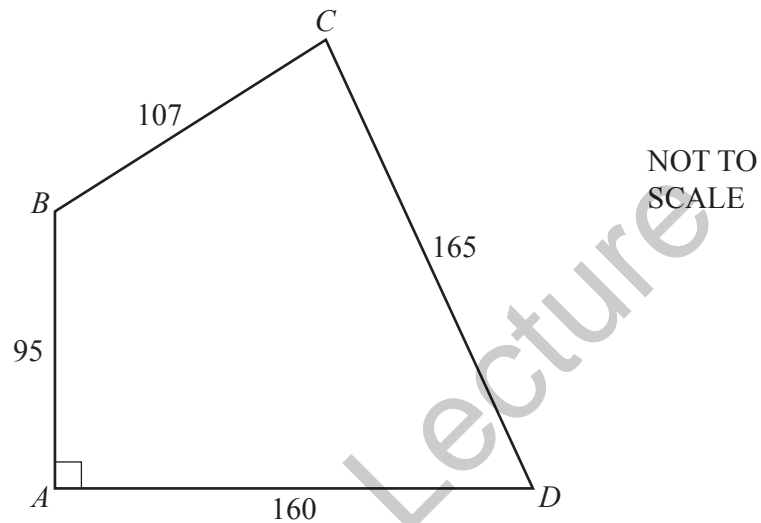Name:

Section:

Trigonometry Worksheet

1

ABCD is the floor plan of an exhibition hall with dimensions shown in metres.
Points *A*, *B*, *C* and *D* all lie on the same horizontal plane.
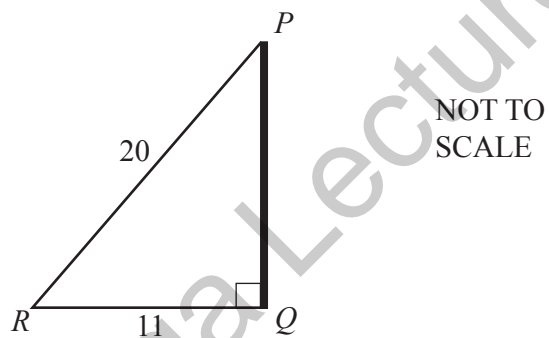
(a) Calculate angle *BCD*.

BCD = ... [4]

(b) A light is attached to the ceiling vertically above B.
The angle of elevation of the light from C is 8.2°.

Calculate the angle of elevation of the light from A.

.... [4]
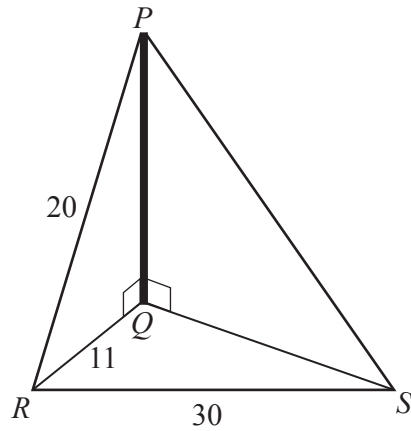
2

PQ is a vertical pole.
A rope is attached from the top of the pole, P, to a point on the ground, R.
$PR = 20$ m, $RQ = 11$ m and $R\hat{Q}P = 90°$.

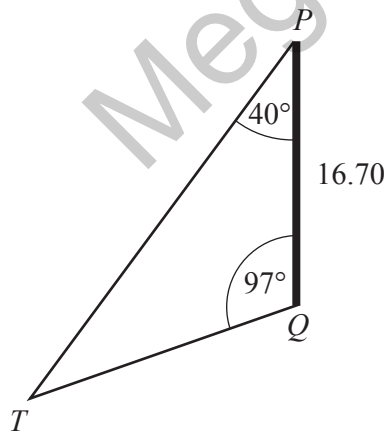**(a)** Show that $PQ = 16.70$ m, correct to 2 decimal places.

[2]

(b)

A second rope is attached from *P* to a point *S*.
$P\hat{Q}S = 90°$ and $RS = 30\,\text{m}$.
The angle of elevation of *P* from *S* is 36°.

Calculate $R\hat{Q}S$.

$R\hat{Q}S =$ .... [5]

(c)

NOT TO
SCALE

A third rope is attached from *P* to a point *T*.
$T\hat{P}Q = 40°$ and $P\hat{Q}T = 97°$.

Calculate *PT*.

3
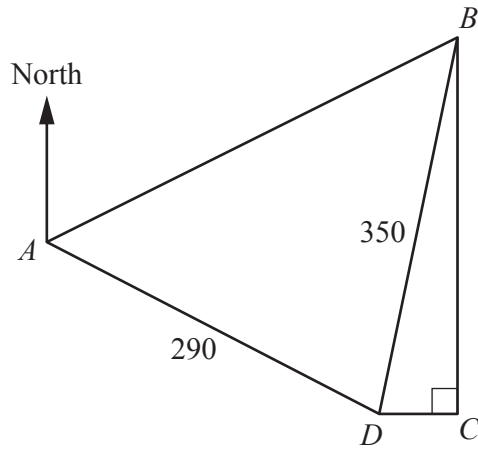
ABCD is a field on horizontal ground.

The bearing of *B* from *A* is 070°.
The bearing of *D* from *A* is 125°.
C is due south of *B* and due east of *D*.
AD = 290 m and *BD* = 350 m.

(a) Calculate the bearing of *D* from *B*.

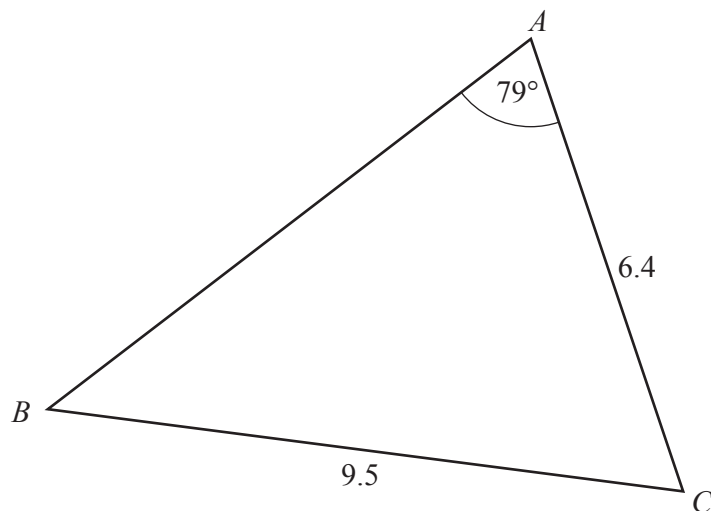.. [4]

(b) A vertical mast is positioned at *D*.
The angle of elevation of the top of the mast from *A* is 10°.

Calculate the angle of elevation of the top of the mast from *C*.

.... [5]

4

In triangle ABC, $AC = 6.4$ cm, $BC = 9.5$ cm and $B\hat{A}C = 79°$.

(a) **(i)** Calculate $A\hat{B}C$.

$A\hat{B}C = $ .... [3]

(ii) Calculate the area of triangle ABC.

.... cm^2 [3]

(b)
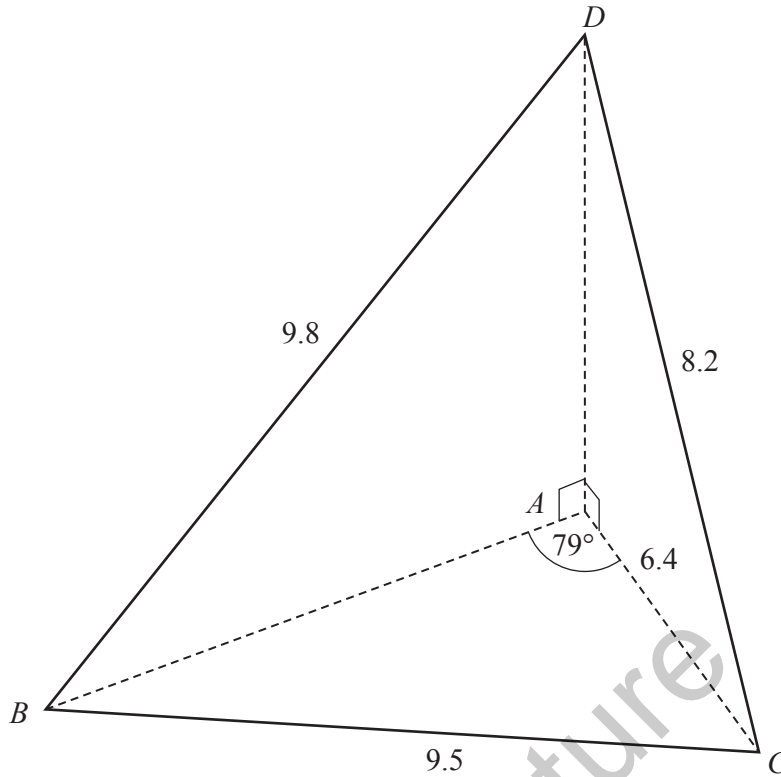
The same triangle ABC forms the horizontal base of a pyramid $ABCD$.
$BD = 9.8$ cm and $CD = 8.2$ cm.
$B\hat{A}D = C\hat{A}D = 90°$.

(i) Calculate $B\hat{D}C$.
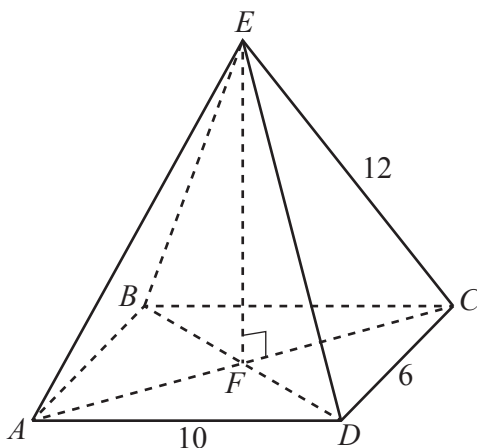
$B\hat{D}C = $ .... [3]

(ii) Calculate the angle of elevation of D from C.

.... [2]

5 **[Volume of pyramid $= \frac{1}{3} \times$ base area $\times$ height]**

ABCDE is a rectangular-based pyramid.
AC and *BD* intersect at *F*.
EF is perpendicular to *FC*.

$AD = 10$ cm, $DC = 6$ cm and $EC = 12$ cm.

(a) Show that $EF = 10.5$ cm, correct to 1 decimal place.

[4]

(b) Find the volume of the pyramid.

.... cm³ [2]

(c) Calculate $D\hat{E}C$.

$D\hat{E}C =$ .... [3]

(d) Calculate the area of triangle *DEC*.

.... cm^2 [2]

6 A light, *L*, is fixed on a building 8 m above the base, *B*, of the building.

(a)
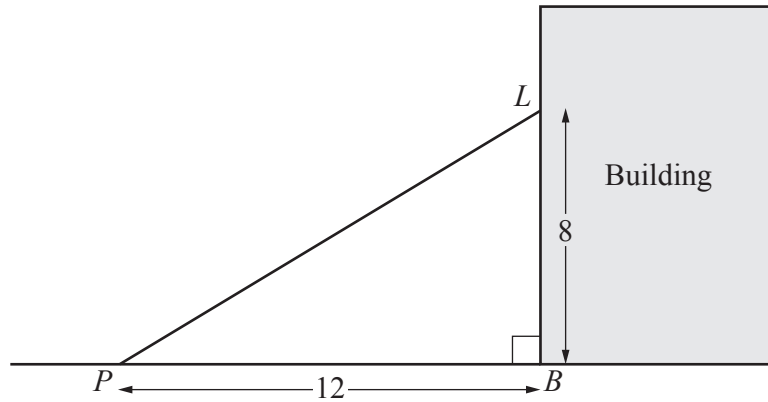
NOT TO SCALE

A point, *P*, is on the horizontal ground 12 m from *B*.

Calculate the angle of elevation of *L* from *P*.

.... [2]

(b)
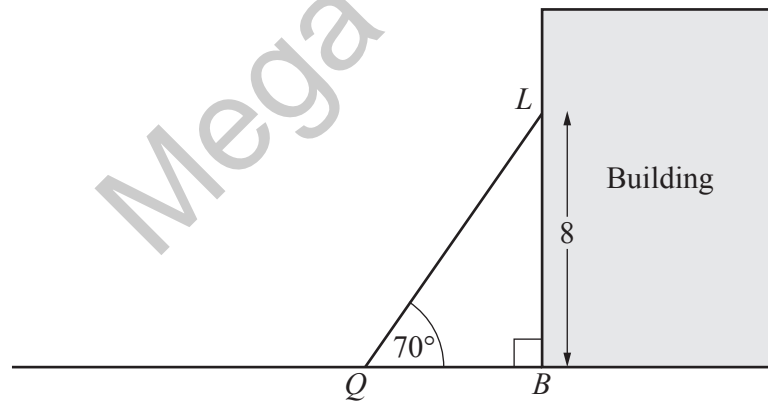
NOT TO SCALE
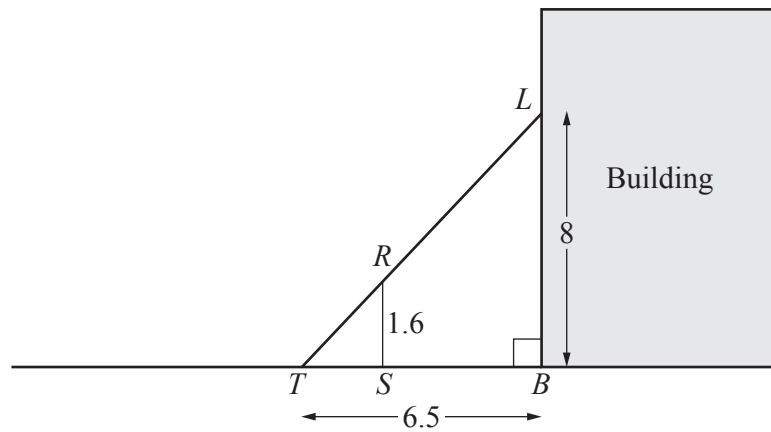
A ladder is placed on the ground at *Q* to reach the light, *L*.
The ladder makes an angle of 70° with the ground.

Calculate *QL*.

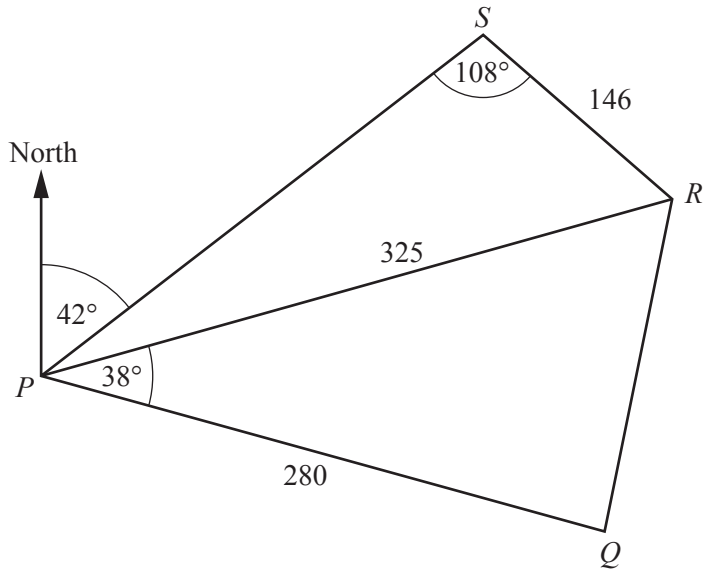*QL* = ... m [2]

(c)

NOT TO SCALE

A vertical pole, *RS*, of length 1.6 m is placed touching the horizontal ground.
The light produces a shadow, *TS*, of the pole on the horizontal ground.
LRT is a straight line and *TB* = 6.5 m.

Calculate *TS*.

TS = ... m [2]

7

North

S

108°

146

NOT TO
SCALE

R

325

42°

38°

P

280

Q
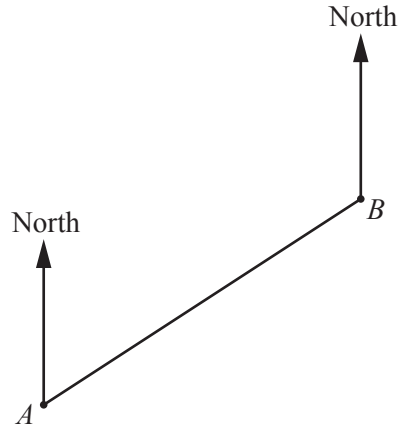
A field is in the shape of a quadrilateral *PQRS*.
A path crosses the field from *P* to *R*.
$PQ = 280$ m, $RS = 146$ m and $PR = 325$ m.
S is on a bearing of 042° from *P*, $P\hat{S}R = 108°$ and $R\hat{P}Q = 38°$.

(a) Calculate the bearing of *R* from *P*.

.... [4]

(b) (i) Show that $QR = 202$ m, correct to the nearest metre.

[3]

8

The diagram shows the positions of two boats, *A* and *B*, drawn to a scale of 1 : *m*.
The actual distance between the two boats is 4 km.

(a) Find *m*, giving your answer correct to 1 significant figure.

m = ... [2]

(b) Measure the bearing of *A* from *B*.

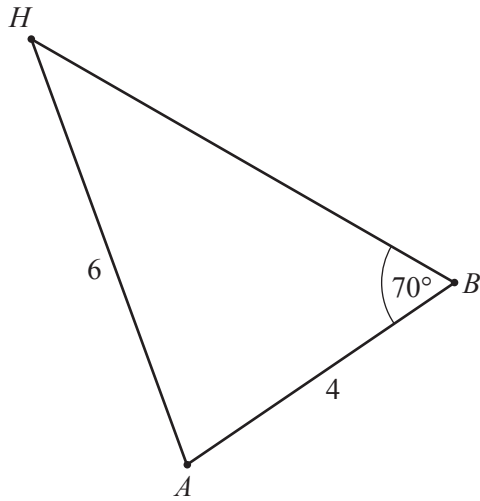.. [1]

(c) A third boat is positioned at *C*.
C is on a bearing of 120° from *A* and on a bearing of 195° from *B*.

Find and label *C* on the diagram. [2]

(d) Find, by measurement, the actual distance in kilometres from *A* to *C*.

.... km [2]

(e)

NOT TO
SCALE

The diagram shows the positions of the boats, A and B, and a harbour, H.
$AB = 4\,\text{km}$, $AH = 6\,\text{km}$ and $A\hat{B}H = 70°$.

(i) Calculate $A\hat{H}B$.

$A\hat{H}B =$ .... [3]

(ii) The boat at A travels in a straight line to the harbour at H.
The average speed of the boat is $p\,\text{km/h}$.
It takes 12 minutes 20 seconds for the boat to travel from A to H.

Calculate p.

$p =$ .... [3]

9
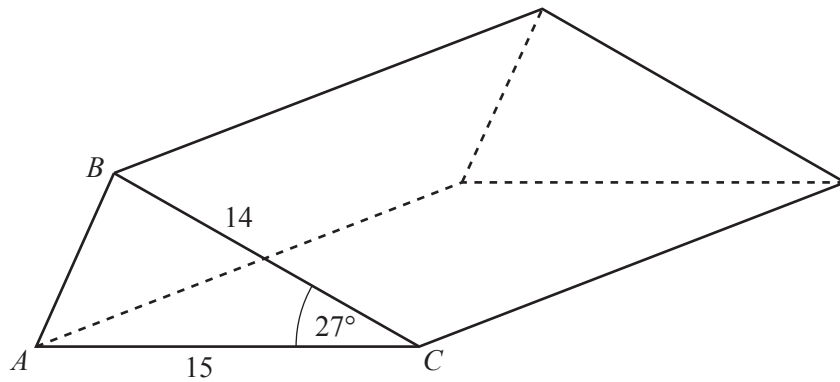
The diagram shows a triangular prism.
$AC = 15$ cm, $BC = 14$ cm and angle $ACB = 27°$.

(a) Calculate AB.

$AB = $ .... cm [3]

(b) The length of the prism is p cm and the volume of the prism is 1000 cm^3.

Calculate p.

$p = $ .... [3]

(c) The prism is to be packed in a carton.
The carton is a cuboid of size 15 cm by p cm by h cm.

Calculate the smallest possible value of h.

$h =$ .... [2]

10
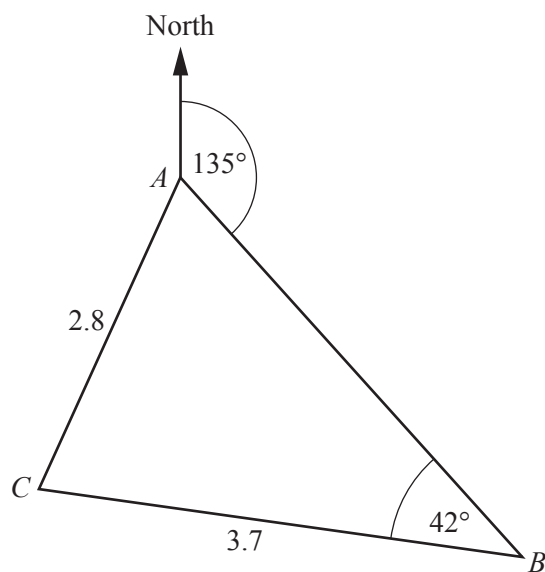
A yacht sails the triangular route shown.
The bearing of B from A is 135°.
$BC = 3.7$ km, $AC = 2.8$ km and $A\hat{B}C = 42°$.

(a) Show that $C\hat{A}B = 62.2°$, correct to 1 decimal place.

[3]

(b) Find the bearing of A from C.
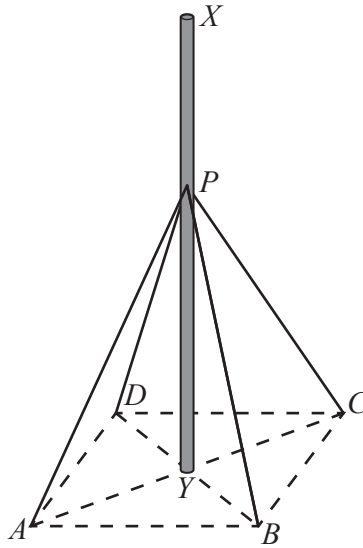
Answer .... [2]

(c) The yacht sails from *A* to *B* to *C* to *A*.

Calculate the total length of the route.

Answer   .... km [4]

11

A vertical mast, *XY*, is positioned on horizontal ground.
The mast is supported by four cables attached to the mast at *P* and to the ground at points
A, *B*, *C* and *D*.
Y is the centre of the square *ABCD*.
PY = 7.50 m.

(a) Given that *AB* = 3.65 m, show that *AY* = 2.58 m correct to 3 significant figures.

[3]

(b) Calculate the length of one of the cables used to support the mast.

Answer .... m [2]

(c) Calculate $A\hat{P}B$.

Answer .... [3]

(d) The angle of elevation of X from A is 77.0°.

    (i) Calculate the height, XY of the mast.

Answer .... m [2]

    (ii) Calculate the angle of elevation of X from the midpoint of AB.

Answer .... [2]

12
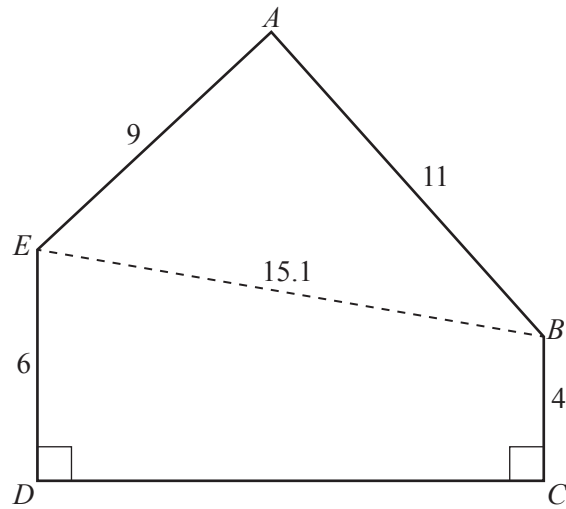
ABCDE is the cross-section of a building.
All the lengths are given in metres.

(a) Calculate *DC*.

.... m [3]

(b) Calculate angle *EAB*.

.... [3]

13
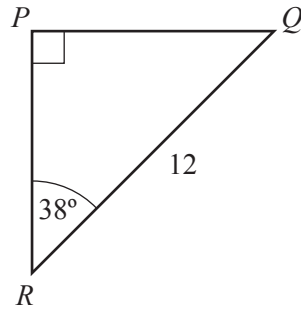
Triangle *PQR* has a right angle at *P*, angle *PRQ* = 38° and *RQ* = 12 cm.

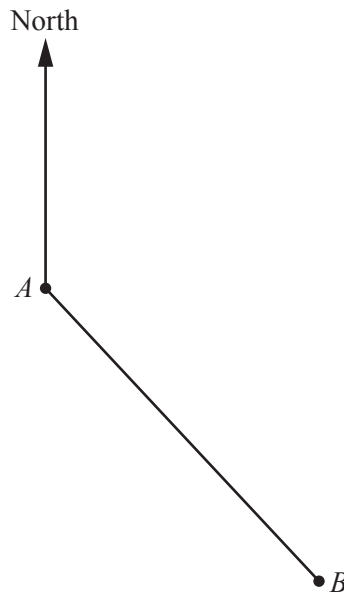**(a)** Calculate *PQ*.

Answer .... cm [2]

(b) *S* is a point such that angle *PRS* is a right angle and *QS* = 10 cm.

Calculate the two possible values of angle *QSR*.

Answer .... or .... [4]

14 The diagram shows the position of two villages *A* and *B*.

North

A

B

(a) Measure the bearing of *B* from *A*.

Answer .... [1]

(b) The bearing of village *C* from *A* is 265°.

Work out the bearing of *A* from *C*.

Answer .... [1]

15
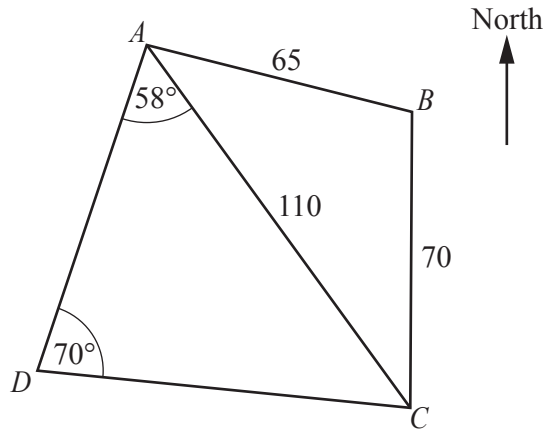
ABCD is a level playing field.
AB = 65 m, *BC* = 70 m and *CA* = 110 m.
CD̂A = 70°, *DÂC* = 58° and *C* is due South of *B*.

(a) Calculate the bearing of *A* from *C*.

Answer .... [4]

(b) Calculate *AD*.

Answer .... m [3]
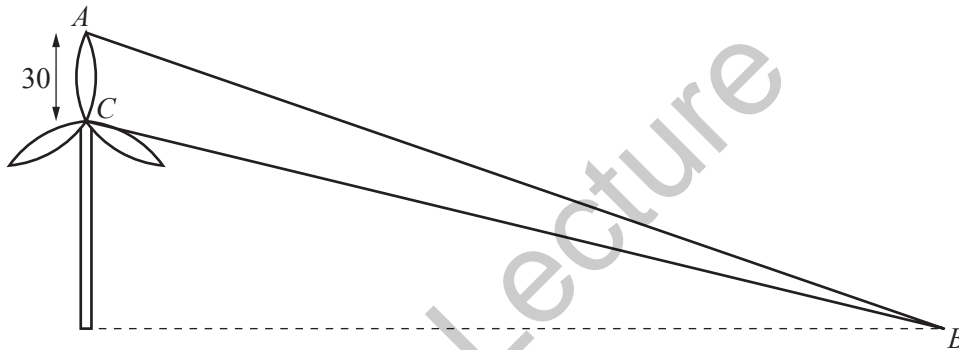
(c) There are two vertical trees, *AX* and *CY,* each of height 17 m, one at each end of the path *AC*.

    (i) Calculate the angle of elevation of *Y* from *B*.

Answer .... [2]

16 (a)

The diagram shows a vertical wind turbine with blades 30 m long.
The blades are stationary with the point *A* being the maximum distance possible from the horizontal ground.
The point *B* is such that the angle of elevation of *A* from *B* is 34° and the angle of elevation of the centre of the blades, *C*, from *B* is 25°.

Calculate the distance *AB*.
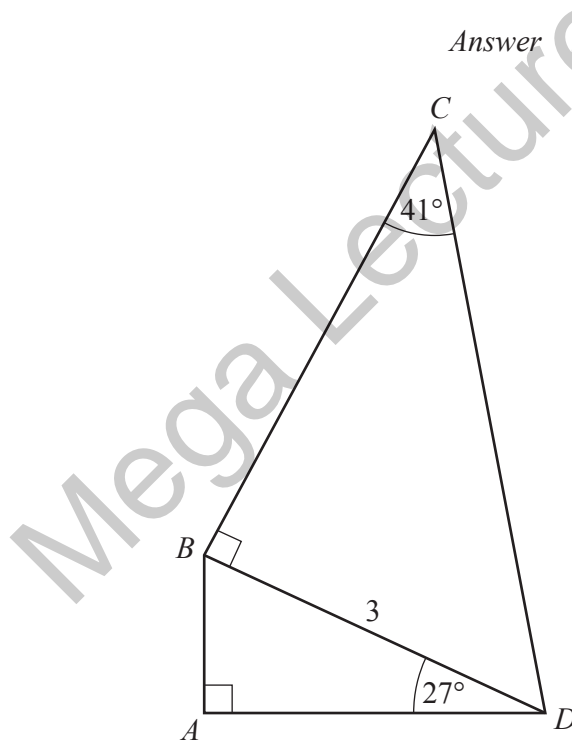
Answer .... m [3]

(b) A different wind turbine, shown in the diagram on the next page, has the centre of its blades, *F*, 75 m from the base of the turbine, *D*.
Point *E* is on sloping ground, 180 m from *F* and 130 m from *D*.

Calculate the angle of depression of *E* from *F*.

Answer .... [4]

17 (a)

In the framework *ABCD*,   *BD* = 3 m.
$B\hat{D}A = 27°$, $B\hat{C}D = 41°$. $D\hat{B}C$ and $D\hat{A}B$ are right angles.

(i) Find *AD*.

Answer .... m [2]

(ii) Find *CD*.

Answer .... m [3]

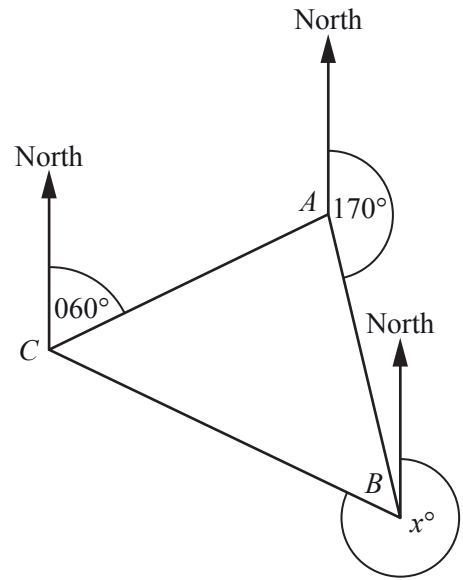**(b)** In triangle *PQR*, *PQ* = 3 m and *QR* = 5 m.
The area of triangle *PQR* = 6 m².

Find the two possible values of $P\hat{Q}R$.

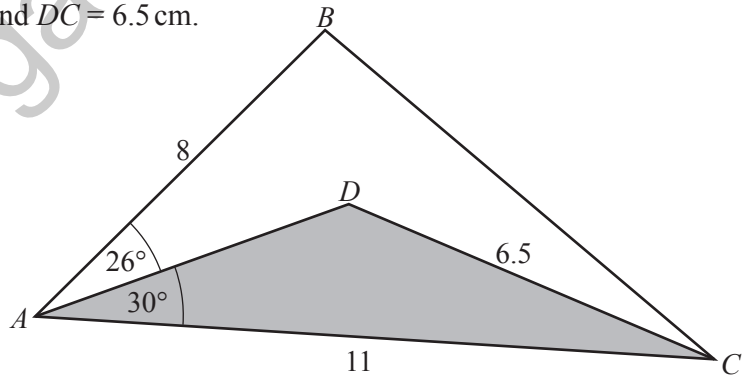*Answer* $P\hat{Q}R$ = ... or .... [3]

18 In the diagram, the bearing of *B* from *A* is 170°.
The bearing of *A* from *C* is 060°.
The bearing of *C* from *B* is *x*°.

Given that triangle *ABC* is isosceles, find the three possible values of *x*.

Answer *x* = ... or .... or .... [3]

19 In the diagram, *AB* = 8 cm, *AC* = 11 cm and *DC* = 6.5 cm.
$B\hat{A}D = 26°$ and $D\hat{A}C = 30°$.

(a) Calculate *BC*.

Answer .... cm [4]
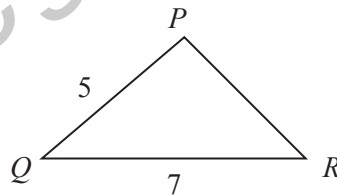
(b) Calculate the obtuse angle *ADC*.

20 **(a)**
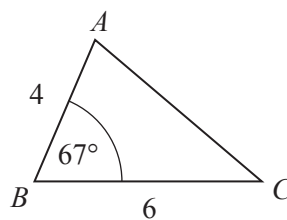
In triangle *ABC*, *AB* = 4 m, *BC* = 6 m and *AB̂C* = 67°.

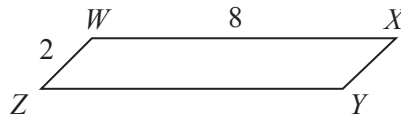**(i)** Show that the area of triangle *ABC* is 11.05 m² correct to 2 decimal places.

[1]

(ii)

In triangle *PQR*, *PQ* = 5 m and *QR* = 7 m.
Area of triangle *PQR* = Area of triangle *ABC*.

Find the acute angle *PQR*.

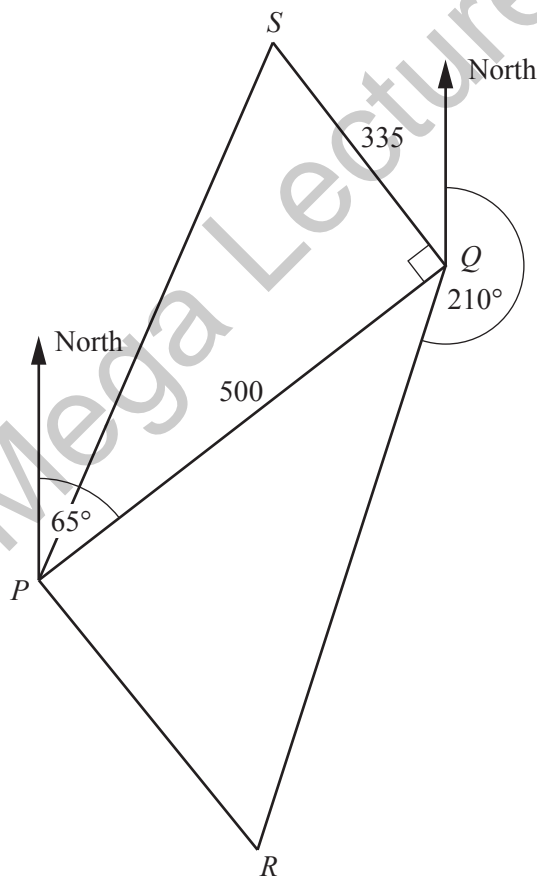*Answer* .... [2]

(iii)

In the parallelogram *WXYZ*, *WX* = 8 m and *WZ* = 2 m.
Area of parallelogram *WXYZ* = Area of triangle *ABC*.

Find the obtuse angle *ZWX*.

Answer .... [3]

21 The diagram shows the positions, *P*, *Q*, *R* and *S*, of four hotels.

The bearing of *Q* from *P* is 065° and the bearing of *R* from *Q* is 210°.
PQ = 500 m, *SQ* = 335 m and *PQ̂S* = 90°.

(a) Calculate *PQ̂R*.

Answer ....[1]

(b) Calculate the shortest distance from *P* to *QR*.

Answer... m [2]

(c) Calculate the bearing of *S* from *P*.

Answer   ....[3]

22
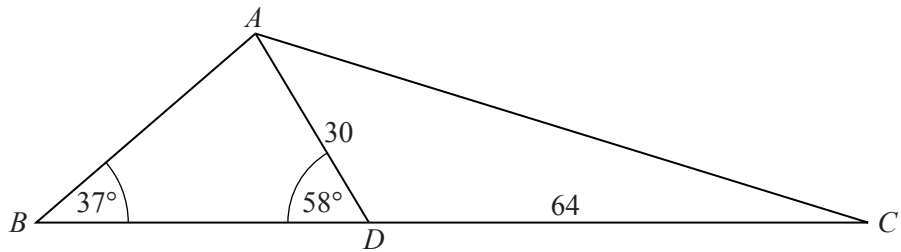
A, *B*, *C* and *D* are four points on level ground.
BDC is a straight line.
AD = 30 m and *DC* = 64 m.
$A\hat{B}D = 37°$ and $A\hat{D}B = 58°$.

(a) Calculate *AB*.

Answer

.... m [3]

(b) Calculate *AC*.

Answer

.... m [4]

(c) Calculate the area of triangle *ADC*.

Answer

.... m^2 [2]

(d) A vertical tower stands at *A*.
P is the point on the line *BC* such that the angle of depression from the top of the tower to the line *BC* is greatest.

Given that this angle of depression is 34°, calculate the height of the tower.

Answer

.... m [3]

23
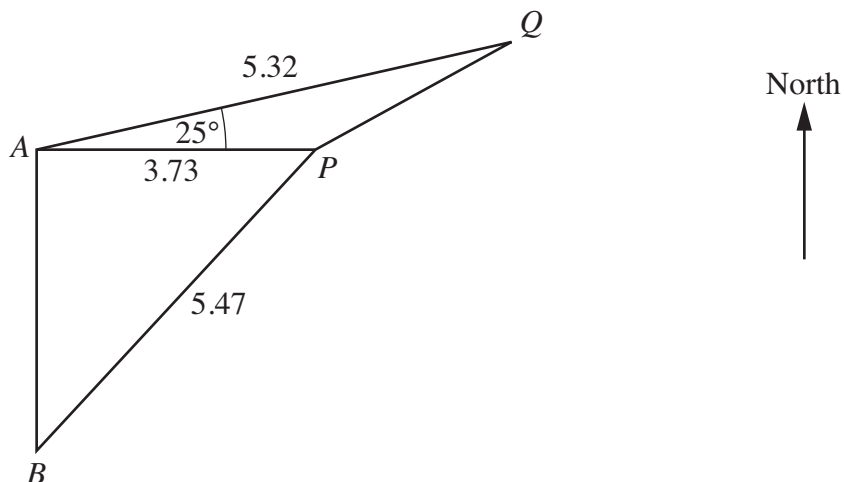
The diagram shows four points, *A*, *B*, *P* and *Q*, at sea.
B is due South of *A* and *P* is due East of *A*.
AP = 3.73 km, BP = 5.47 km, AQ = 5.32 km and $P\hat{A}Q$ = 25°.

(a) Calculate $A\hat{B}P$.

Answer ....[2]

(b) Calculate *PQ*.

Answer ....km [4]

(c) A boat sailed in a straight line from Q to A.

    (i) Find the bearing of A from Q.

Answer .... [1]

    (ii) A lighthouse is situated at A.
The top of the lighthouse is 30 m above sea level.
Calculate the angle of depression of the boat from the top of the lighthouse when the boat is 100 m from A.

Answer .... [2]

24 The scale drawing shows three towns, A, B and C.
The scale of the drawing is 1 cm to 25 km.
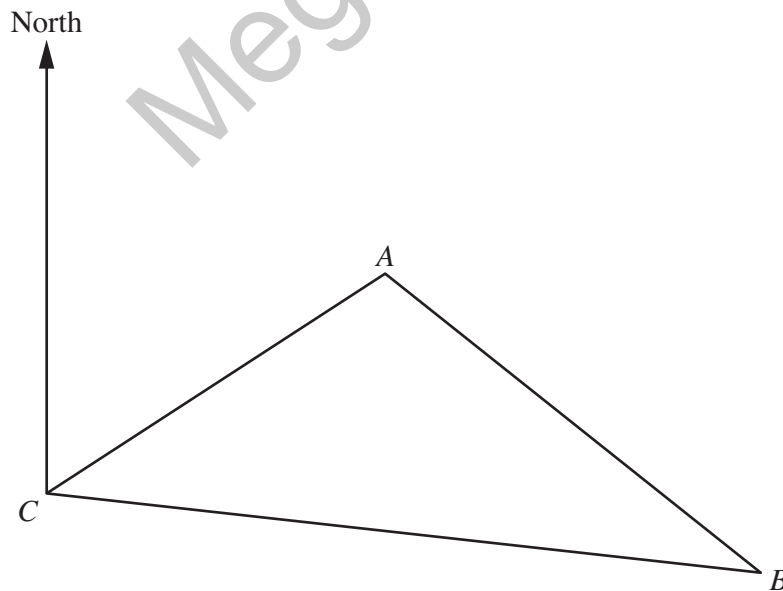
(a) Measure the bearing of A from C.

Answer .... [1]

(b) Find the bearing of C from A.

Answer .... [1]

(c) Find the actual distance, in kilometres, from B to C.

Answer .... km [1]