St. Patrick's High School, Keady

Mathematics Department

GCSE Mathematics Practice Booklet

M6

Topic 6 – Geometry and Measure 2

Angles in Polygons

Scale drawings and bearings

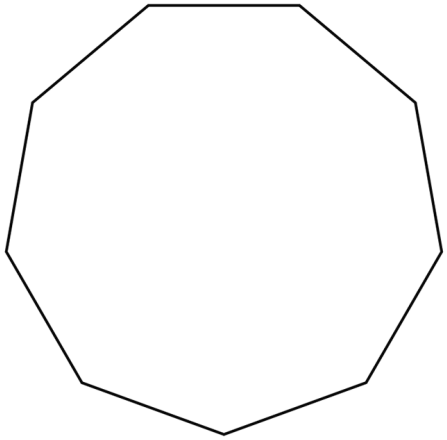
Constructions and Loci

Imperial and metric units

Questions taken from CCEA Past Papers

Keady Maths

Q1



This is a drawing of a regular nonagon (a shape with nine sides of equal length).

Explain why the size of an interior angle is 140°

[2]

Q2

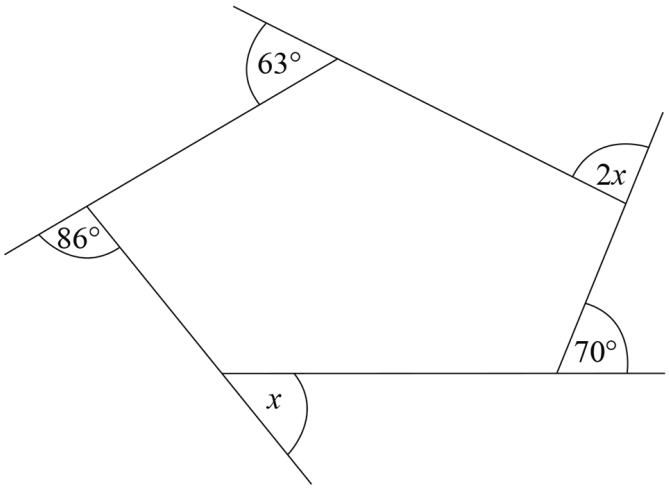


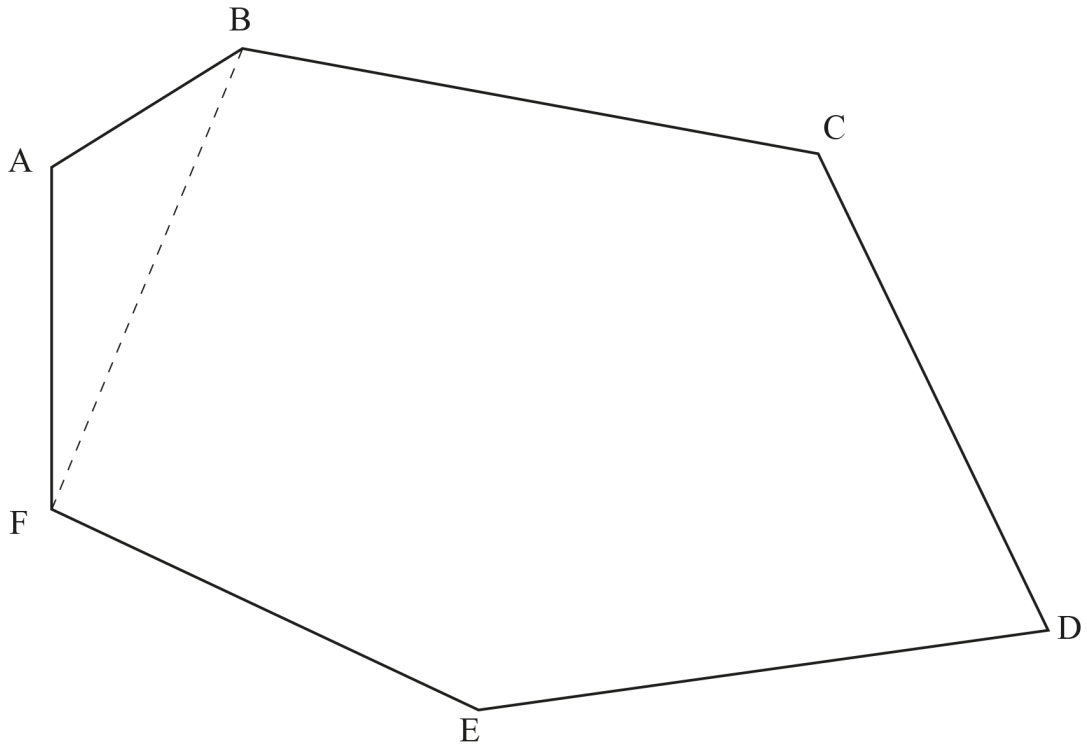
Diagram not drawn accurately

Work out the size of angle x in the diagram above.

Answer $x =$ _____ ° [4]

Q3

Polygon ABCDEF may be divided into triangles. One triangle is shown.

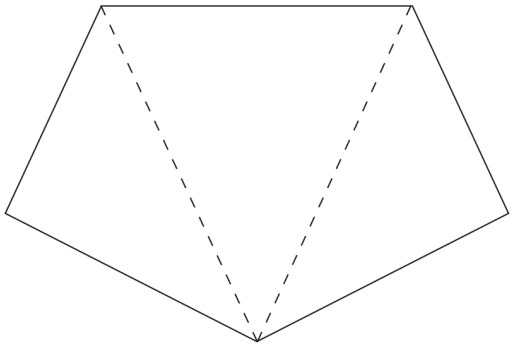


Use triangles to work out the sum of the interior angles of the polygon ABCDEF.

You **must show** your working.

Answer _____ ° [2]

Q4



(a) (i) What is the total of all the angles in the three triangles shown?

Answer _____ ° [1]

(ii) What is the sum of the interior angles of a five-sided polygon?

Answer _____ ° [1]

(b) What is the sum of the interior angles of a seven-sided polygon?

Answer _____ ° [2]

Q5

ABCDE is a pentagon.

Lines AF and CG are straight lines.

Work out the value of $x + y + z$

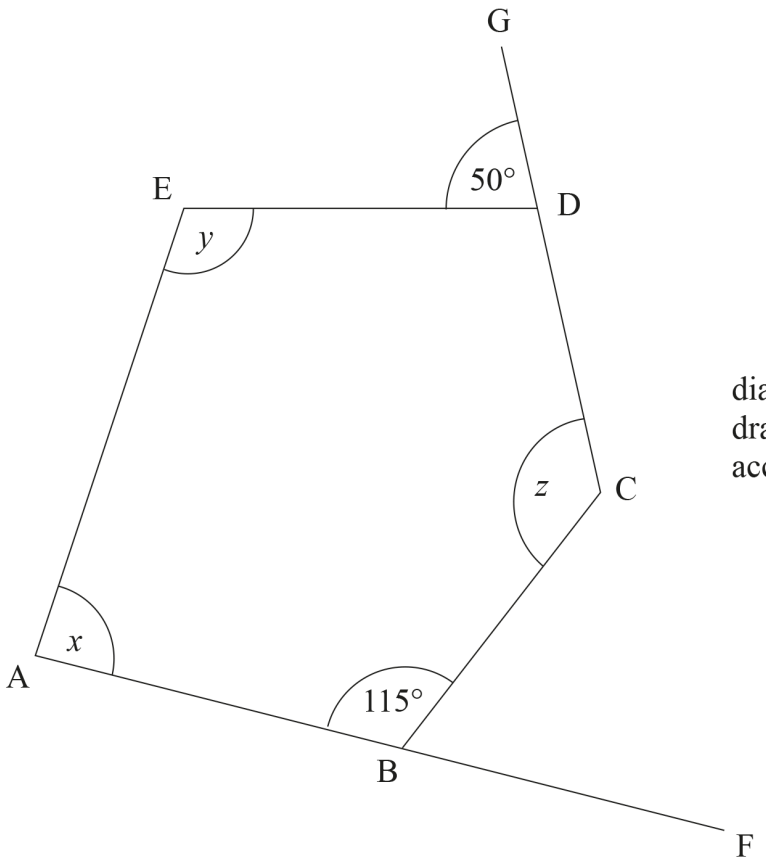


diagram not drawn accurately

Answer _____ ° [5]

Q6

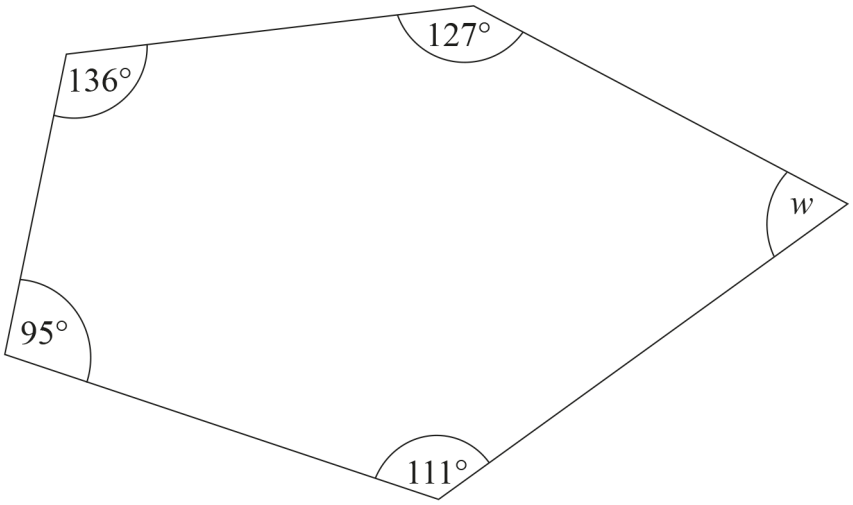


diagram not drawn accurately

Work out the size of the angle w in the pentagon drawn above.

Answer w = _____° [3]

Q7

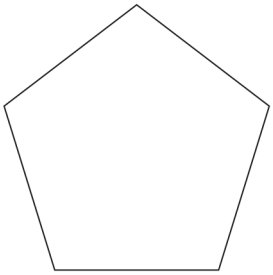
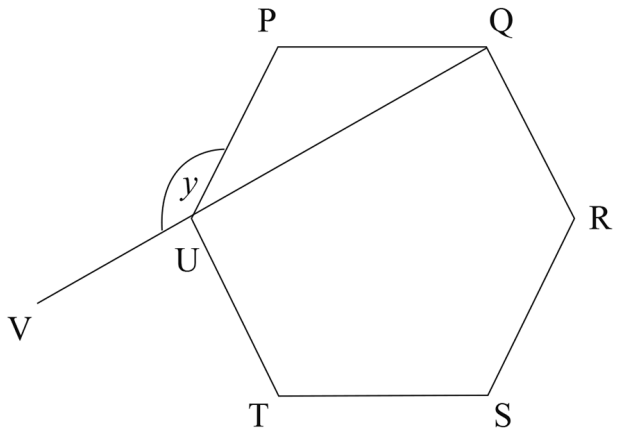


diagram not
drawn accurately

Calculate the interior angle of a regular pentagon.

Answer _____° [2]

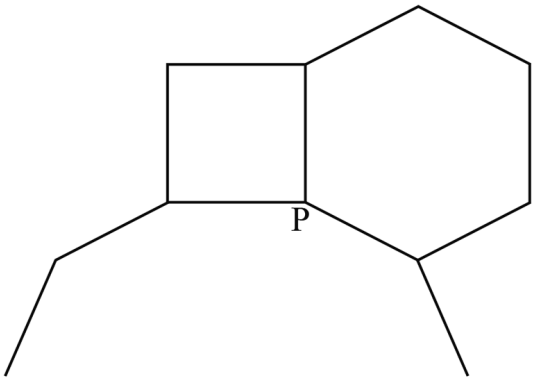
Q8 PQRSTU is a regular hexagon.
QUV is a straight line.
Show that angle y is 150°
Give reasons for each step of your work.



[4]

Q9 Three regular polygons meet at point P as shown.

diagram not drawn accurately



One polygon is a square and another polygon is a regular hexagon. How many sides has the third polygon?

Explain your working clearly.

Answer _____ sides [4]

Q10 **(a)** Four equilateral triangles and a square are joined together as shown in the diagram.

Calculate the size of angle g.

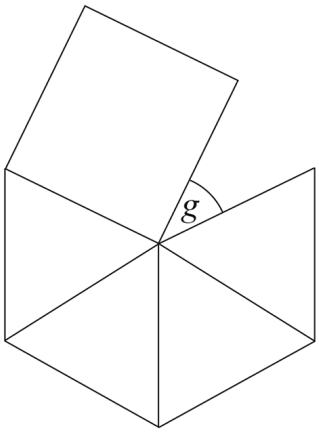


diagram not
drawn accurately

Answer $g =$ _____ ° [3]

(b) An equilateral triangle and a regular pentagon are joined together as shown in the diagram.

Calculate the size of angle h.

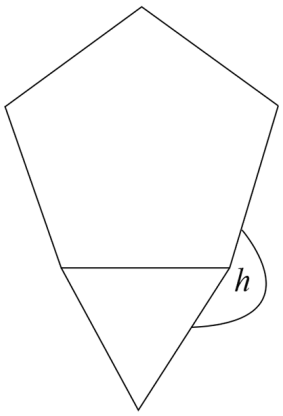
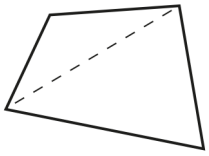


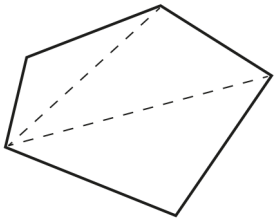
diagram not
drawn accurately

Answer _____ ° [3]

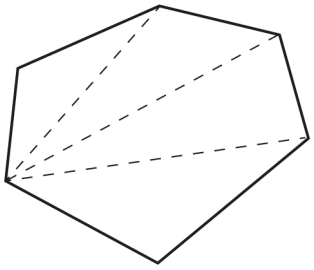
Q11



Quadrilateral



Pentagon



Hexagon

P is a polygon.

The sum of all the angles in P is three times the sum of the angles in a quadrilateral.

How many sides has P?

Answer _____ [2]

Q12

Each interior angle of a regular polygon is 140°.

How many sides has the polygon?

Answer _____ [2]

Q13 On a diagram the distance between Belfast and Liverpool is 6.5 cm.

The bearing of Liverpool from Belfast is 135°

Show the position of Liverpool on the diagram below.

Mark it clearly with ×.

[2]

Q14 The bearing of a fishing boat from a lighthouse is 118°.

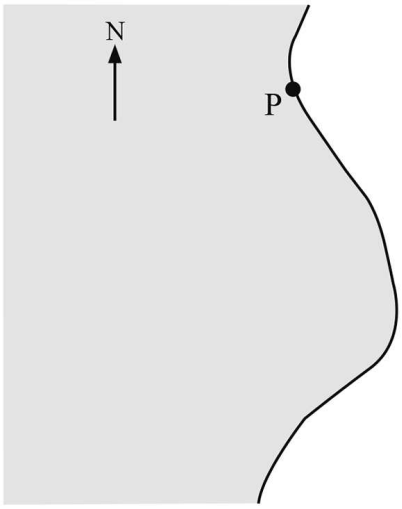
Work out the bearing of the lighthouse from the fishing boat.

Answer _____ ° [2]

Q15 A lifeboat leaves port P to answer an emergency call from a ship S.

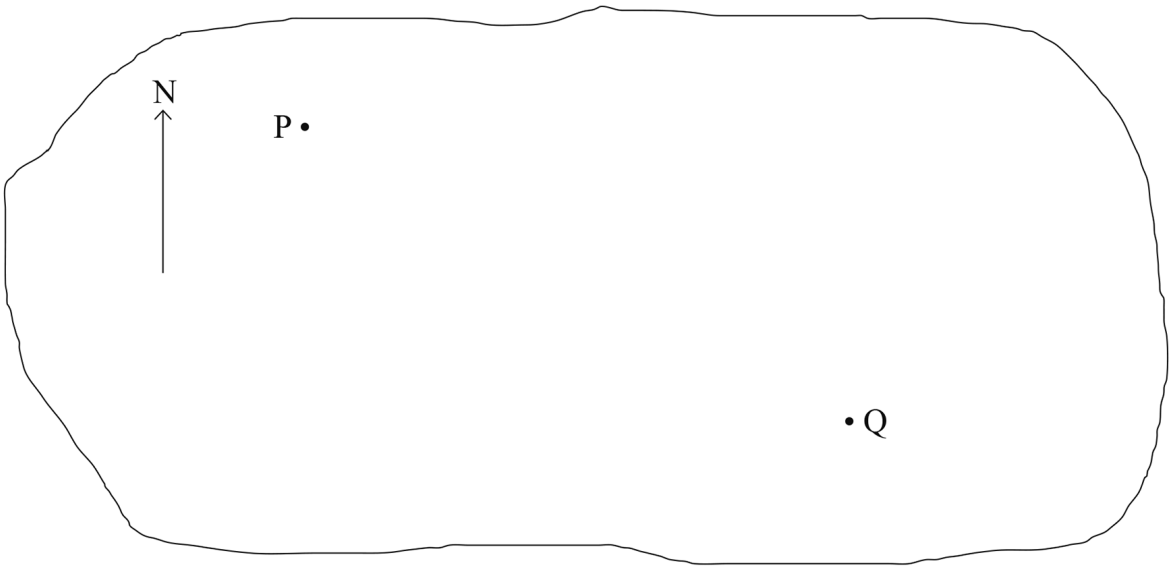
The ship is 30 km from P on a bearing of 120°

Using a scale of 1 cm = 4 km, mark the position of the ship S.



[2]

Q16 Towns P and Q are shown on the map.



(a) Measure the bearing of Q from P.

Answer _____ ° [1]

(b) Measure the bearing of P from Q.

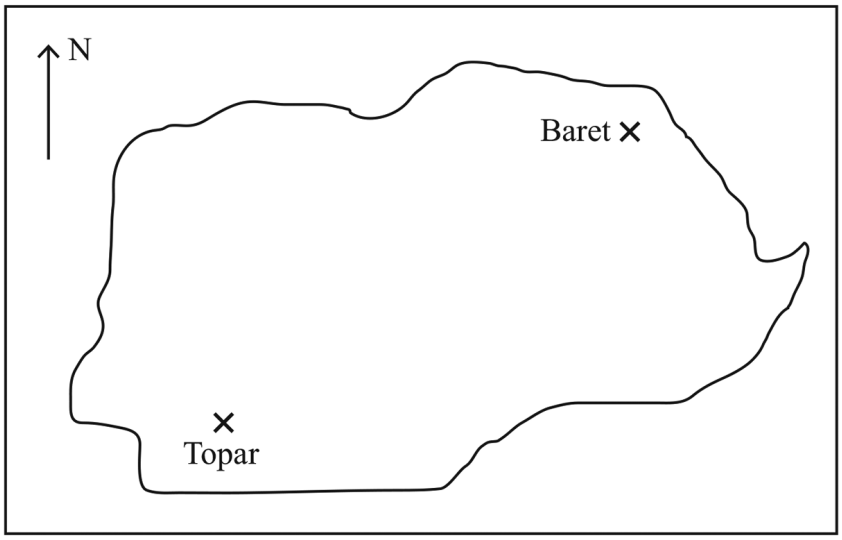
Answer _____ ° [1]

(c) The scale of the map is 1cm to 5 km.

Work out the actual distance between the two towns.

Answer _____ km [3]

Q17



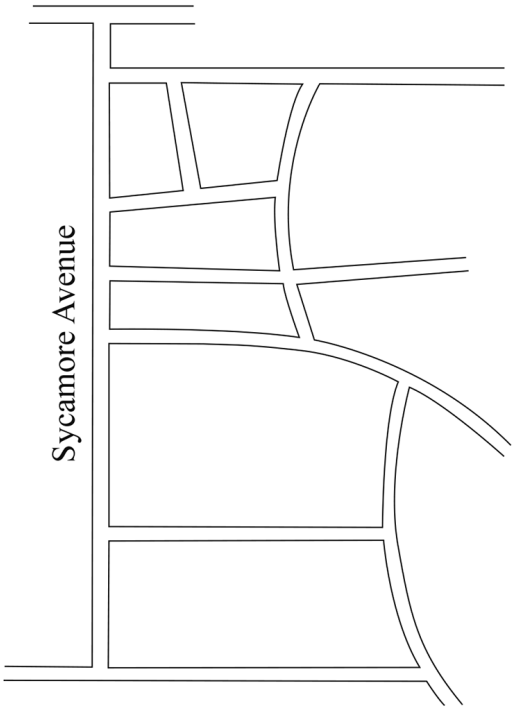
In the map above the scale is 1 cm = 60 km.

Find the actual distance between Baret and Topar.

Answer _____ km [3]

Q18

5 Below is a street map showing Sycamore Avenue.



The actual length of Sycamore Avenue is 180 m.

Work out the scale of the map as a ratio in the form 1 : _____

Answer 1 : _____ [3]

Q19 Two boats are 40 km apart.

Boat Y is due east of boat X as shown in the scaled diagram below.

The scale used is 1 cm = 5 km

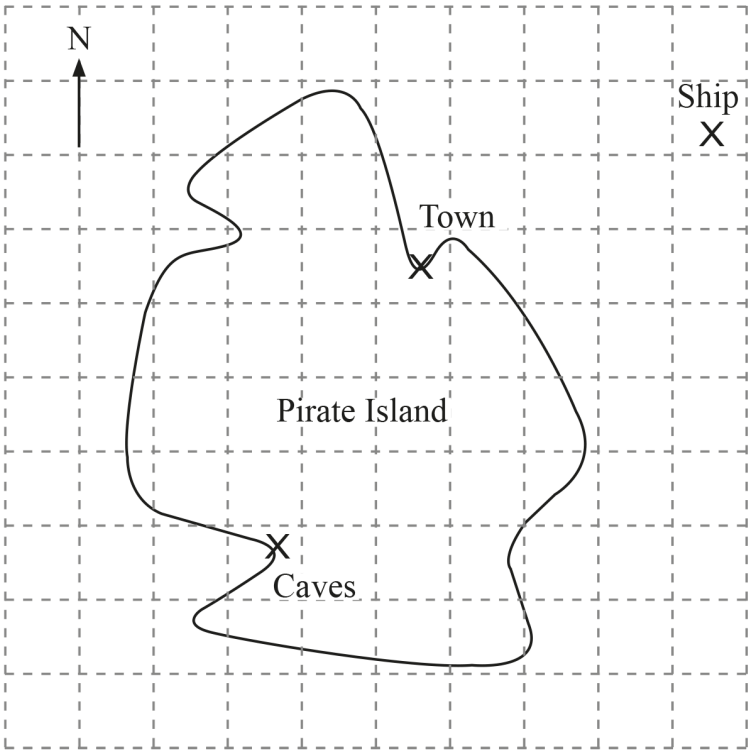
Lobster pots are placed in a region which is less than 25 km from boat X and less than 30 km from boat Y.

Using a ruler and compasses, show this region on the diagram by shading.

Boat X • • Boat Y

[3]

Q20



SCALE
1 cm = 2 km

(a) Use the scale to find the distance from the town to the caves.

Answer _____ km [2]

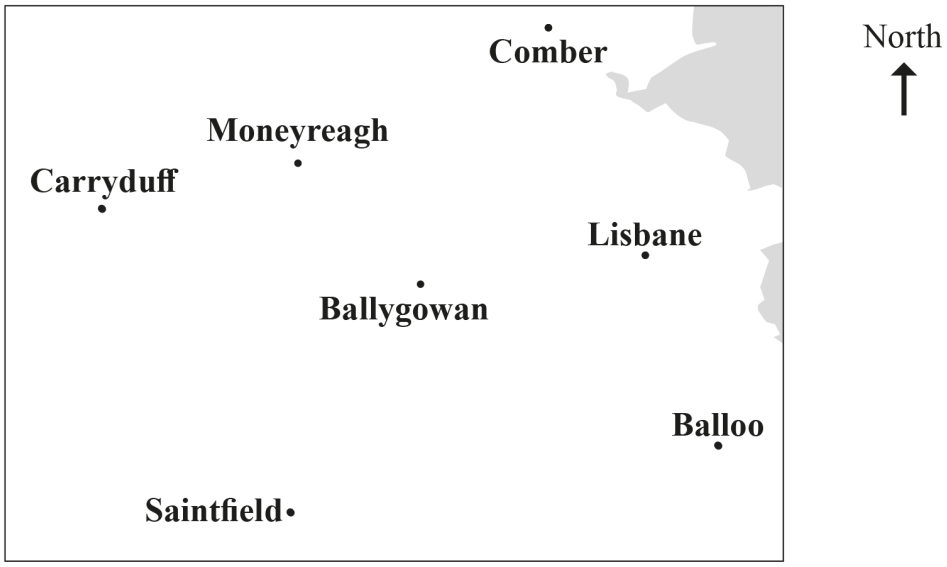
(b) Mark, with an X, the position of the buried treasure which is 6 km due South of the town. [1]

(c) Measure and write down the bearing of the ship from the town.

Answer _____ ° [2]

Q21

The map shows some places in Co Down.



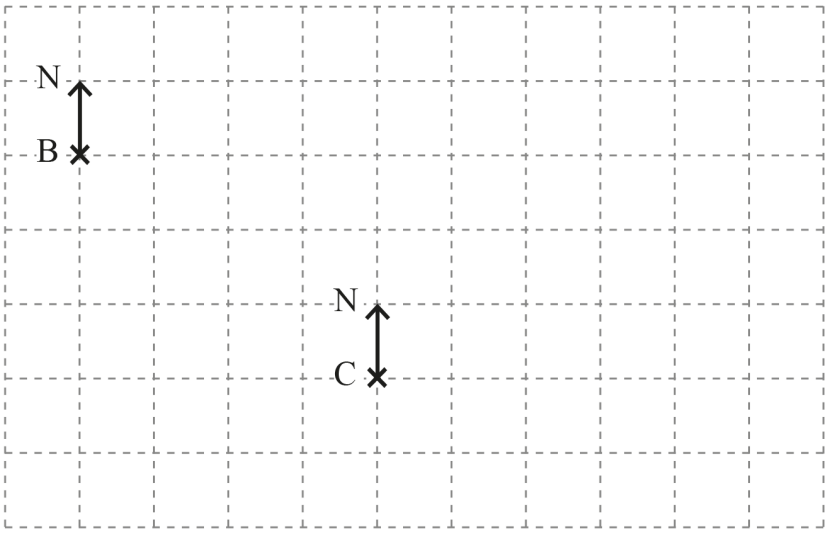
Scale: 1 cm represents 1 mile

A bird flies direct from Carryduff to Balloo.

What is the actual distance the bird flies?

Answer _____ [2]

Q22 The diagram shows the position of two airports, B and C.



(a) Measure the bearing of C from B.

Answer _____° [1]

(b) A third airport D is 350 km on a bearing of 055° from airport C.

On the diagram, using a scale of 1 cm to 50 km, mark the position of airport D with a cross (✕) and label it D. [2]

Q23

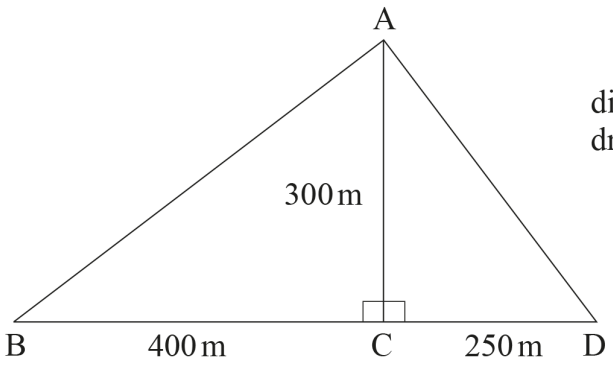


diagram not drawn accurately

(a) In the space below, make a scale drawing of the diagram ABCD shown above.

Use a scale of 1 cm to 50 m.

B ×

[3]

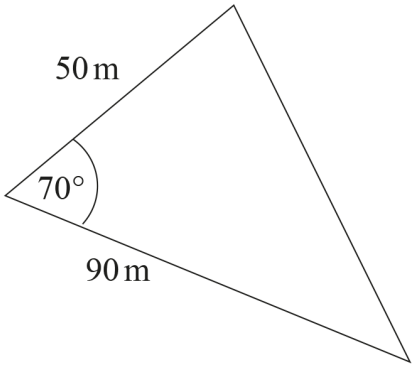
(b) Use your scale drawing to calculate the actual length of AB.

Answer AB = _____ m [1]

Q24 The sketch below shows a triangular field.

Two sides have lengths of 50 m and 90 m.

The angle between these two sides is 70°



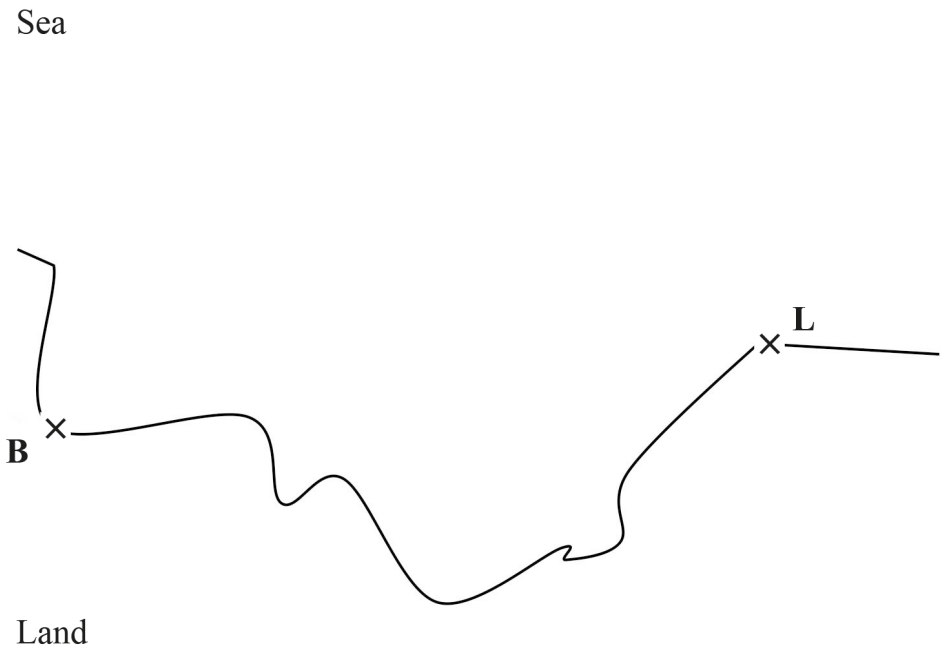
Using a scale of 1 cm = 10 m, draw this triangular field in the space below. [3]

Q25 The diagram shows a section of coastline with a lifeboat station marked at B and a lighthouse marked at L.

A sinking ship sends a distress signal.

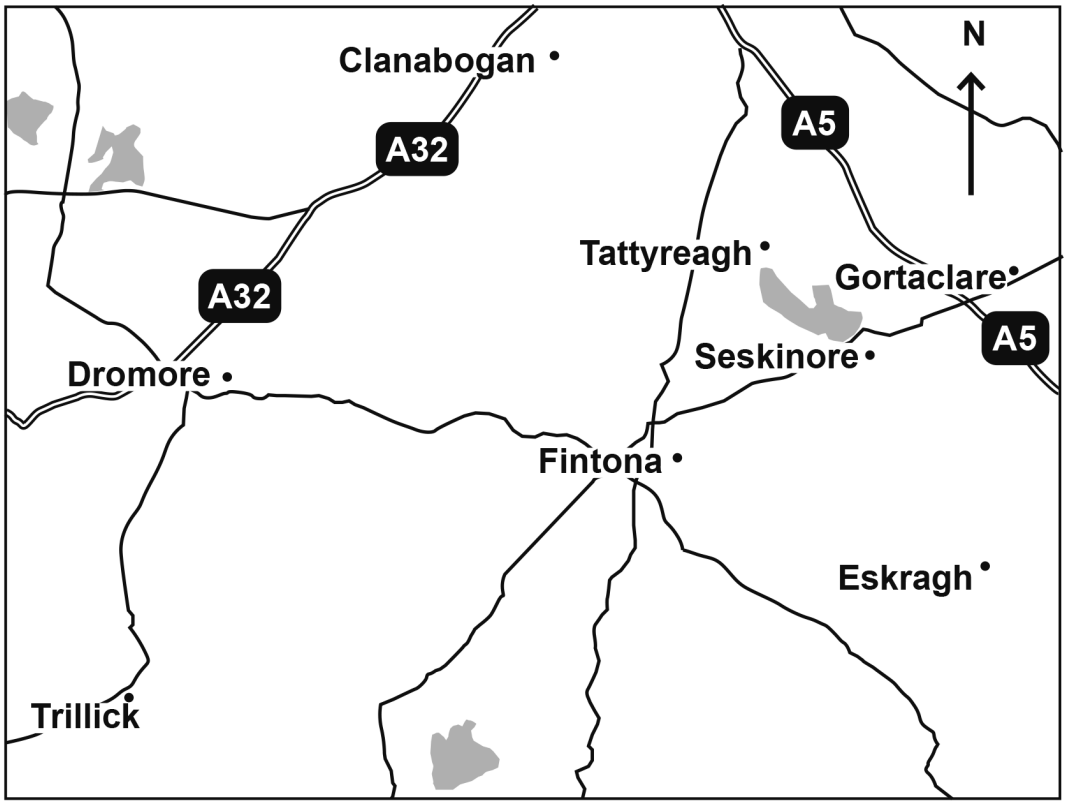
The ship is less than 70 km from B and less than 30 km from L.

Using a scale of 1 cm = 10 km, **shade the region** in which the ship could be.



[3]

Q26

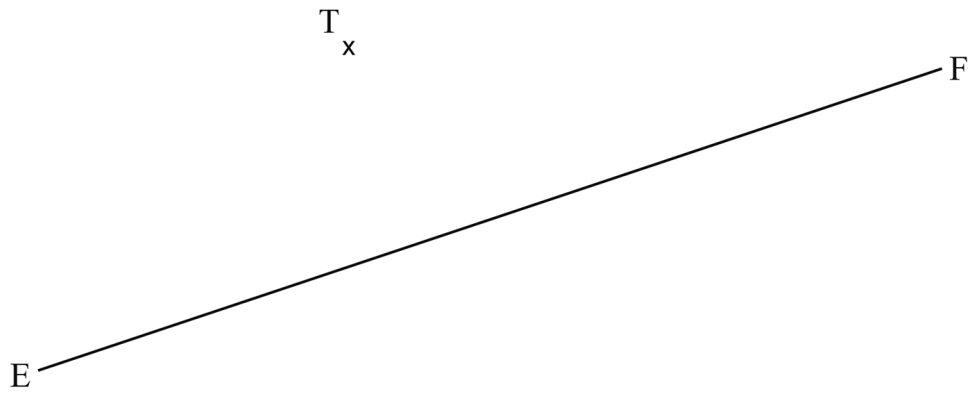


What is the bearing of Dromore from Fintona?

Answer _____° [1]

Q27 Use ruler and compasses only to construct the perpendicular from the point T to the line EF.

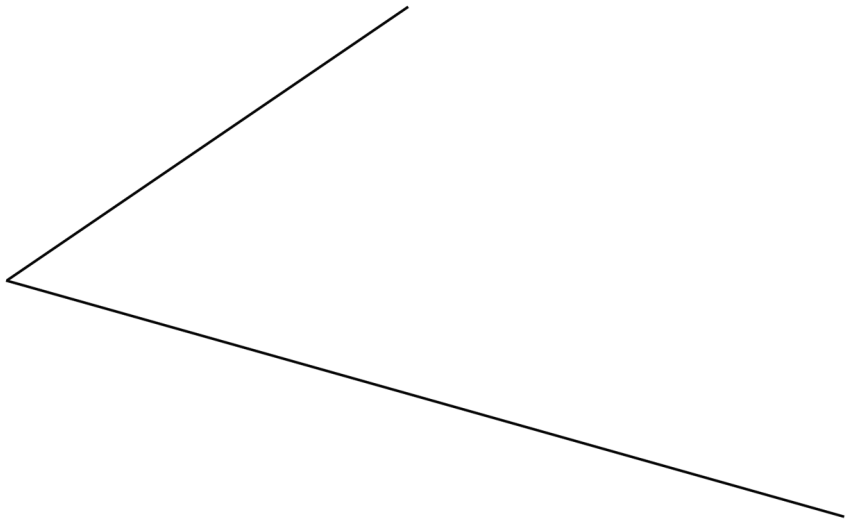
You must show all your construction work.



[2]

Q28 Using a ruler and compasses only, construct the bisector of the angle below.

You must show all construction lines.

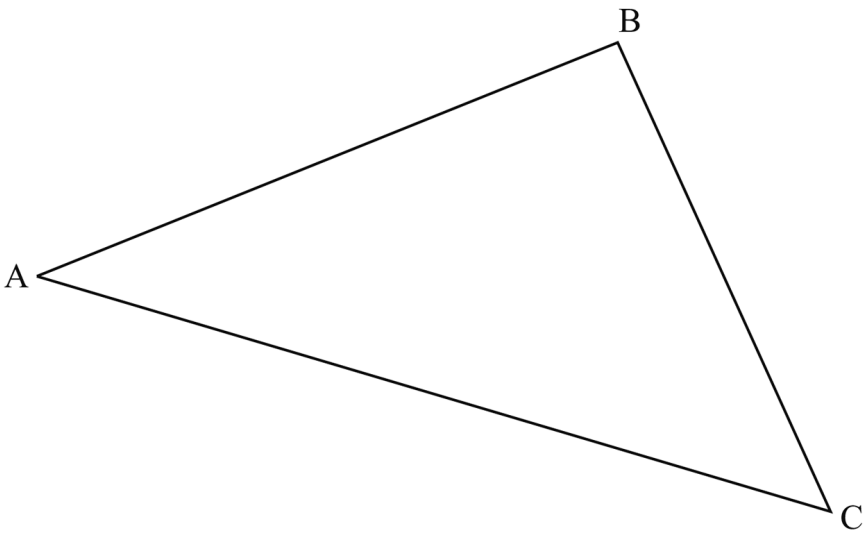


[2]

Q29 **(a)** Use only a ruler and a pair of compasses to construct an equilateral triangle of side length 7 cm.
Show all your construction arcs.

[2]

(b) Use only a ruler and a pair of compasses to bisect the angle ABC in the triangle below.
Show all your construction arcs.



[2]

Q30

ABCD is a rectangle, with AB = 9 cm and BC = 7 cm.

Shade the region inside the rectangle which is the locus of all points that are

(i) greater than 4.5 cm from C

and **(ii)** nearer to B than D. [3]

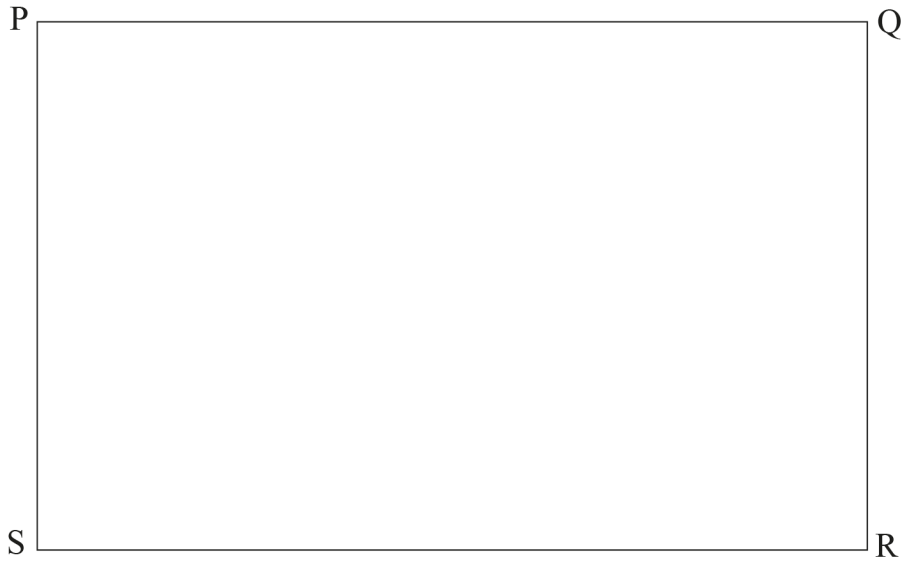
Q31

PQRS is a rectangle.

Shade the region inside the rectangle which is

more than 5 cm from P

and more than 3 cm from the line QR.



[3]

Q32

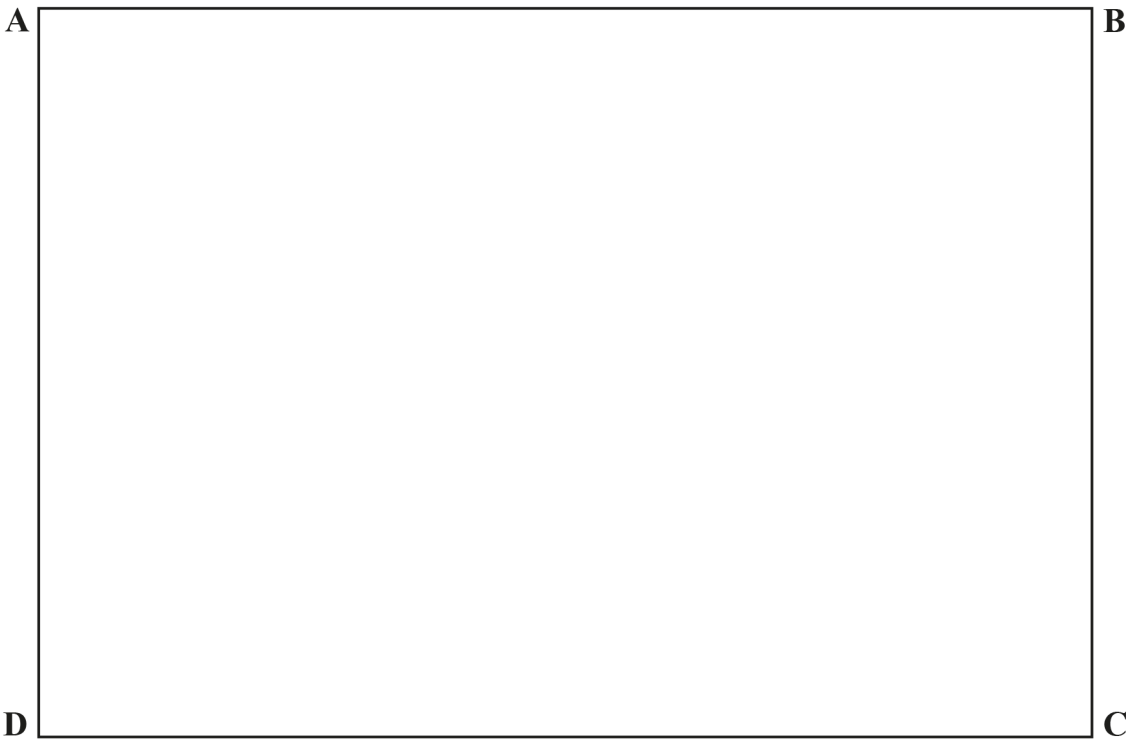
Toby walks his dog in the field **ABCD** so that he is always:

more than 40 m from **A**;

nearer to **A** than **B**;

nearer to **DA** than **DC**.

Shade the area where Toby walks his dog.



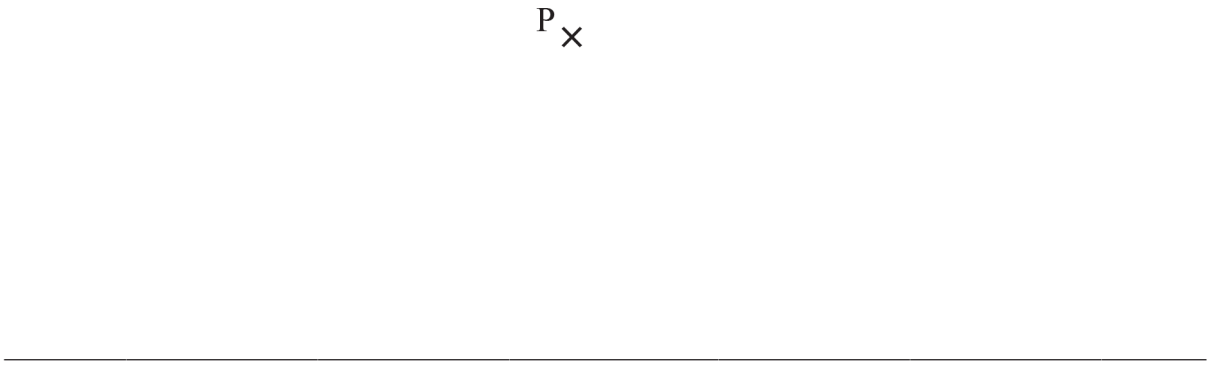
Scale of diagram: 1 cm = 10 m

[4]

Q33

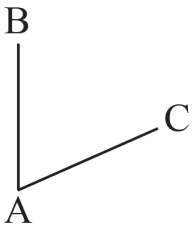
Use a ruler and compasses to construct the perpendicular from the point P to the line shown.

Leave all construction arcs and lines.



[2]

Q34 Cara read the following instructions to draw a triangle.



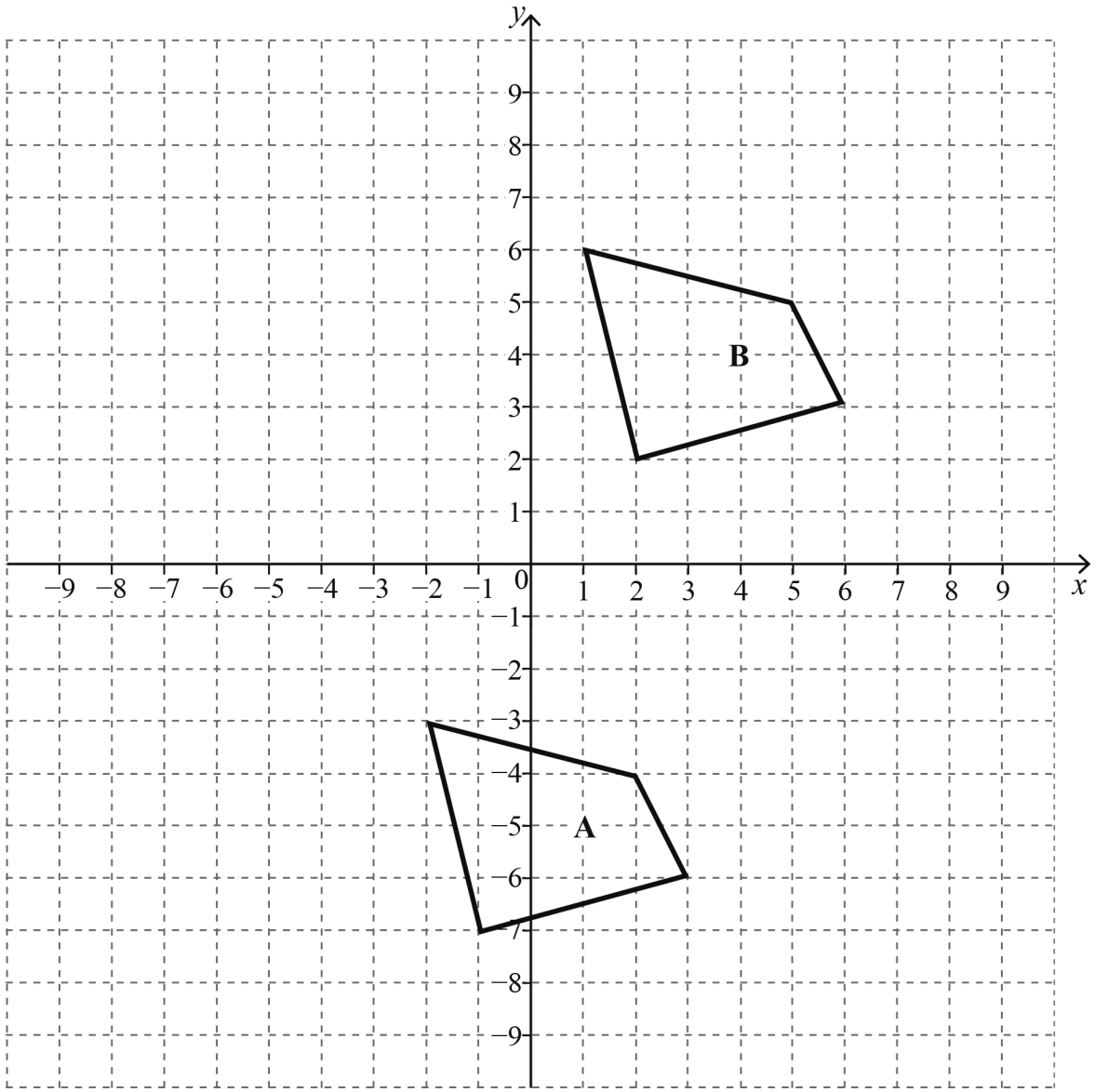
- Using a ruler, draw a 10 cm **vertical line** from point A.
  Note: Point A has been marked below.
- Label the other end B.
- Place a protractor at point A and measure an angle of 70° to the right of the line AB and mark with a dot.
- Draw an 8 cm line from A through your dot.
- Label the end of this line C.
- Join B to C.

Follow the instructions and draw Cara's triangle below.

•
A

[3]

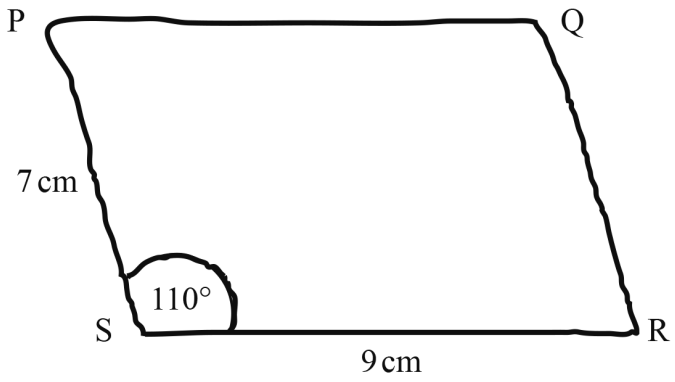
Q35



(a) Describe fully the single transformation that maps shape **A** onto shape **B**.

Answer _____ [2]

(b) A sketch of a parallelogram PQRS is shown.



It is not drawn to scale.

Use a ruler and protractor to draw an accurate diagram of the parallelogram in the box below.

[4]

Q36 Which imperial unit would be used to measure

(a) a depth of several metres,

Answer _____ [1]

(b) a volume of twenty litres,

Answer _____ [1]

(c) a length of a few centimetres?

Answer _____ [1]

Q37 The petrol consumption of a car is 64 miles to the gallon.

How many miles should the same car do to the litre?

1 gallon = 8 pints. **Show your working clearly.**

Answer _____ [2]

Q38 An imperial unit for measuring the speed of a car is miles per hour.

Write down an imperial unit for measuring

(a) the length of a pencil,

Answer _____ [1]

(b) the weight of an apple.

Answer _____ [1]

Q39 Which **imperial** unit would be used to measure

(a) how much petrol a car tank can hold when full,

Answer _____ [1]

(b) how far a runner can run in 20 seconds,

Answer _____ [1]

(c) the weight of a biscuit?

Answer _____ [1]

Q40

Change 20 miles/h to km/h.

Answer _____ km/h [2]

Q41

Here are some metric and imperial units.

miles **pints** **kilograms** **millimetres**

Write them in the correct place in the table below.

Metric units	Imperial units

[2]

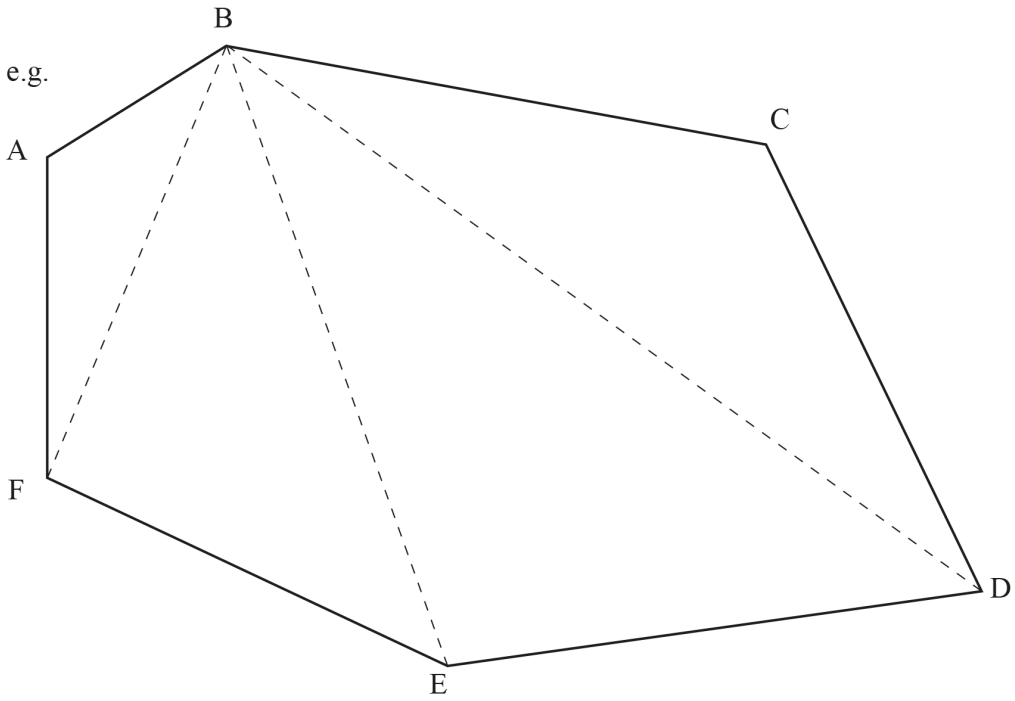
1.

QWC	
Exterior angle = 360 ÷ 9 = 40 **or** 9 × 40 = 360	C1
Interior angle = 180 – 40 = 140	C1
or	
Interior = (180 × 7) ÷ 9 = 140	C2

2.

$x + 86 + 63 + 2x + 70 = 360$ or equivalent	M1 A1
$(3x =)$ 141	MA1
$x = 47$	MA1
Alternative method:	
360 – (86 + 63 + 70) or 360 – 219	M1 A1
141	MA1
47	A1

3.



Angle sum = 180 × 4 = 720° M1 A1

4.

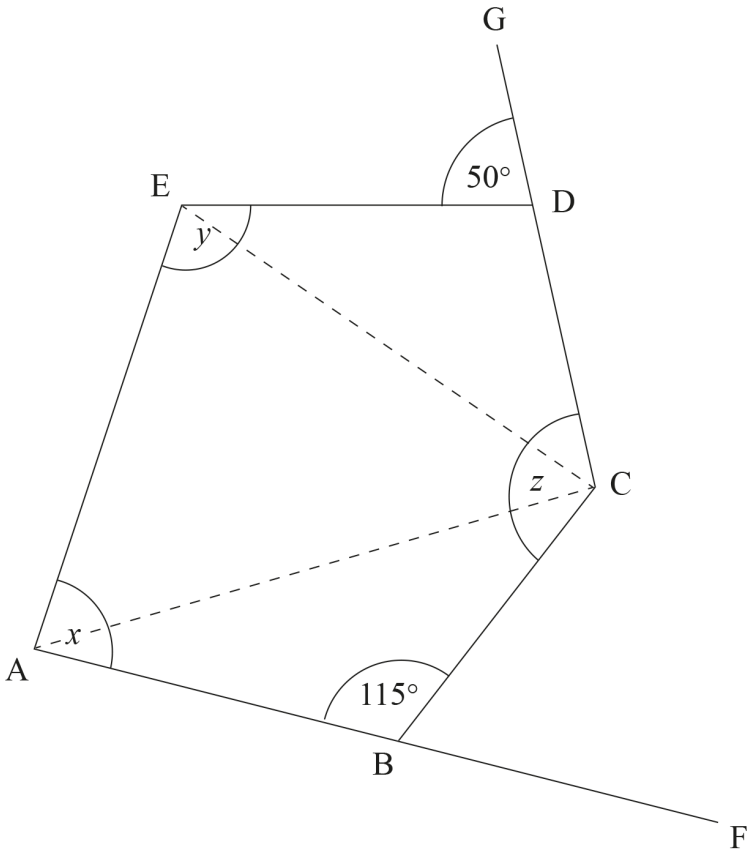
(a) **(i)** 540 A1

(ii) 540 A1

(b) 540 + 180 + 180 = 900 M1 A1
or 5 × 180 = 900

5.

$180 - 50 = 130$	follow through only for clear numerical error	MA1
$115 + 130 = 245$	follow through only for clear numerical error	MA1
Total of the angles in a Pentagon = 540 = (3 triangles so $3 \times 180°$)		A1
$540 - 245 = 295$		M1 A1



6.

540	MA1
540 – (127 + 136 + 95 + 111) (or 540 – 469)	M1
71	A1

7.

180 – 72	M1
108	A1
or alternative answer	
540 ÷ 5	M1
= 108	A1

8.

ext angle of hexagon = 360/6 = 60°	MA1
int angle of hexagon QPU = 120	MA1
PUQ = (180 – 120)/2 = 30° isosceles triangle	MA1
y = 180 – 30 = 150° straight line	MA1

9.

720 ÷ 6 = 210	C1
360 – 210 = 150	C1
180 – 150 = 30	C1
$\frac{360}{30} = 12$	C1

10.

(a) Evidence of 60×4 MA1

$360 - (240 + 90)$ MA1

30 A1

(b) Evidence of 108 in correct place on diagram **or** saying interior angle = 108° MA1

$360 - (108 + 60)$ MA1

192 A1

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11. Using 2, 3, 4, 5, 6 triangles in polygons and drawing 7 and 8 sided polygons M1

8 A1

Allow MA1 for $3 \times 360 = 1080$

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12. (180 – 140 =) 40 MA1

$\left(\frac{360}{40} =\right) 9$ MA1

13.

Correct bearing ± 2°	MA1
Correct distance ± 2 mm	MA1

14.

360 – 62 or 118 + 180	MA1
298	A1

15.

Correct length of 7.5 cm (± 2 mm)	MA1
Correct bearing of 120° (± 2°)	MA1

16.

(a)	119 ± 2	A1
(b)	299 ± 2	A1
(c)	8.4 ± 0.2	A1
	8.4 × 5 = 42 ± 1	M1, A1

17.

Distance = 6.5 cm(±2 mm)	A1
6.5 × 60	M1
390	A1

18.

Sycamore Avenue = 9 cm or 90 mm	A1
9 cm : 180m = 9 : 18 000	MA1
1 : 2000	A1

19.

Arc drawn 5 cm from X	MA1
Arc drawn 6 cm from Y	MA1
Correct area shaded	A1

20.

(a) 4.2 × 2 = 8.4	A1 MA1
(b) Correct position marked	MA1
(c) 066 ± 2	M1 A1

21. 8.9 miles (accept 8.7 to 9.1, including 9) A1 A1

22.

(a) correct angle A1

(b) correct length, correct angle A1 A1

23.

(a) Accurate scale drawing A3

(b) AB = 500 m A1

24.

Line of 5 cm ± 0.2 cm drawn A1

Line of 9 cm ± 0.2 cm drawn A1

Angle of 70° (± 2°) drawn A1
(P1 if triangle not drawn)

25.

Arc of 7 cm drawn from B	MA1
Arc of 3 cm drawn from L	MA1
Area bounded by the two arcs shaded	A1

26.

280 (±2°)	A1

27.

Correct construction lines used	M1
Accurate perpendicular line drawn	A1

28.

Construction arcs	M1
Accurate angle bisector drawn	A1

29.

(a)	One side of length 7 cm plus two intersecting construction arcs	M1A1
(b)	Completion of accurately drawn triangle Arcs on AB and BC, equidistant from B plus two intersecting arcs Accurately drawn angle bisector	M1A1

30.

Arc of circle drawn, centre C and radius 4.5 cm	MA1
Perpendicular bisector of BD drawn	MA1
Correct region shaded	A1

31.

Arc drawn inside rectangle, centre P, radius 5 cm	A1
Straight line drawn inside rectangle, 3 cm from QR	A1
Correct region shaded inside rectangle	A1

32.

Arc, radius 4 cm, centre A	MA1
Bisector of AB	MA1
Bisector of angle D	MA1
Correct shading for arc and 2 lines	MA1

33.

Arc from P crossing the line	MA1
Arcs from crossing point to intersect and draw line from P to intersection	MA1

34.

Line AB correctly drawn	MA1
Angle of 70° correctly drawn	MA1
Line AC correctly drawn and triangle completed	MA1

35.

(a) Translation 3 right and 9 up — A1 A1

(b) 9 cm base (±2 mm) — A1

110° angle at S (±2°) — A1

7 cm parallel lines (±2 mm) — A1

9 cm line parallel to base (±2 mm) — A1

36.

(a) Yard, foot — A1

(b) Pint, gallon — A1

(c) Inches — A1

37.

1 litre ≅ 1.75 pints or equivalent — C1

8 miles to the pint and 6 miles to $\frac{3}{4}$ pint
so 14 to the litre — C1

38.

(a) inch — A1

(b) ounce — A1

39.

(a) gallon A1

(b) yard, foot A1

(c) ounces A1

40.

$20 \times \frac{8}{5} = 32$ M1 A1

(allow 1 for sight of 5, 8)

41.

Metric Units	Imperial Units
kilograms	miles
millimetres	pints

All 4 correct A2 At least 2 correct A1

Q1 The diagram shows a regular pentagon placed on top of a regular hexagon.

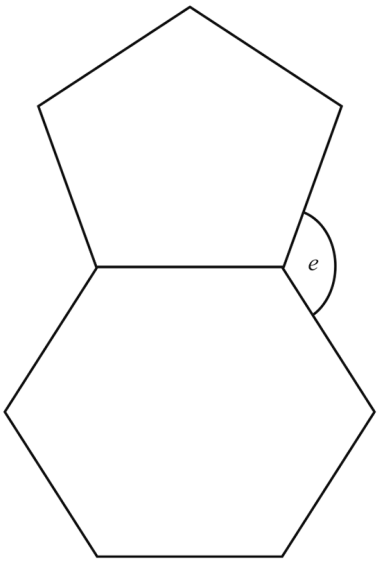


diagram not
drawn accurately

Calculate the size of the angle marked e.

Show all your working.

Answer e = _____ ° [4]

Q2 A regular polygon has an interior angle of 150°

(a) How many sides does it have?

Answer _____ [2]

Two of these polygons are placed edge to edge.

(b) What regular shape would fit exactly in the space beside these touching edges?

Answer _____ [2]

Q3

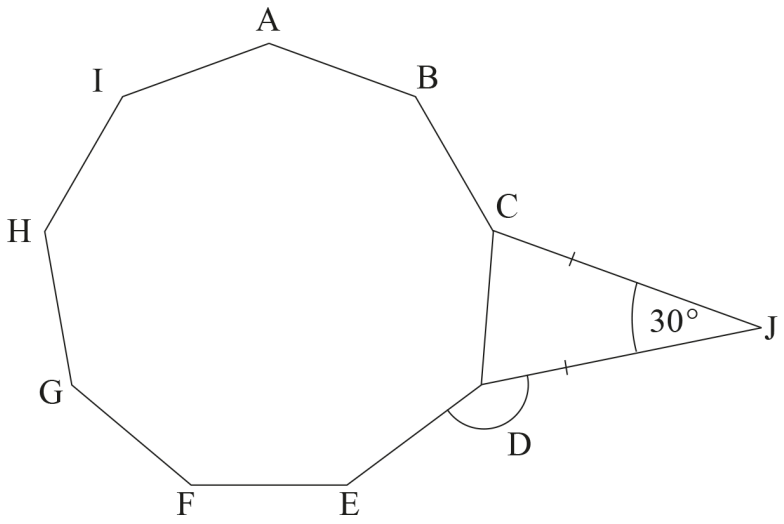


diagram not drawn accurately

The diagram shows a regular nonagon ABCDEFGHI with an isosceles triangle DCJ attached.

The angle DJC = 30°

Calculate the size of the angle EDJ.

Show your working clearly.

Answer _____° [4]

Q4

(a) Work out the size of an exterior angle of a 24-sided regular polygon.

Answer _____° [2]

(b) The sum of the interior angles of a regular polygon is 1800°

Work out how many sides this polygon has.

Answer _____ [2]

Q5 A regular polygon has exterior angles of size 15°

(a) How many sides has the polygon?

Answer _____ [2]

(b) Bailey thinks all regular pentagons are congruent.

Is he correct?

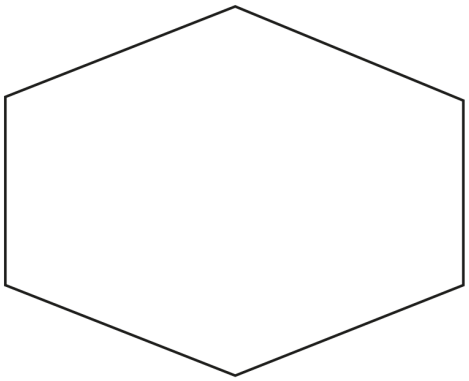
Circle your answer.

yes no more information needed [1]

Q6 Ellie and Tanisha are working out the sum of the angles in polygons.

Ellie decides to split the hexagon below into triangles.

(a) Show how this can be done.



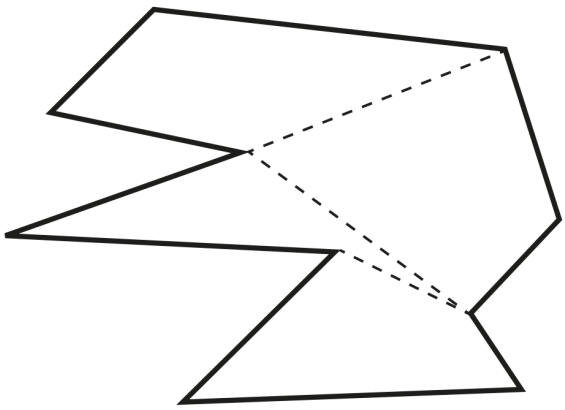
[1]

(b) What is the sum of the angles in the hexagon?

Answer _____° [1]

Tanisha splits the decagon below into quadrilaterals as shown.

(c) What is the sum of the angles in the decagon?



Answer _____° [1]

Q7 Calculate the size of the angle a.

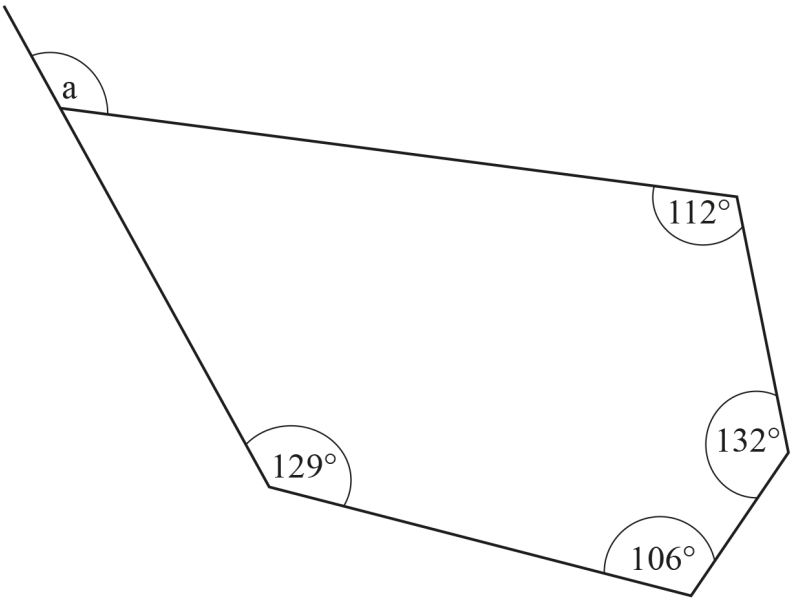


diagram
not drawn
accurately

Answer Angle a = _____ ° [3]

Q8 A sketch of an irregular pentagon is shown.

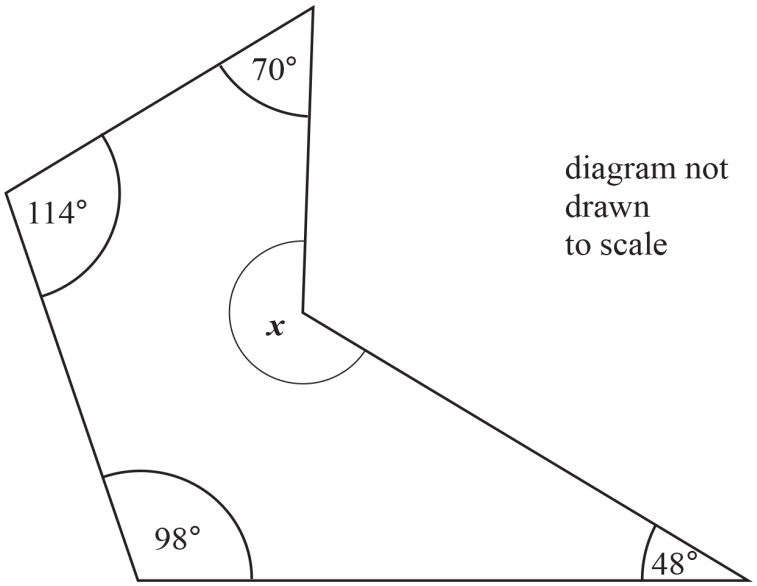


diagram not drawn to scale

Calculate the value of x.

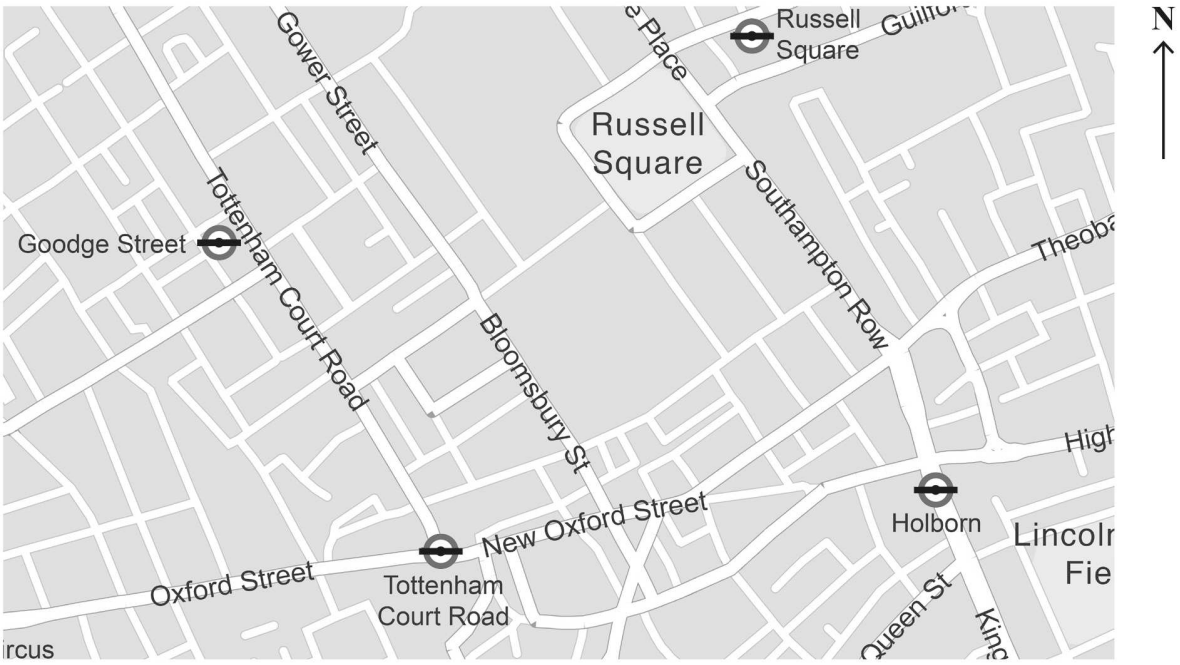
Show all your working.

Answer _____ ° [3]

Q9

The map shows the position of four Underground Stations in London.

The symbol for an underground station is



Map Scale 1 cm = 100 m

(a) Calculate the **actual distance** between Goodge Street Underground Station and Holborn Underground Station.

Show your working clearly.

Answer _____ m [2]

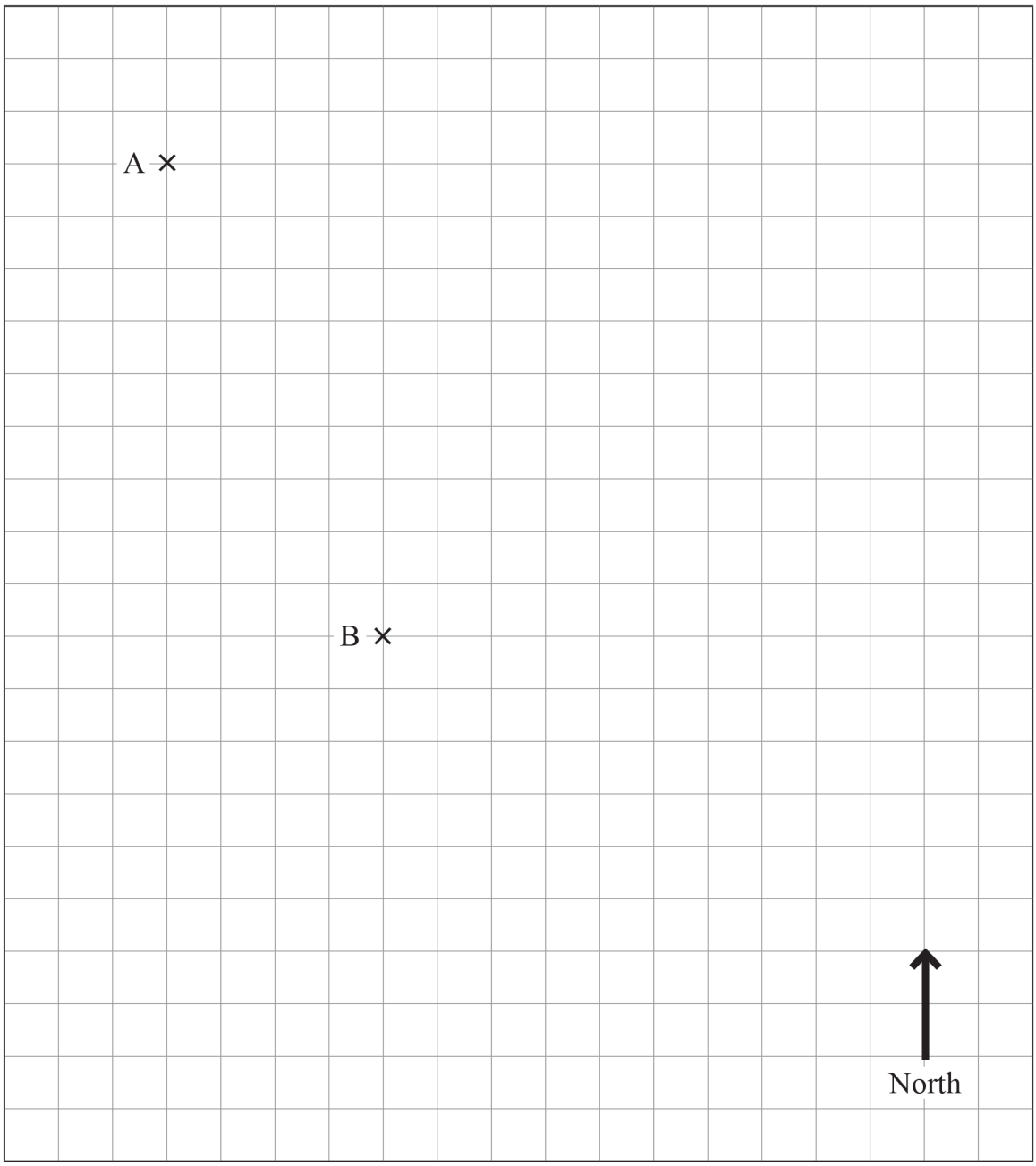
(b) Great Ormond Street Children's Hospital is 550 m due North of Holborn Underground Station.

Mark the exact position of the hospital with an X. [2]

Q10 The position of two Airport Control Towers, A and B, are shown.

(a) What is the bearing of B **from A**?

Answer _____ ° [1]



(b) The two towers pick up a distress signal from a plane.

The bearing of the plane from A is 110°

The bearing of the plane from B is 050°

Find and mark the position of the plane with a P on the diagram. [2]

Q11

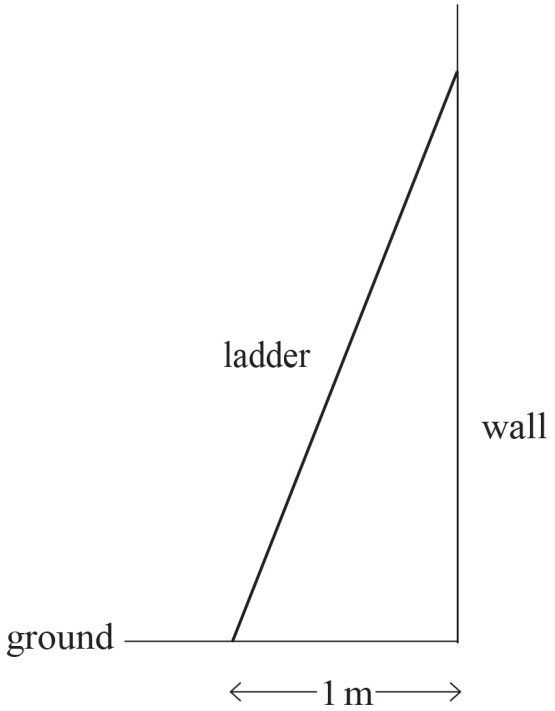


diagram not drawn accurately

A ladder is 4 metres long.

The bottom of the ladder is 1 metre from a vertical wall.

Use a scale drawing, with 4 cm : 1 m, to find the height of the top of the ladder above the ground.

wall

Q12 Draw the locus of all points which are the same distance from **A** and **B**.

A
×

×
B

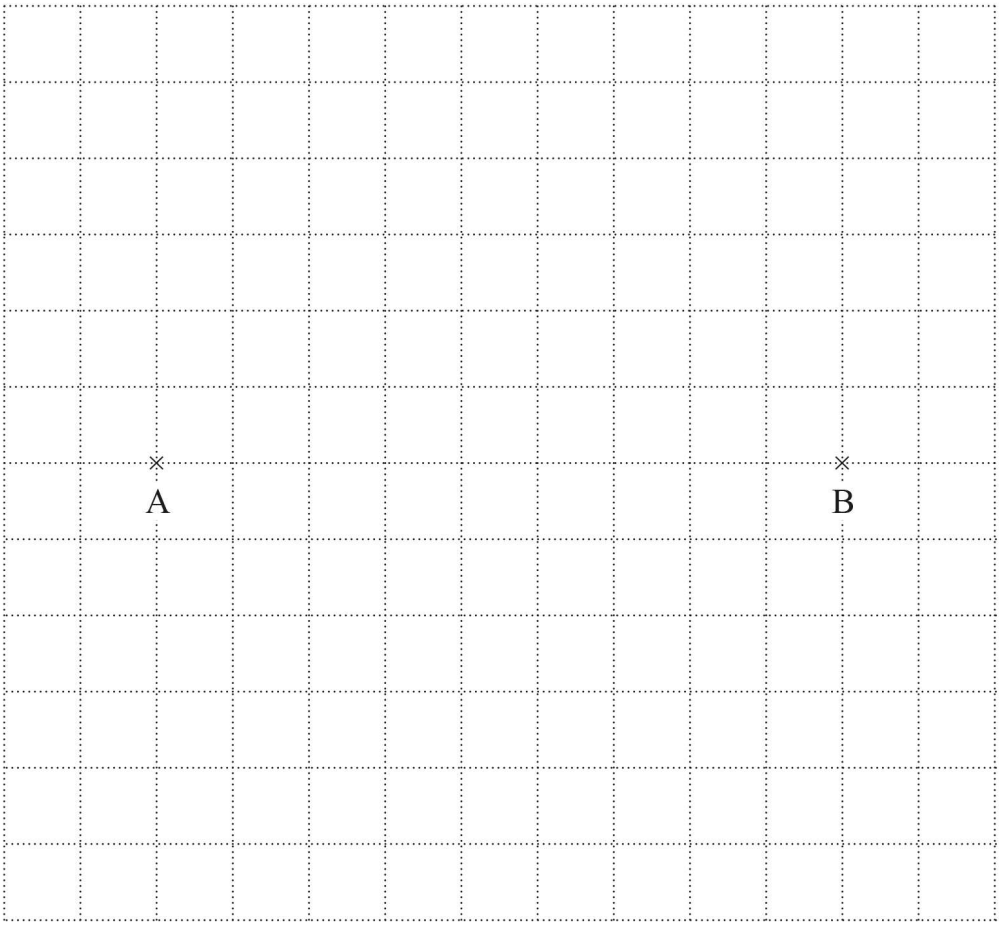
[2]

Q13

Two transmitters are located at points A and B, 9 metres apart.

The best reception is an area which is less than 6 metres from A and closer to B than to A.

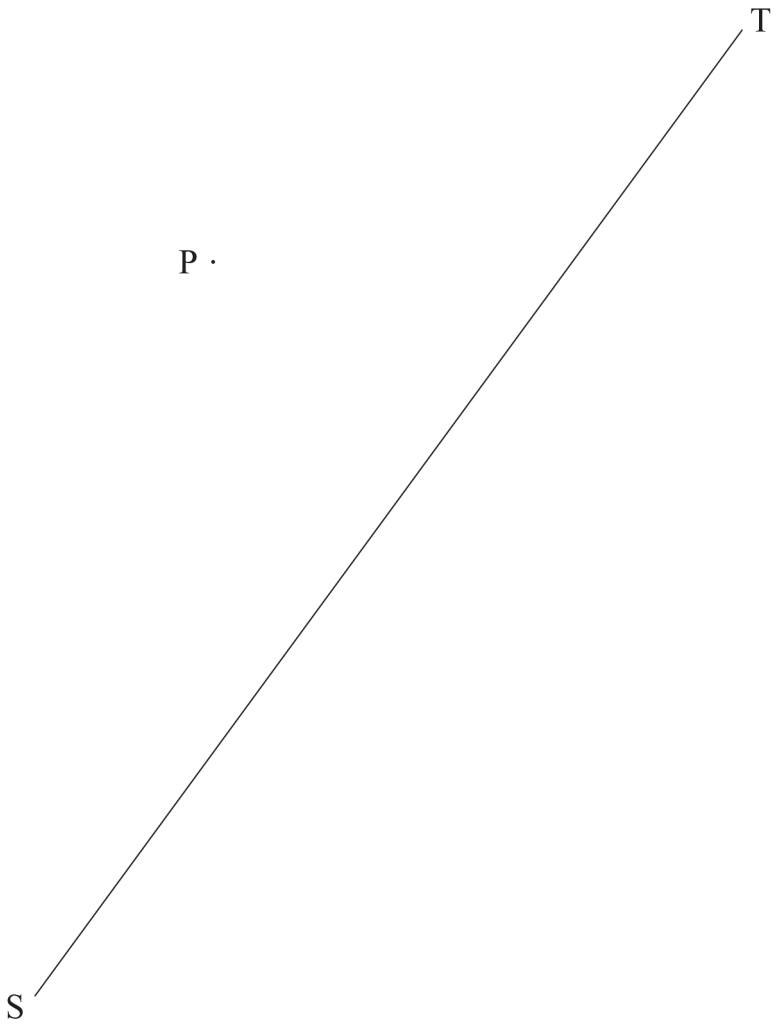
Shade this area on a scale drawing below, using a scale of 1 cm to 1 metre.



[3]

Q14

Construct the line which represents the shortest distance from point P to the line ST in the diagram below.



[2]

1.

$360 \div 5 = 72$ **or** $360 \div 5 = 72$		**or** $540 \div 5 = 108$	MA1
$360 \div 6 = 60$	$360 \div 6 = 60$	$720 \div 6 = 120$	MA1
$72 + 60$	$108 + 120$	$108 + 120 = 228$	MA1
132	$360 - (108 + 120) = 132$	$360 - 228 = 132$	MA1

2.

(a) Exterior angle = 30 MA1

Number of sides = $\frac{360}{30} = 12$ MA1

(b) equilateral triangle

Allow A1 for sight of 60° in calculation or diagram A2

3.

Angle JDC = 75° MA1

$360° \div 9 = 40°$, $180° - 40° = 140°$ M1 A1

Angle EDJ = 145° MA1

4.

(a) $360 \div 24$ M1
15 A1

(b) $180\ (n - 2) = 1800$ M1
$n = 12$ A1

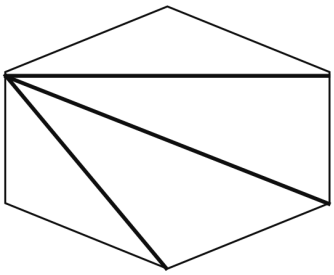
5.

(a) $360 \div 15 = 24$ M1A1

(b) no A1

6.

(a)



A1

(b) $(4 \times 180) = 720$ MA1

(c) $(4 \times 360) = 1440$ MA1

7.

Total of angles in pentagon = 540 MA1

540 – 479 = 61 MA1

Angle a = 180 – 61
a = 119 MA1

8.

3 × 180 = 540° MA1

540 – (114 + 98 + 48 + 70)

540 – 330 MA1

= 210° A1

9.

(a) Distance measured accurately in cm (tolerance of 0.2 cm) MA1
Measure × 100 = Actual distance in metres MA1

(b) Position marked at 5.5 cm due north (tolerance of 0.2 cm) A1 A1

10.

(a) bearing 156° (± 2°) A1

(b) correct line from A and correct line from B A1

lines intersect to locate position of P A1

11.

4 cm line MA1

16 cm ladder MA1

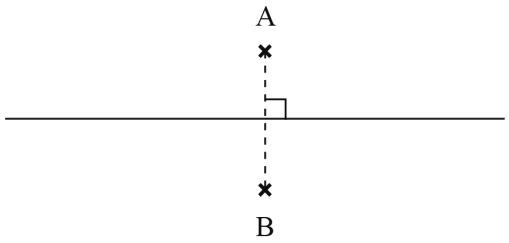
height measured ÷ 4 MA1

4 cm line MA1

16 cm ladder MA1

height measured ÷ 4 MA1

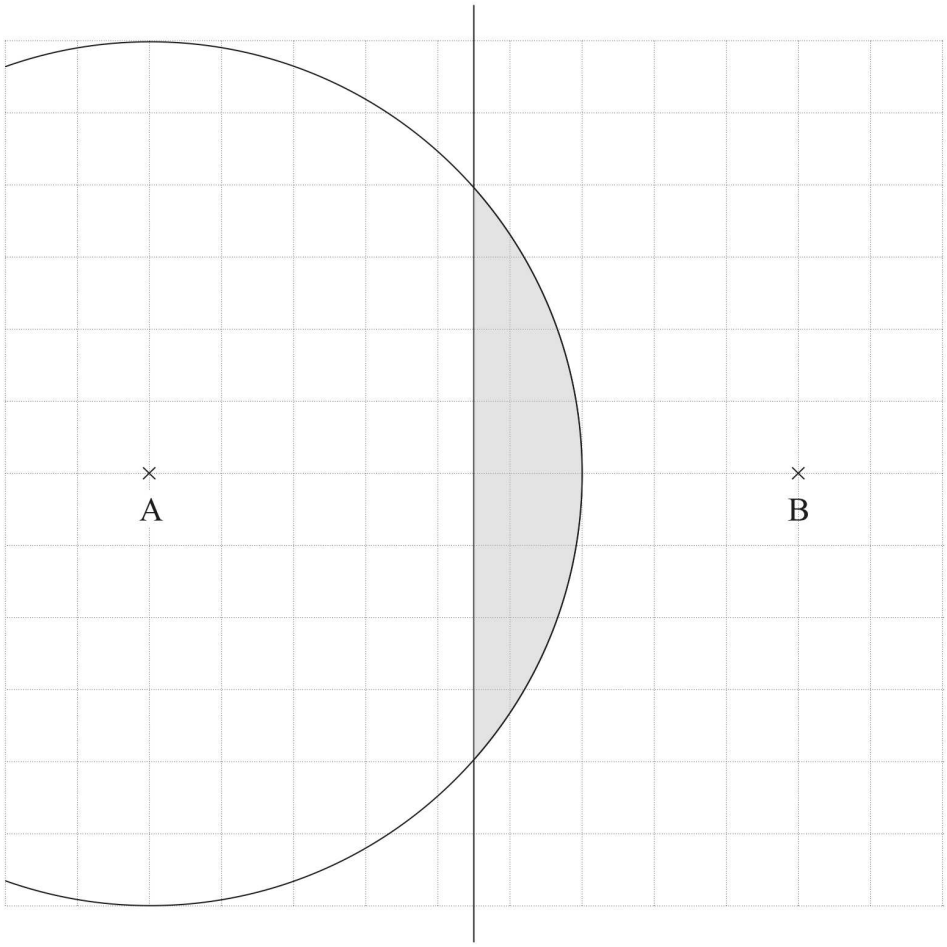
12.



M1 A1

13.

Circle, centre at A and radius of 6cm A1
Perpendicular bisector of AB (drawn, not necessarily constructed) A1
Correct area shaded A1



14.

Construction of perpendicular from P onto ST A2
(allow A1 for arcs, but not completed)