

Lake Vyrnwy is a reservoir in mid Wales.

(a) Lake Vyrnwy can release between 25 and 45 megalitres of water per day from the dam.

The lake also supplies water through underground pipes to another reservoir at a rate of 230 000 m^3 per day.

(i) How many litres are there in 25 megalitres?
Circle your answer. [1]

25×10^8 25×10^{-6} 25×10^7 $2{\cdot}5 \times 10^6$ $2{\cdot}5 \times 10^7$

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(ii) Which is the best estimate for the volume of water passing through the underground pipes **per hour**?
Circle your answer. [1]

8500 m^3 9600 m^3 10 040 m^3 10 400 m^3 11 000 m^3

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(b) Lake Vyrnwy has a surface area of approximately 4 540 000 m^2.
Lake Vyrnwy contains 59·7 gigalitres of water.

Calculate an estimate of the average depth of the lake.
Give your answer in metres.

[3]

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Every year, *Aber Young Farmers* club organises a sponsored walk.

(a) This year, the length of the walk is 20 miles.
Calculate the length of the walk in km. [2]

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(b) Last year, the walk raised a total of £3600.
It cost £180 to organise the walk last year.
Give the cost of organising the walk as a percentage of the total raised. [2]

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(c) This year, walkers will be charged to take part.
Aber Young Farmers decided that:

charge in pence = 3 × height of the walker in cm

What is the height of the shortest walker who will need to pay a charge of more than £5?
Give your answer correct to the nearest cm.
You must show all your working. [3]

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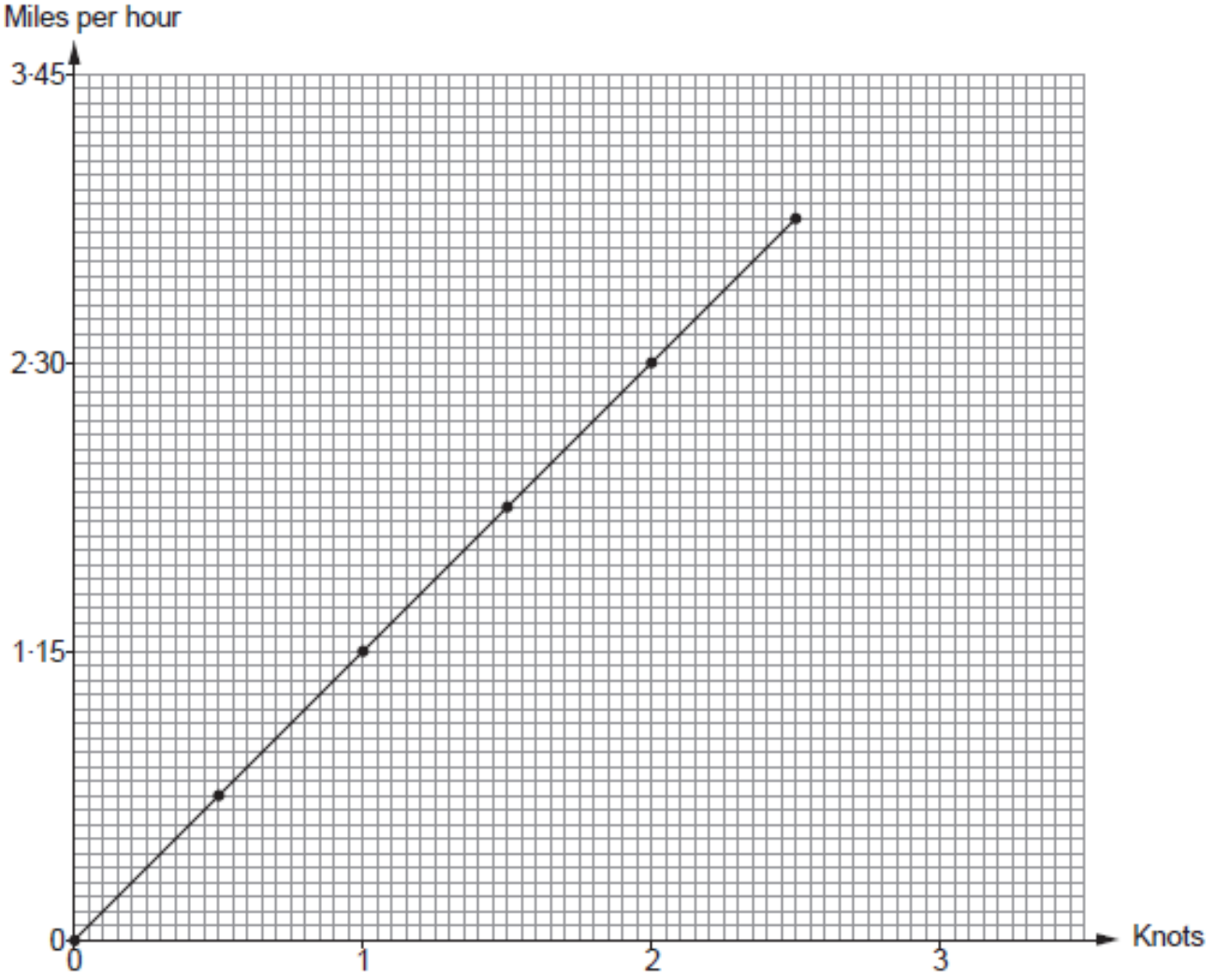
. Emily has drawn a conversion graph, as shown below.
She uses it to help her brother understand how to convert knots to miles per hour.



Complete each of the following statements.

(a) 23 miles per hour is equal to ..... knots. [1]

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(b) 5 knots is equal to ..... miles per hour. [2]

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Sioned and Rhodri are making a kite.

A diagram of the kite they are making is shown below.
AC and DB are the diagonals of the kite.
$AE = 22\,\text{cm}$, $EC = 28\,\text{cm}$ and $DE = 20\,\text{cm}$.

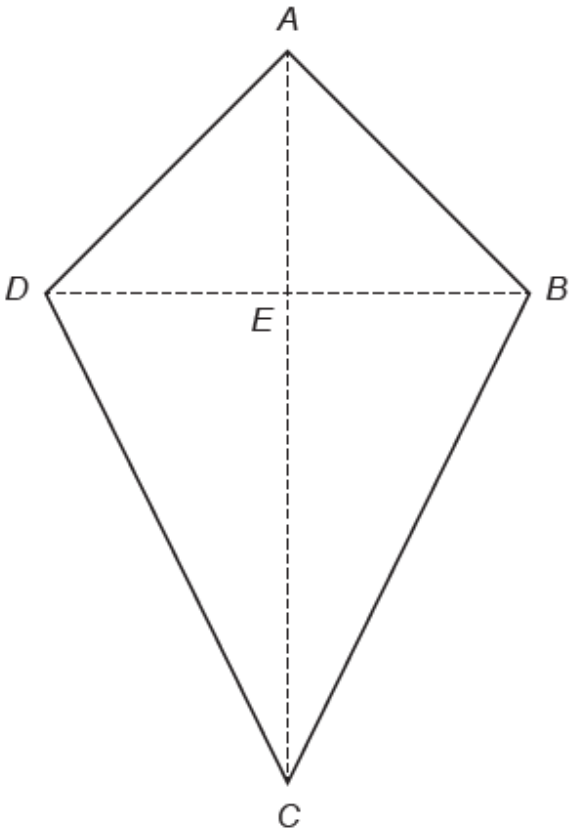

Diagram not drawn to scale

(a) Rhodri makes a statement about their kite being able to fly in strong wind,

"The length of the long diagonal must be at least 120% of the length of the short diagonal."

Assuming Rhodri is correct, should their kite be able to fly in strong wind?
You must show all your working. [4]

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(b) Sioned says,

"The best length for the tail on a kite depends on the area of the kite."

Sioned refers to the table below that she has seen on the internet.

Area of the kite, A	Best length for the tail
$A < 500\,\text{cm}^2$	2 m
$500\,\text{cm}^2 \leqslant A < 900\,\text{cm}^2$	2·4 m
$900\,\text{cm}^2 \leqslant A < 1200\,\text{cm}^2$	3·1 m
$1200\,\text{cm}^2 \leqslant A$	3·5 m

Work out the best length of tail for Sioned and Rhodri's kite.
You must show all your working. [4]

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(a) Gwilym is stacking 6 boxes in his garage.

The height of his garage is 2·5 m, correct to the nearest 10 cm.
5 of Gwilym's boxes each have a height of 40 cm, correct to the nearest 10 cm.
The other box has a height of 55 cm, correct to the nearest 5 cm.

Calculate the maximum possible gap between the stack of 6 boxes and the garage ceiling. [4]

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Mr Aston lives at 137 Ffordd Uchel.
He is ordering some new signs for his house and for his gatepost from a website.

Diagram not drawn to scale

All the signs available on the website are **mathematically similar**.

He selects a rectangular sign for the front of his house.
It has a length of 42 cm and a height of 24 cm.
The digits 1, 3 and 7 on the sign are all 18 cm high.

The rectangular sign Mr Aston is considering for his gatepost has a height of 20 cm.

(a) Calculate the height of the digits 1, 3 and 7 on the sign Mr Aston is considering for his gatepost. [2]

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Height of the digits 1, 3 and 7 is ..... cm

(b) Mr Aston's gatepost is 30 cm wide.
Will the sign he is considering fit his gatepost?

Yes ☐ No ☐

You must show all your working and give a reason for your answer. [3]

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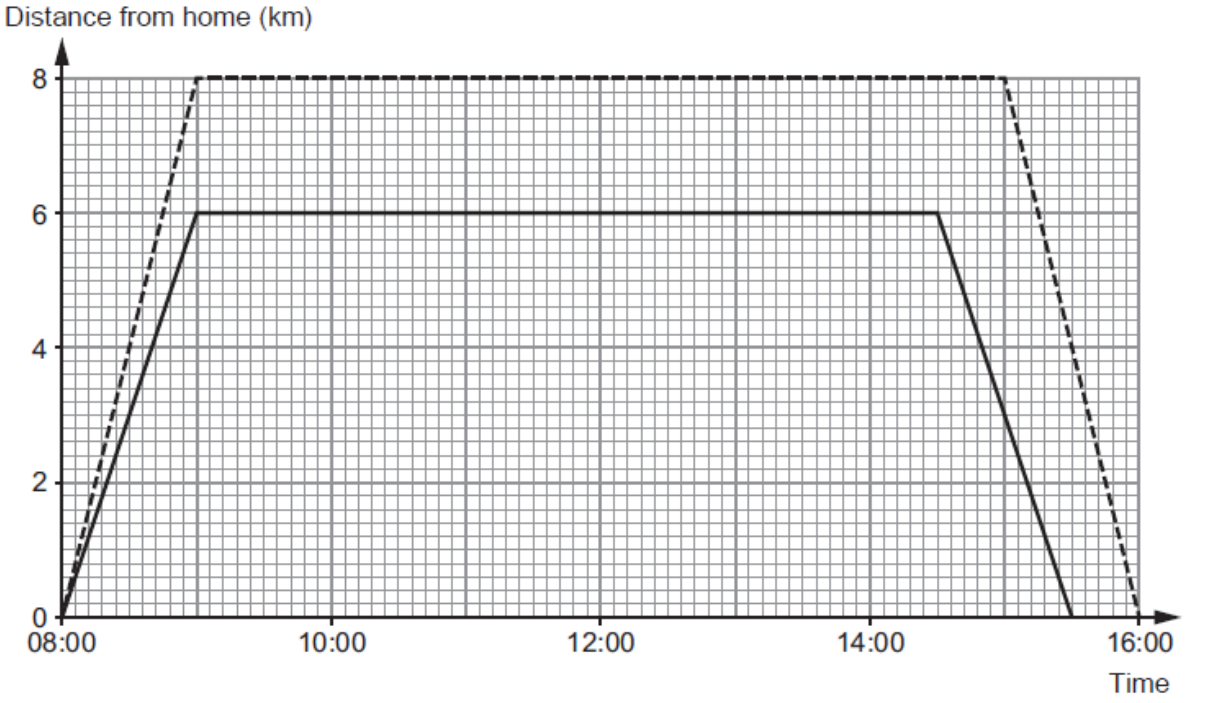
2. Eleri and Yvon are sisters.
They both live at *Cwm Uchel*.
They do not go to the same school.
The graph represents each of their journeys to school and back.

Key:

– – – – – – – – represents Eleri's journeys ——— represents Yvon's journeys



(a) At what time did Yvon arrive home from school?
Circle your answer. [1]

14:45 15:15 15:30 15:45 16:00

(b) Eleri cycles along a straight road to school and back.
How far does she cycle when going to school and back in one day?
Circle your answer. [1]

6 km 8 km 9 km 12 km 16 km

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(c) Martha looks at the graph and says,

'The school Eleri attends is 2 km from Yvon's school.'

Is this true?

Certainly true ☐ Certainly false ☐ Can't tell ☐

Give a reason for your answer. [1]

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In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

Maes Alun Camping
Charges

Tents covering ground area:

- less than or equal to 12 m^2 cost £14 per night
- greater than 12 m^2 cost £16 per night

AND

Charge per person: £4 per night

Stay 5 nights and get the next night **completely free**.
This means **no charge** for tents or people on **every 6th night**.

Rhodri and Lars are planning a camping holiday, staying at *Maes Alun Camping*.
They are going to

- take only one tent between them,
- take a tent covering a rectangular ground area, measuring 2·5 metres by 4·4 metres,
- both stay for a total of 12 nights.

Their holiday is just 8 weeks away.
They **each** plan to save £15 per week from now until their holiday in 8 weeks' time.

Will the amount they save be enough to pay for their holiday?
You must show all your working. [8 + 2 OCW]

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Lazar wants to send a package to Germany.
He looks at pricing charts for three different companies, *ParcelMax*, *DirectGo* and *Pack2save*.

ParcelMax   Total cost = Sum of the 3 dimensions in cm × £0.60
DirectGo   Total cost = Volume measured in cm^3 × £0.01
Pack2save   Total cost = Total area of all 6 faces measured in cm^2 × £0.02

Lazar's parcel is a cuboid measuring 10 cm by 20 cm by 30 cm.

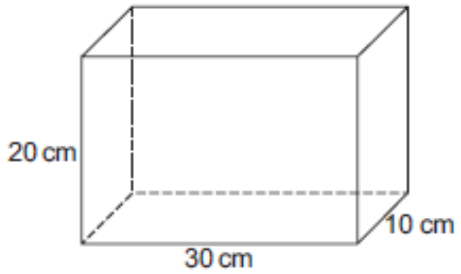

Diagram not drawn to scale

(a) Find the cost of sending the parcel for each of the three different companies.
Give each of your answers in pounds (£).

(i) *ParcelMax* [2]

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(ii) *DirectGo* [3]

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(iii) *Pack2save* [4]

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Kari now sketches a diagram of the red piece of the jigsaw, which is shown below.
She shows some extended lines and indicates all the angles she needs to find.

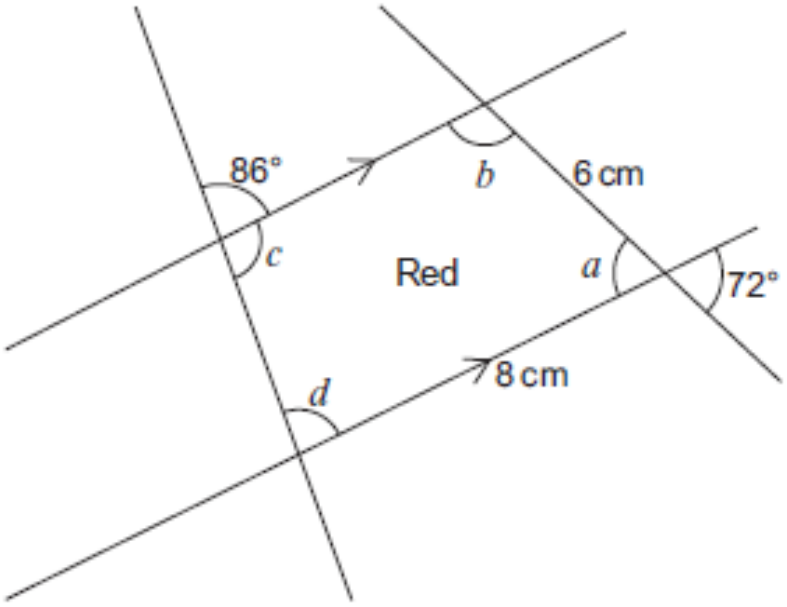

Diagram not drawn to scale

Find the 4 missing angles in the red piece of the jigsaw.
Draw the red piece of Kari's jigsaw accurately.
One side has been drawn for you. [6]

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a = ... °, b = ... °, c = ... °, d = ... °

Bethan builds a rectangular sheep pen.

(a) The perimeter fence of the sheep pen is 18 m long.
It costs her £1.10 for every 0·5 metres of fencing used to make the sheep pen.

(i) Calculate the cost of the fencing used to make this sheep pen. [2]

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Cost is £ .....

(ii) The length of Bethan's sheep pen is two times its width.
Find the length and width of this sheep pen.
You must show your working. [2]

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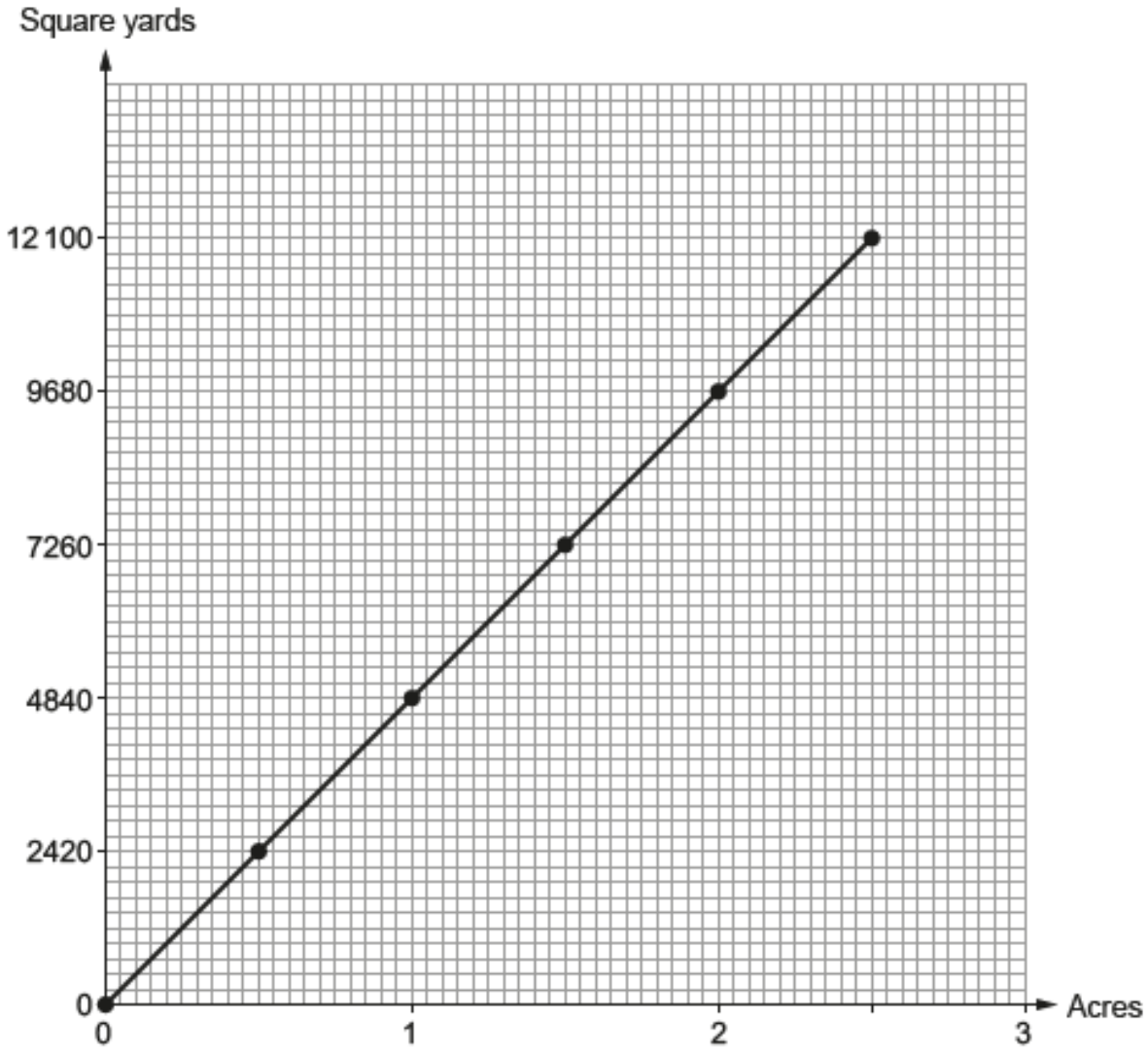
Marcus is a farmer.
He has his own conversion graph to change between acres and square yards.



Complete each of the following statements.

(a) 3 acres is equal to ..... square yards. [1]

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(b) 5·5 acres is equal to ..... square yards. [2]

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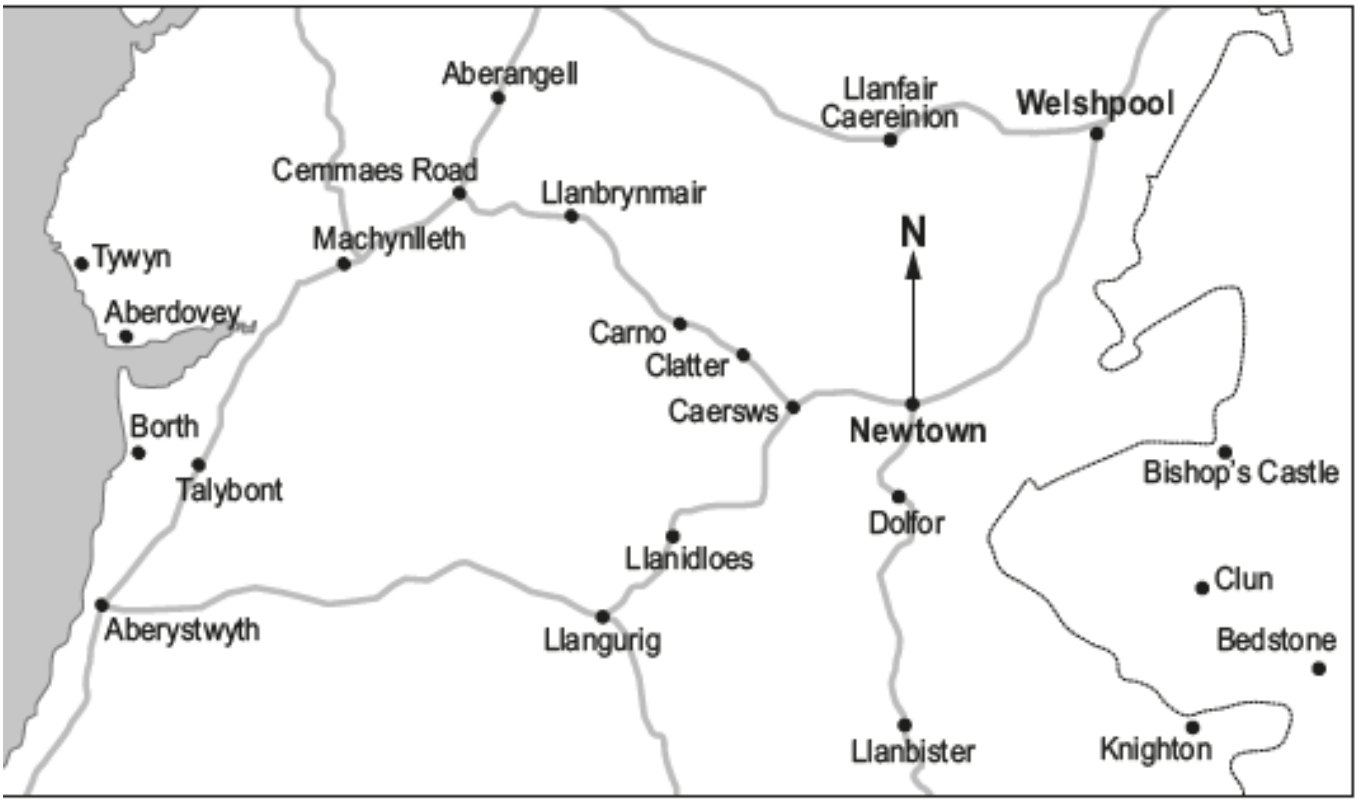
The map shows a part of Wales.
The position of Newtown is shown on the map.



(a) Write down the bearing of Welshpool from Newtown. [1]

.....°

(b) Name the place on the map that is on a bearing of 235° from Newtown. [2]

(c) The distance from Newtown to Welshpool is approximately 14 miles by road.

(i) **Estimate** the distance by road from Welshpool to Llanfair Caereinion in miles. [1]

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..... miles

(ii) Megan lives in Cemmaes Road.
To travel to work, she starts by heading towards Machynlleth.
Her journey to work is approximately **40 km**.

Convert 40 km to miles. [2]

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..... miles

In which town or village could Megan work? [1]

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(d) A different map has a scale of 1 : 10 000.
Megan measures 3 cm on this map.
What distance does this represent in **metres**? [2]

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..... metres

When it is 21:30 on a Tuesday in London, it is 02:30 on a Wednesday in Dhaka, Bangladesh.

It takes 10 hours 30 minutes to fly from Dhaka to London.
A flight leaves Dhaka on Thursday at 13:00 local Dhaka time.

On what day and at what time should this flight arrive in London?
Give your answer in local London time. [4]

Arrival in London:

Day ..... Time .....

Stylish computer desk Made of laminate wood. Non-scratch top. **Length is exactly 2000 mm**	

Luc wants this new desk for his bedroom.

The desk is to fit on the straight wall between his wardrobe and his bookcase.

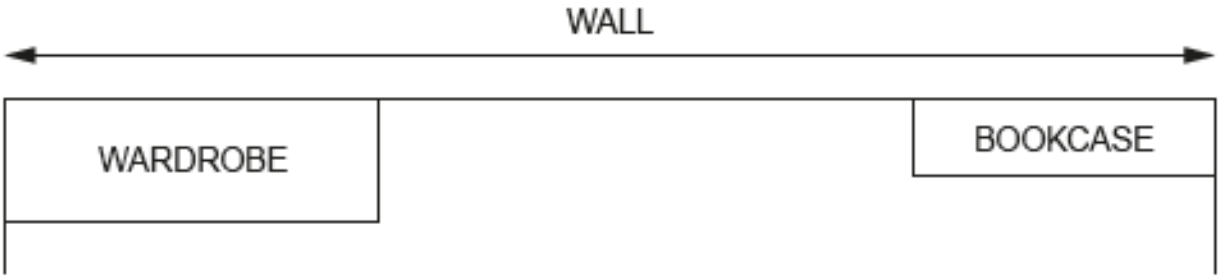

Diagram not drawn to scale

Luc has measured the length of

- the wall, which is 600 cm, correct to the nearest 10 cm,
- the bookcase, which is 147 cm, correct to the nearest 1 cm,
- the wardrobe, which is 250 cm, correct to the nearest 1 cm.

(a) What is the greatest possible length of the wall?
Circle your answer. [1]

600 cm 605 cm 645 cm 610 cm 650 cm

(b) What is the least possible length of the wardrobe?
Circle your answer. [1]

249 cm 249·45 cm 249·49 cm 249·5 cm 250 cm

(c) Can Luc be certain that this desk will fit in the space available?

You must
- show all your calculations,
- give the greatest or least bounds of any measurements used in calculations or comparisons,
- give a reason for your answer. [5]

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Shape and Measure

Numeracy Calculator Past Paper Questions

Bus timetable from Orme Station to Outlet Village

Only 55 minutes from Orme Station direct to Outlet Village.

Buses leave the station
- every 12 minutes from 8 a.m. until 12 noon
- every 24 minutes from 12 noon until 10 p.m.

(a) At what time does the first bus after 09:00 leave Orme Station?
Circle your answer. [1]

09:05 09:12 09:18 09:24 09:30

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(b) Gwil looks at the timetable shown above.
He decides to take the latest possible bus to be at Outlet Village by 15:00.

At what time will Gwil arrive at Outlet Village?
You must show all your working. [2]

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(b) Gustav also makes a birthday cake for his sister.
The top face of the cake is in the shape of a trapezium.

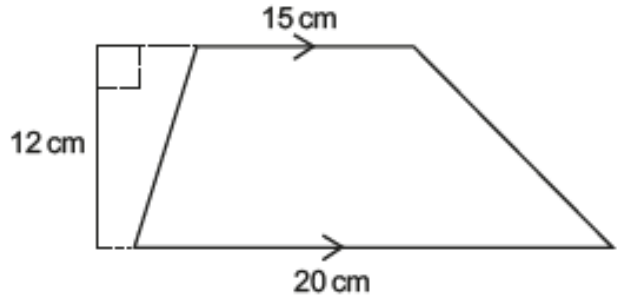

Diagram not drawn to scale

Gustav plans to ice the top face of the cake.
Each packet of icing costs £1.35 and is enough to cover 65 cm^2.
He has to buy complete packets of icing.

(i) Calculate the area of the top face of the cake Gustav has made. [2]

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(ii) How much will it cost Gustav to ice the top face of the cake?
You must show all your working. [3]

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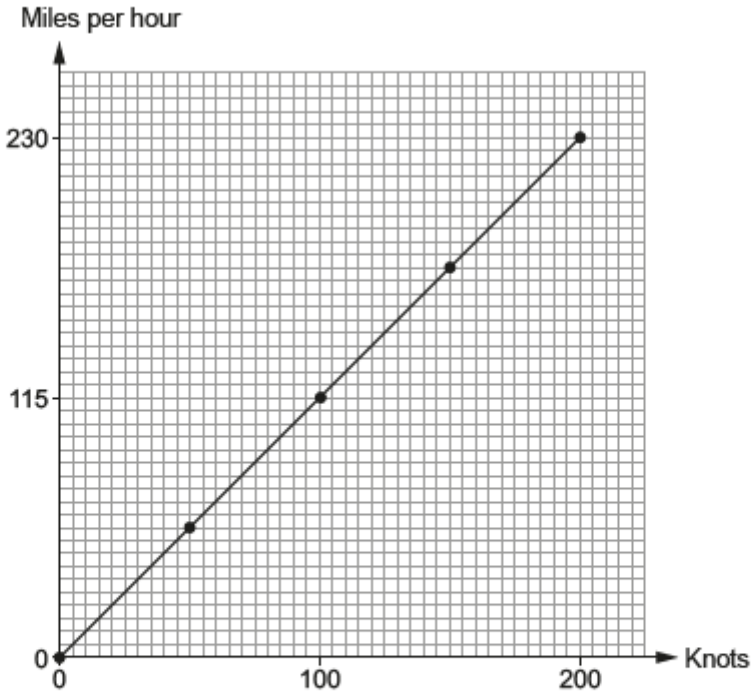
(iii) Gustav also plans to decorate the cake with small pieces of marzipan shaped as shown below.
The top face of each piece of marzipan is a rhombus.
Will these pieces of marzipan tessellate?

Yes ☐ No ☐

Draw a simple diagram to support your answer. [1]

Alun has made his own conversion graph to change knots to miles per hour.



(a) Use Alun's conversion graph to write 150 knots in miles per hour. [1]

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(b) Nikita thinks Alun's conversion graph may be inaccurate.

Nikita knows that 1000 knots is 1150.779 miles per hour, correct to 3 decimal places.

Convert 20 knots to miles per hour
- using Alun's conversion graph, and then
- using Nikita's values.

Calculate the difference, in miles per hour, between your answers.
Give your answer correct to 2 decimal places.
You must show all your working. [4]

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Sanjay stacks three boxes in a pile.
The heights of the boxes are 25 cm, 36 cm and 47 cm.
They are all measured correct to the nearest centimetre.
What is the greatest possible height of the stack of the three boxes? [2]

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Greatest possible height of the stack of three boxes is ..... cm

Ursula is lying on her surfboard 180 metres away from the foot of a vertical cliff.
The height of the cliff is 146 metres.

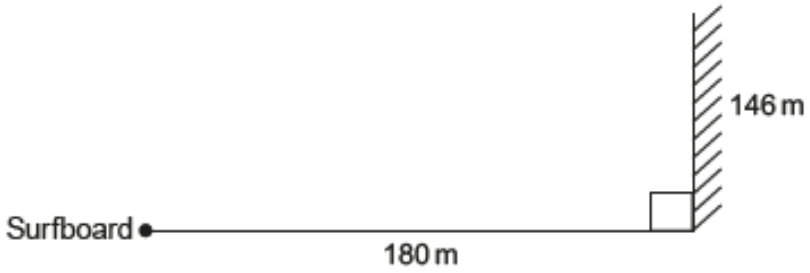

Diagram not drawn to scale

Ursula was told that if the angle of elevation of the top of the cliff from her lying position is between 42° and 45°, it is safe for her to attempt to stand on her surfboard.

Calculate the angle of elevation of the top of the cliff from Ursula's position lying on her surfboard.

State whether it is

- safe for Ursula to attempt to stand, or
- not safe as she is too near the cliff, or
- not safe as she is too far out at sea. [4]

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Marta buys a new television.

(a) Marta wants to fit the television in a bookcase on the wall.
In the shop she forgot to write down the length of the television.
She did write down the height and the diagonal of the screen.

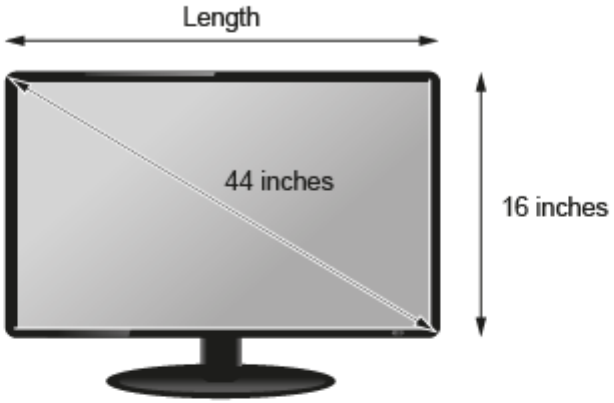

Diagram not drawn to scale

Marta needs to know the length of the screen before she opens the box, in case she wants to return the television.
Calculate the length of the screen.
Give your answer correct to 2 significant figures. [4]

Length is ..... inches, correct to 2 significant figures.

4. Elin's old fish tank is leaking.

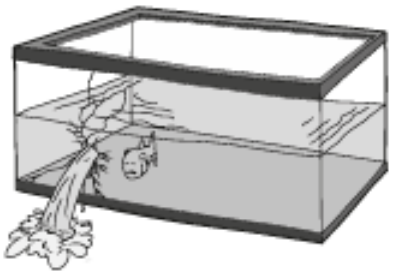

Diagram not drawn to scale

This old fish tank is in the shape of a cuboid.
The base of this tank measures 60 cm by 40 cm.
Before the leak, the height of the water level in Elin's old fish tank was 45 cm.

Elin decides to replace her fish tank with a cylindrical one.

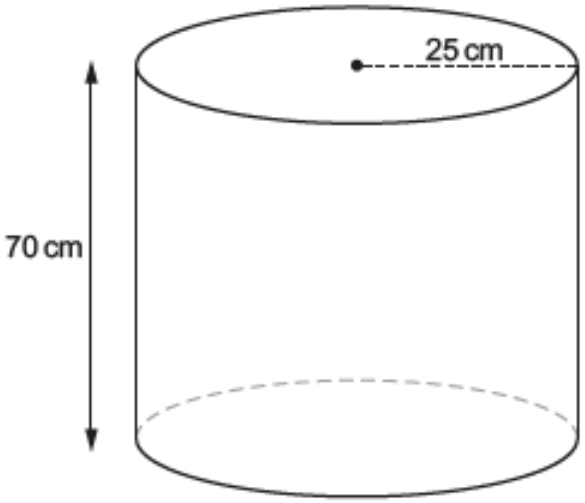

Diagram not drawn to scale

She selects a new cylindrical fish tank that has a radius of 25 cm and a height of 70 cm.

Will all the original contents, including the water and the fish, fit into this cylindrical tank?
You must show all your working. [4]

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The diagram below shows where Levi wants to attach a string of lights to his house.

Levi wants to attach a single string of lights from *B* to *A* and then from *A* to *C*.
The diagram below shows the measurements Levi has taken.

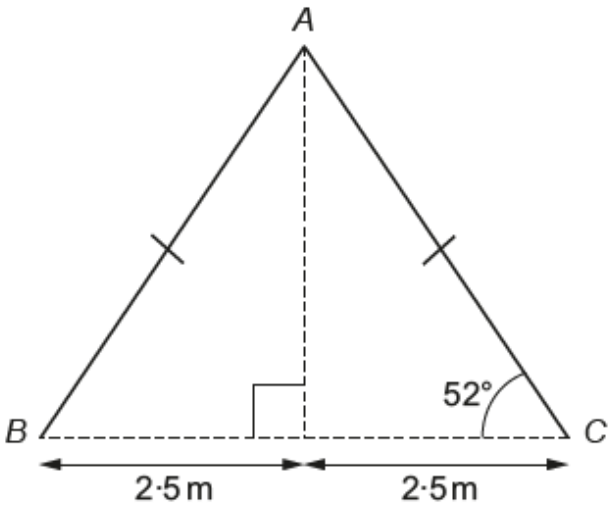

Diagram not drawn to scale

He spends £410 at the electrical store buying a string of lights.
After putting up the lights, Levi finds he has 6 metres of the string of lights left over at one end.

How much did the electrical store charge Levi, per metre, for the string of lights? [6]

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Rhys lives in St Asaph.
He wants to video call friends in Montreal, New Delhi and Sydney.

(a) The table below shows times around the world when it is 12:30 in St Asaph.

City	Time	Day
St Asaph	12:30	Saturday
Montreal	07:30	Saturday
New Delhi	17:00	Saturday
Sydney	21:30	Saturday

(i) When it is 23:30 on Saturday in St Asaph, what time and day is it in Montreal?
Circle your answer. [1]

04:30, Sunday 07:30, Saturday 18:30, Saturday

02:30, Saturday 12:30, Saturday

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(ii) When it is 01:00 on Sunday in Sydney, what time and day is it in St Asaph?
Circle your answer. [1]

16:00, Sunday 16:00, Saturday 10:00, Sunday

10:00, Saturday 06:00, Monday

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(b) 1 Australian dollar (AUD) is worth £0.61.

How much is £320 worth in Australian dollars?
Give your answer to the nearest Australian dollar. [2]

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£320 = ... AUD

(b) There were 71 532 supporters in the stadium watching the match.
A newspaper headline writes this number of supporters correct to 2 significant figures.
Which of the following numbers should appear in this headline?
Circle your answer. [1]

72 71 000 71 400 71 500 72 000

(c) The rugby pitch at the stadium is measured.
On the diagram below, each measurement is given **correct to the nearest 10 centimetres**.

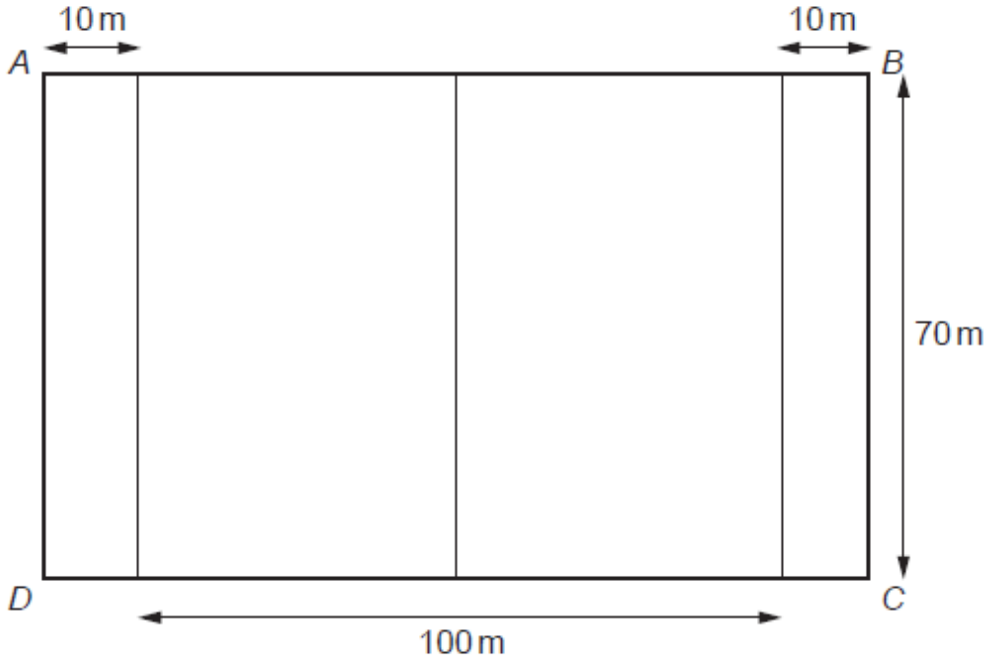

Diagram not drawn to scale

What is the least possible length of *AB*?
Give your answer in metres.
You must show all your working. [3]

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(a) (i) The internal measurements of a tin of baked beans are:

- radius 3·6 cm,
- height 9·3 cm.

Calculate the internal volume of the tin. [2]

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(ii) Every 1 cm^3 of baked beans in a tin has a mass of 1 g.

A portion of baked beans is $\frac{1}{2}$ a tin.

What is the mass of a portion of baked beans? [1]

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A portion of baked beans has a mass of ..... g

(b) A mathematically similar tin of baked beans has a radius of 4·2 cm.

Diagram not drawn to scale

Calculate the height of the larger tin of beans. [2]

(c) In a portion of baked beans there is:

- 1·85 g of salt,
- 11·7 g of sugar.

For women, the recommended daily allowance of:

- salt is 6 g,
- sugar is 90 g.

Consider a portion of baked beans.
Is it salt or sugar that provides the greater proportion of the recommended daily allowance for women?
You must show all your working. [3]

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Mr Jakob notices a crack in a vertical wall which stands on horizontal ground.

(a) Mr Jakob fixes two temporary supports against the wall, as shown in the diagram below.

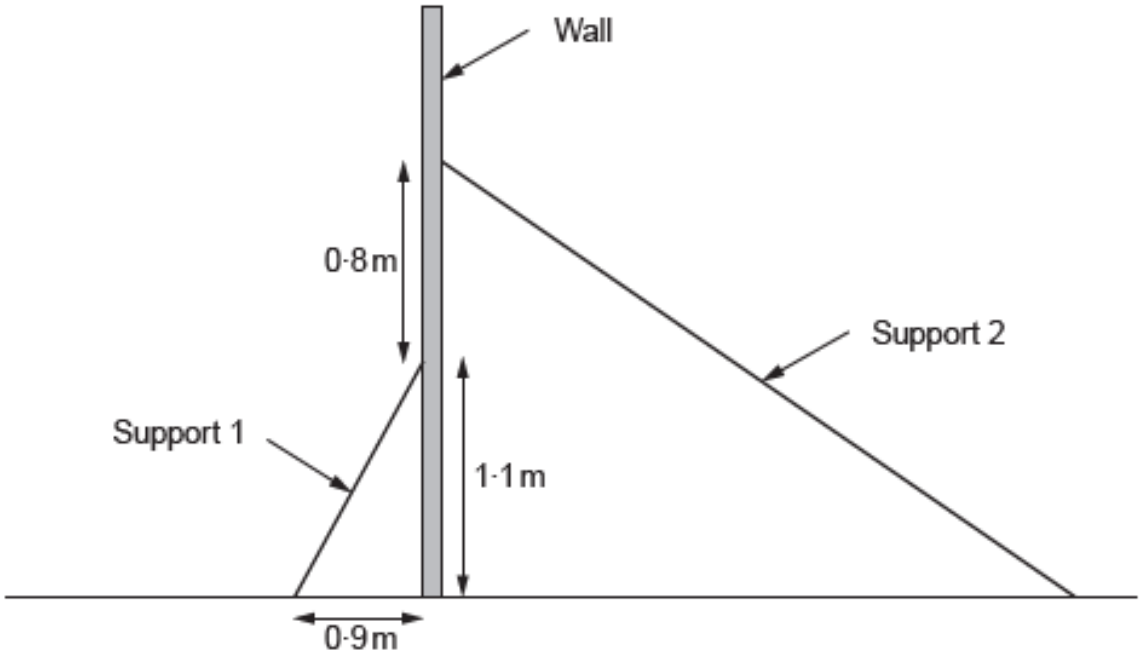

Diagram not drawn to scale

(i) Calculate the length of Support 1. [3]

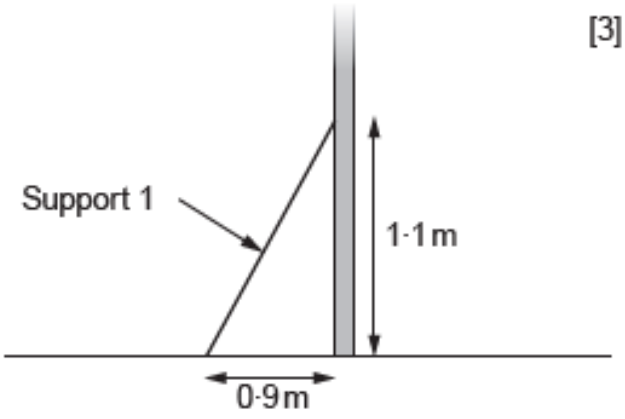

Diagram not drawn to scale

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(ii) The length of Support 2 is 2·6 m.
Calculate the angle between the horizontal ground and Support 2. [3]

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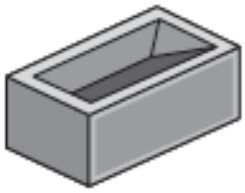
) Mr Jakob gets a quote of £516 for rebuilding his wall.



The quote includes:
- 8 hours' labour costs at £22.50 per hour,
- a 20% discount off the cost of the bricks.

Calculate the cost of the bricks before the discount. [3]

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The picture shows a solid concrete step.
The step:

- stands on horizontal ground,
- has all of its edges vertical or horizontal,
- has a uniform cross-section.

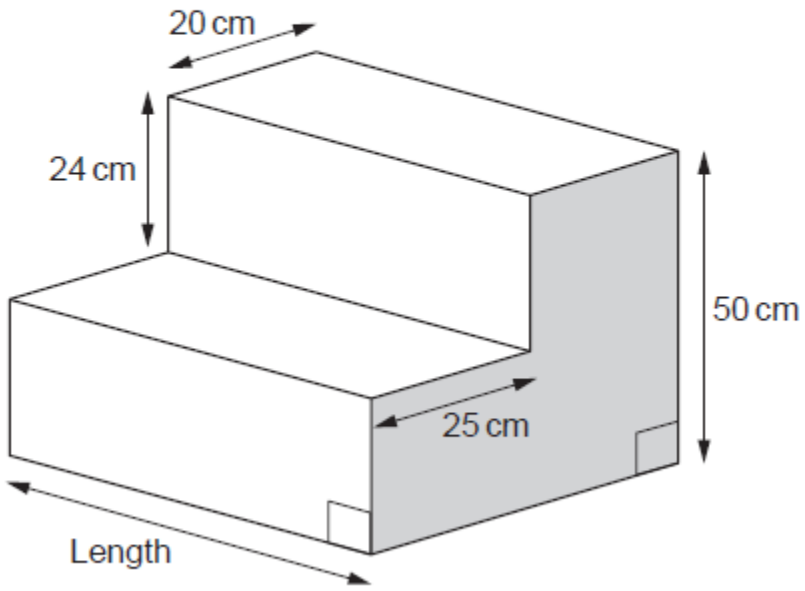

Diagram not drawn to scale

(b) The volume of concrete in the step is 66 000 cm^3.

(i) The concrete to make the step costs 39p per litre.

A builder charges a rate of £27 per hour.
Any fraction of an hour is charged as that fraction of his hourly rate.
(For example, half an hour is charged at half of £27.)

It takes him 1 hour 20 minutes to make the step.

There were no other costs.
Calculate the total cost of making the step. [3]

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(ii) Calculate the length of the step.
Give your answer in cm.
You must show all your working. [5]

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A cylindrical mug has an inner radius of 4·3 cm and an inner height of 11·8 cm.

Tea is poured into the mug.
The level of the tea is 2 cm below the top of the mug.

Calculate the volume of the tea in the mug. [3]

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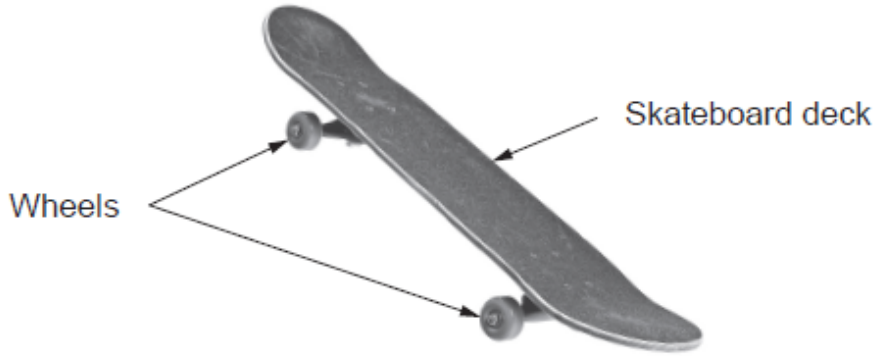
Finbar's skateboard is shown below.



(a) The diameter of each wheel on Finbar's skateboard is 6·4 cm.
He uses his skateboard to go to visit his friend Sab.
Sab lives 2340 metres from Finbar.

(i) When Finbar visits Sab, how many times will each wheel on Finbar's skateboard rotate? [4]

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Robyn has 5 planks of wood each of length 2 m and width 10 cm.

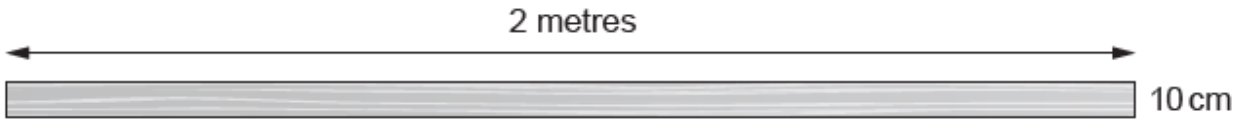

Diagram not drawn to scale

She lays the 5 planks horizontally on the floor. She leaves a **15 cm gap** between each plank, as shown below.

Diagram not drawn to scale

Robyn is planning to make a gate. She uses these 5 planks and one other plank that is to be placed diagonally, as shown below.

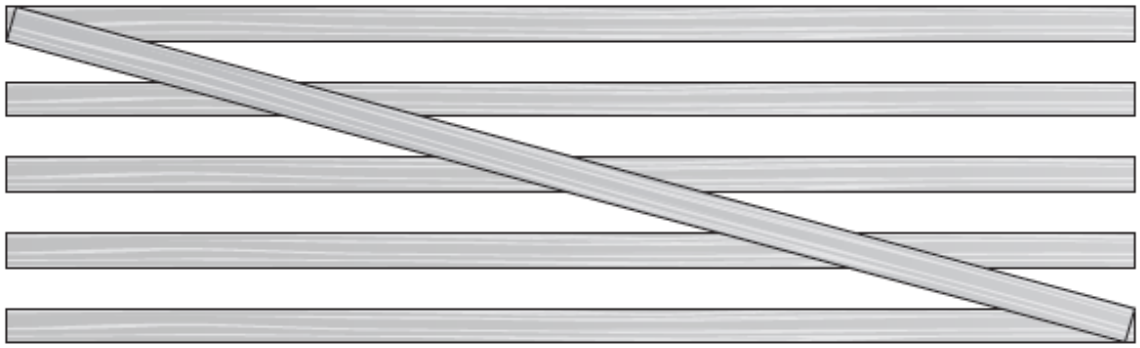

Diagram not drawn to scale

(a) (i) Calculate an estimate of the length of the plank that is to be placed diagonally. Give your answer in metres. [4]

(ii) What assumption did you make in calculating the length of the plank that is to be placed diagonally? [1]

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(b) Robyn finishes the gate with two end planks of wood.

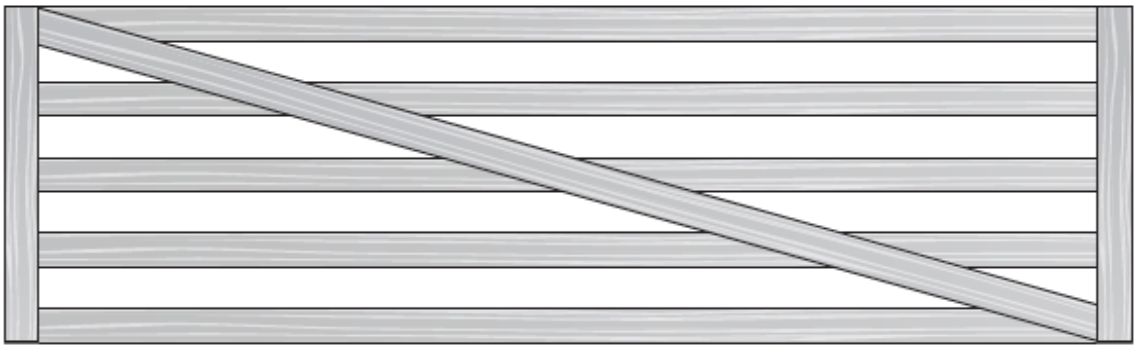

Diagram not drawn to scale

The costs of the different sizes of planks of wood are in the following ratio:

cost of 1 horizontal plank : cost of 1 diagonal plank : cost of 1 end plank

= 3 : 4 : 5

An end plank costs £8.55.
Calculate the total cost of the planks needed to make the gate. [4]

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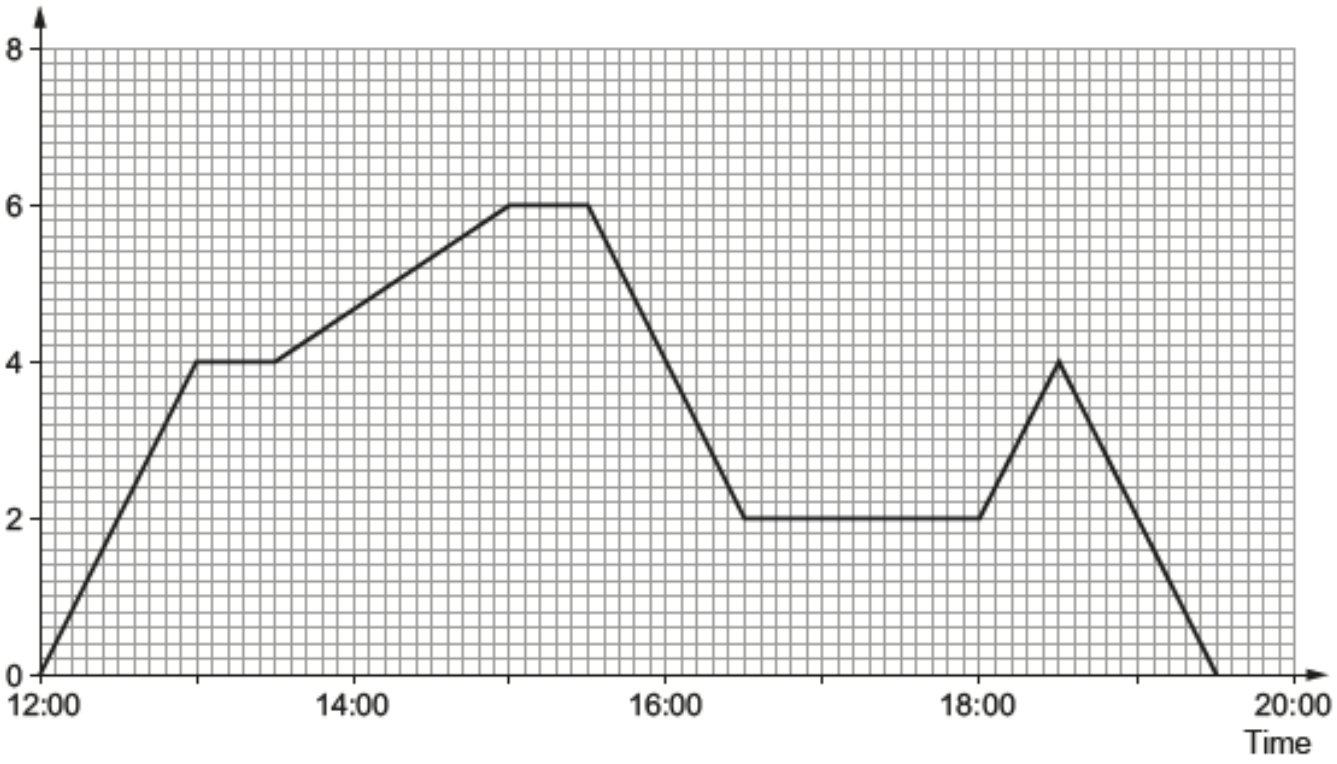
1. The travel graph below shows a journey Gareth made yesterday.



(a) How far away from home was Gareth at 15:00?
Circle your answer. [1]

0 km 2 km 4 km 6 km 8 km

(b) At what time did Gareth arrive back home?
Circle your answer. [1]

14:00 16:30 18:45 19:15 19:30

(c) Sometime after 5p.m., Gareth headed for the supermarket.
The supermarket was closed when he got there so he headed straight back home.
At what time did Gareth arrive at the supermarket?
Circle your answer. [1]

17:00 17:30 18:00 18:15 18:30 19:00

(d) Gareth did not stop for the whole of the time between 15:00 and 15:30.
What could the travel graph tell you about his journey between these times? [1]

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(b) The Headteacher decides to place signs around the school site to stop pupils using their bikes on grassed areas.

He introduces a new sign to pupils in the school newsletter.
The size of the sign in the newsletter is shown below.

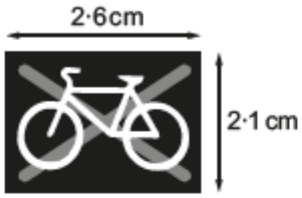

Diagram not drawn to scale

A mathematically similar new sign is placed near the side of the playing field.

Diagram not drawn to scale

It is 33·6 cm high.
How wide is this sign? [2]

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Width is ..... cm

The wire window guard shown below is to be made.

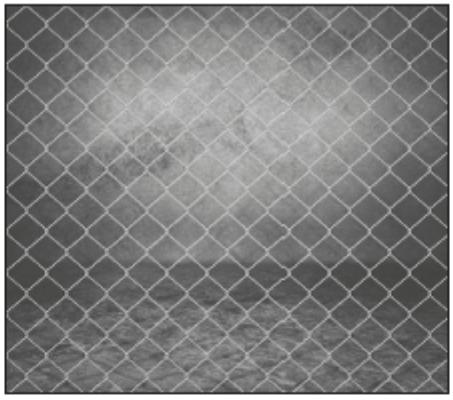

Diagram not drawn to scale

The length of the sides of each small wire square shown is 3·3 cm.

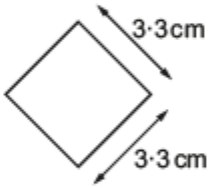

Diagram not drawn to scale

Llinos considers the length of the diagonal of each small square.

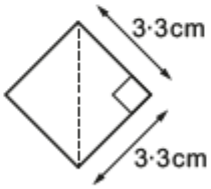

Diagram not drawn to scale

She says,

The height of the window guard is equal to 9·5 diagonals of the square.
The width of the window guard is equal to 11 diagonals of the square.

(a) Calculate the length of the diagonal of a small square.
Give your answer correct to 1 decimal place. [3]

(b) Calculate the area of the **window guard**.
You must show all your working. [3]

Gwenda enjoys road running.

(a) She keeps a record of her run each day this week.

Day	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Distance	4·6 km	5·4 km	2·2 km	6·2 km	7·2 km	2·2 km	3·4 km
Time	26 mins	31 mins	12 mins	35 mins	40 mins	14 mins	22 mins

Last week, her average speed for the week was 9·6 kilometres per hour.
Calculate Gwenda's percentage improvement in her average speed from last week to this week.
You must show all your working. [6]

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Percentage improvement is ..... %

(b) The diagram shows the cross-section of one part of her run.

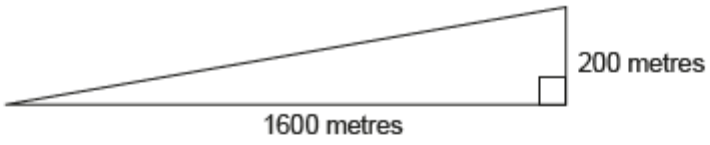

Diagram not drawn to scale

Calculate the angle of elevation of the road. [3]

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(c)

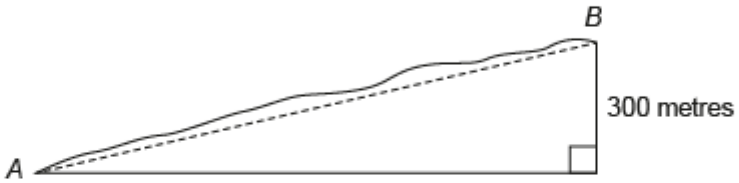

Diagram not drawn to scale

Gwenda runs on another section of uneven road from *A* to *B*.
The rise in this section of the road is 300 metres.
The angle of elevation of *B* from *A* is 10°.

(i) Calculate an estimate of how far Gwenda has run.
State any assumption you have made. [4]

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Assumption: .....

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(ii) What is the impact of your assumption on your answer? [1]

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Rhodri studies a cylindrical cell under his microscope.
The height of the cell is 2 microns.
The circumference of the cell is 5 microns.

Calculate the volume of the cell he sees under the microscope.
Give your answer in microns^3, correct to 1 significant figure. [5]

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