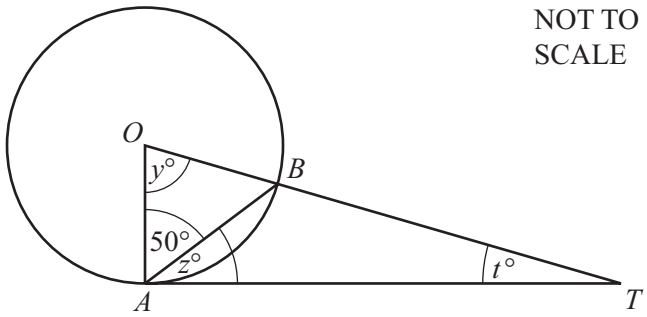
Geometry
2002 - 2011

www.Q8maths.com

7



TA is a tangent at *A* to the circle, centre *O*.
Angle *OAB* = 50°.

Find the value of

(a) *y*,

Answer(a) y = ... [1]

(b) *z*,

Answer(b) z = ... [1]

(c) *t*.

Answer(c) t = ... [1]

---

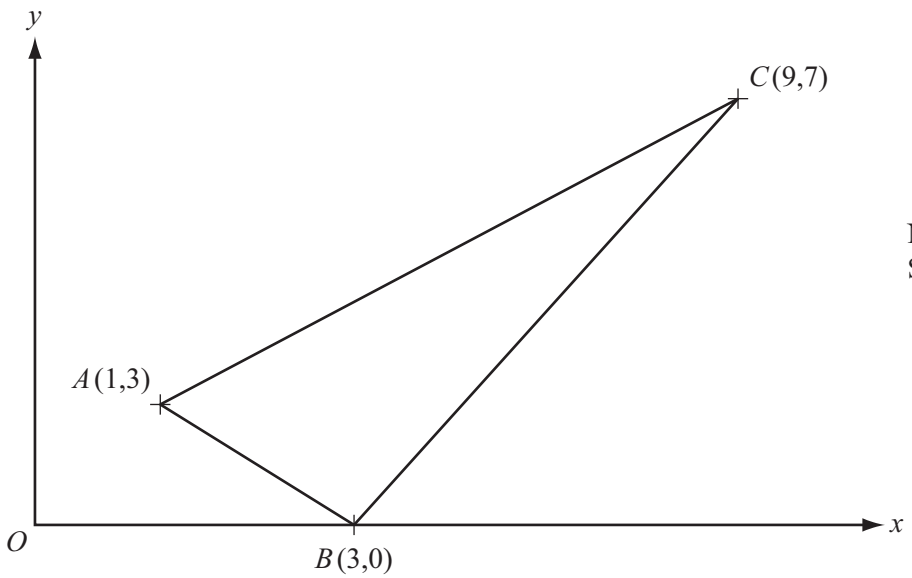
8 Seismic shock waves travel at speed *v* through rock of density *d*.
v varies **inversely** as the **square root** of *d*.

v = 3 when *d* = 2.25.

Find *v* when *d* = 2.56.

Answer v = ... [3]

16



NOT TO SCALE

The co-ordinates of A, B and C are shown on the diagram, which is not to scale.

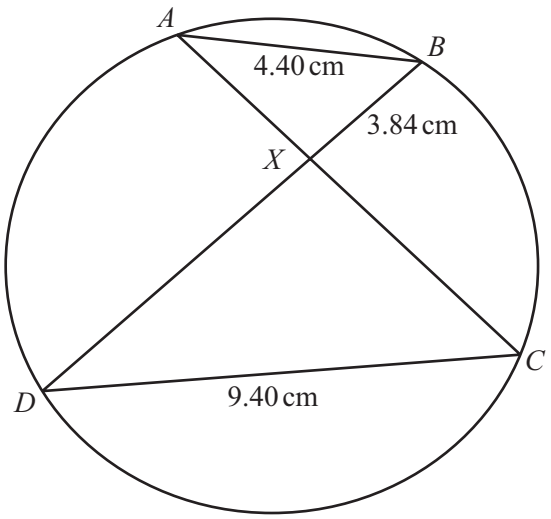
(a) Find the length of the line AB.

Answer(a) $AB =$ ..... [3]

(b) Find the equation of the line AC.

Answer(b) ..... [3]

22



NOT TO SCALE

A, B, C and D lie on a circle.
AC and BD intersect at X.

(a) Give a reason why angle BAX is equal to angle CDX.

Answer(a) ..... [1]

(b) $AB = 4.40$ cm, $CD = 9.40$ cm and $BX = 3.84$ cm.

(i) Calculate the length of CX.

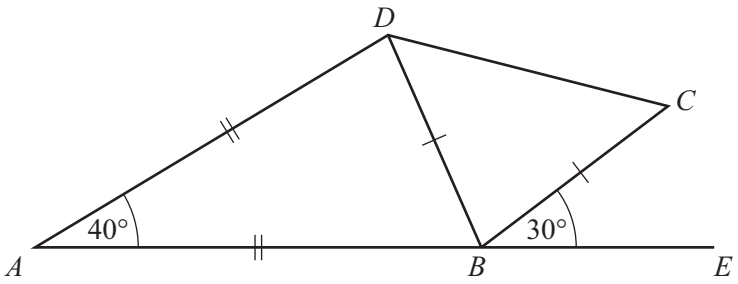
Answer(b)(i) $CX =$ ..... cm [2]

(ii) The area of triangle ABX is 5.41 cm^2.

Calculate the area of triangle CDX.

Answer(b)(ii) ..... cm^2 [2]

3 (a)



NOT TO SCALE

ABCD is a quadrilateral with angle *BAD* = 40°.
AB is extended to *E* and angle *EBC* = 30°.
AB = *AD* and *BD* = *BC*.

(i) Calculate angle *BCD*.

Answer(a)(i) Angle *BCD* = ... [3]

(ii) Give a reason why *DC* is not parallel to *AE*.

Answer(a)(ii) ..... [1]

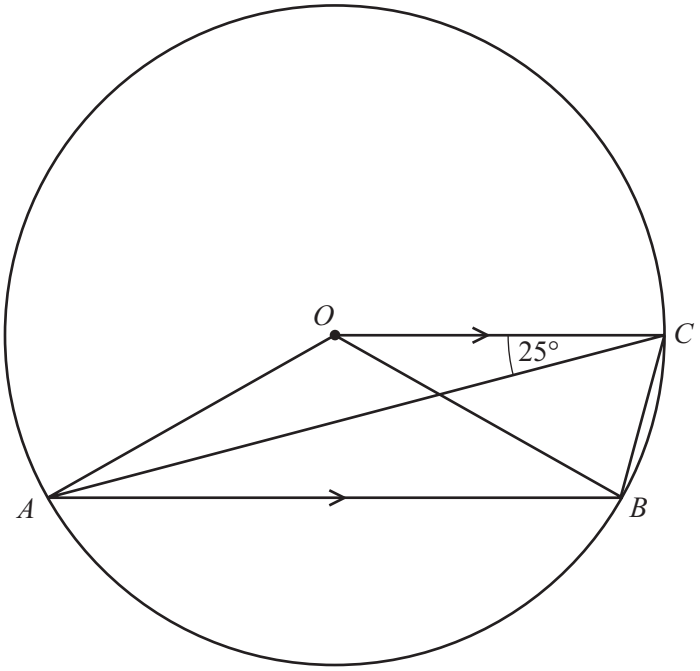
(b) A regular polygon has *n* sides.

Each exterior angle is $\frac{5n}{2}$ degrees.

Find the value of *n*.

Answer(b) n = ... [3]

(c)



NOT TO SCALE

The diagram shows a circle centre O.
A, B and C are points on the circumference.
OC is parallel to AB.
Angle $OCA = 25°$.

Calculate angle OBC.

Answer(c) Angle OBC = ... [3]

1 Javed says that his eyes will blink 415 000 000 times in 79 years.

(a) Write 415 000 000 in standard form.

Answer (a) ..... [1]

(b) One year is approximately 526 000 minutes.
Calculate, correct to the nearest whole number, the average number of times his eyes will blink per minute.

Answer (b) ..... [1]

---

2 Luis and Hans both have their birthdays on January 1st.
In 2002 Luis is 13 and Hans is 17 years old.

(a) Which is the next **year** after 2002 when both their ages will be prime numbers?

Answer (a) ..... [1]

(b) In which **year** was Hans twice as old as Luis?

Answer (b) ..... [1]

3

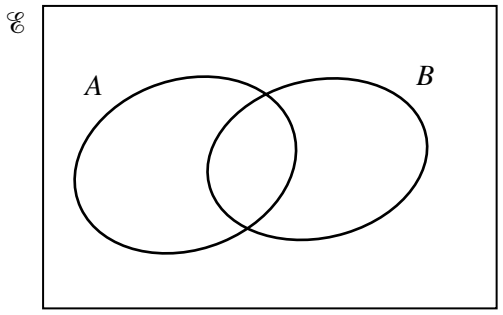


Diagram 1

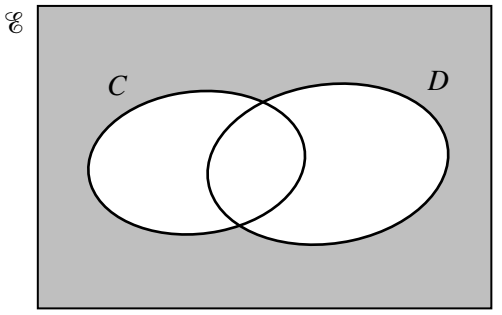


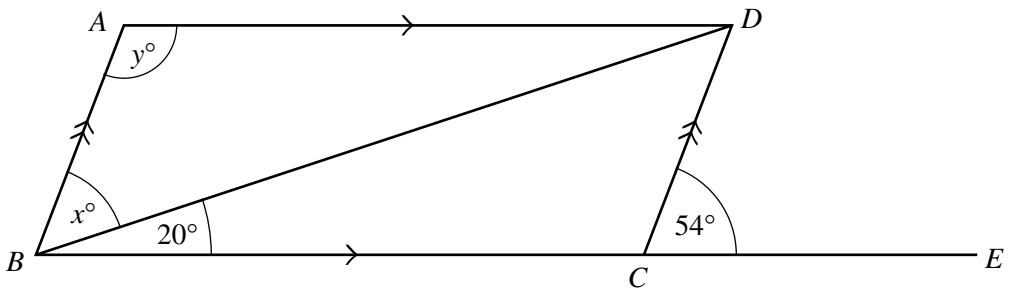
Diagram 2

(a) In Diagram 1, shade the area which represents $A \cup B'$. [1]

(b) Describe in set notation the shaded area in Diagram 2.

Answer (b) ..... [1]

4



NOT TO SCALE

ABCD is a parallelogram and *BCE* is a straight line. Angle *DCE* = 54 ° and angle *DBC* = 20 °.

Find *x* and *y*.

Answer x = ...

y = ... [2]

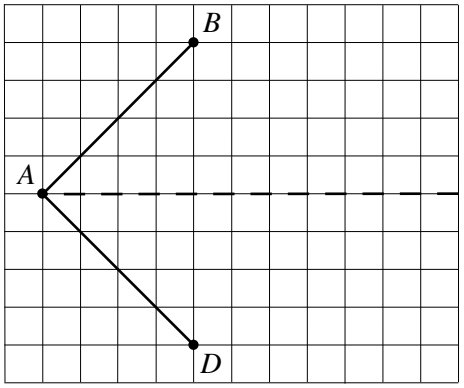
---

5 Calculate the length of the straight line joining the points (– 1, 4) and (5, –4).

Answer ..... [2]

---

15 **(a)**

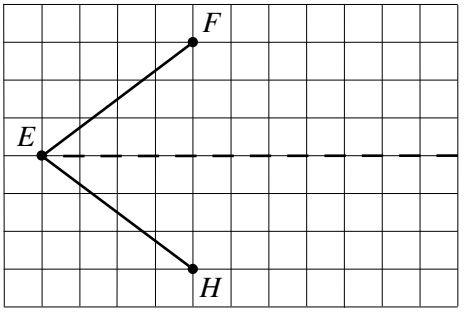


(i) Complete quadrilateral *ABCD* so that the dotted line is the **only** line of symmetry. [1]

(ii) Write down the special name for quadrilateral *ABCD*.

Answer (a)(ii) ..... [1]

(b)

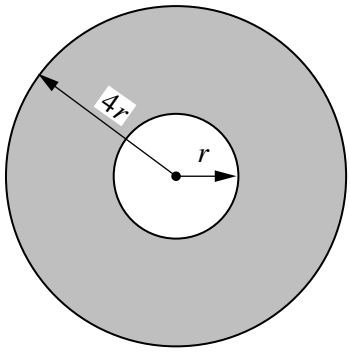


(i) Complete quadrilateral *EFGH* so that the dotted line is one of **two** lines of symmetry. [1]

(ii) Write down the order of rotational symmetry for quadrilateral *EFGH*.

Answer (b)(ii) ..... [1]

17



NOT TO SCALE

Two circles have radii r cm and $4r$ cm.
Find, in terms of π and r.

(a) the area of the circle with radius $4r$ cm,

Answer (a) ..... cm^2 [1]

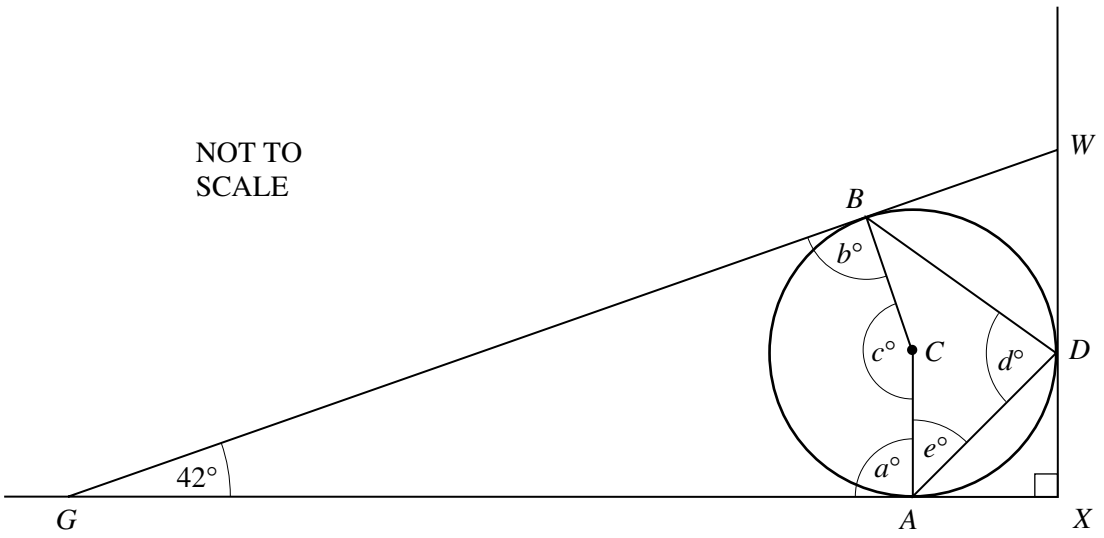
(b) the area of the shaded ring,

Answer (b) ..... cm^2 [1]

(c) the total length of the inner and outer edges of the shaded ring.

Answer (c) ..... cm [2]

4



A sphere, centre *C*, rests on horizontal ground at *A* and touches a vertical wall at *D*.
A straight plank of wood, *GBW*, touches the sphere at *B*, rests on the ground at *G* and against the wall at *W*.
The wall and the ground meet at *X*.
Angle *WGX* = 42°.

(a) Find the values of *a, b, c, d* and *e* marked on the diagram. [5]

(b) Write down one word which completes the following sentence.

'Angle *CGA* is 21° because triangle GBC and triangle GAC are ……'. [1]

(c) The radius of the sphere is 54 cm.

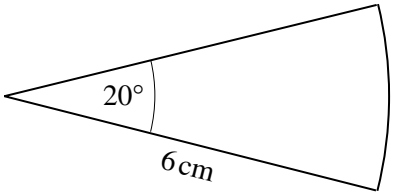
(i) Calculate the distance *GA*. Show all your working. [3]

(ii) Show that *GX* = 195 cm correct to the nearest centimetre. [1]

(iii) Calculate the length of the plank *GW*. [3]

(iv) Find the distance *BW*. [1]

8 **(a)** A sector of a circle, radius 6 cm, has an angle of 20°.



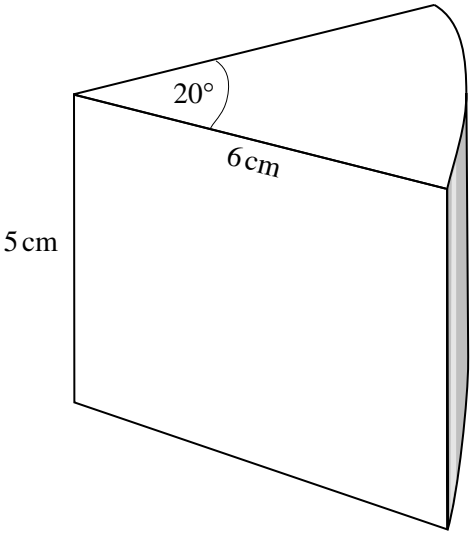
NOT TO SCALE

Calculate

(i) the area of the sector, [2]

(ii) the arc length of the sector. [2]

(b)



NOT TO SCALE

A whole cheese is a cylinder, radius 6 cm and height 5 cm.
The diagram shows a slice of this cheese with sector angle 20°.

Calculate

(i) the volume of the slice of cheese, [2]

(ii) the **total** surface area of the slice of cheese. [4]

(c) The radius, r, and height, h, of cylindrical cheeses vary but the volume remains constant.

(i) Which one of the following statements *A, B, C* or *D* is true?

A: h is proportional to r.

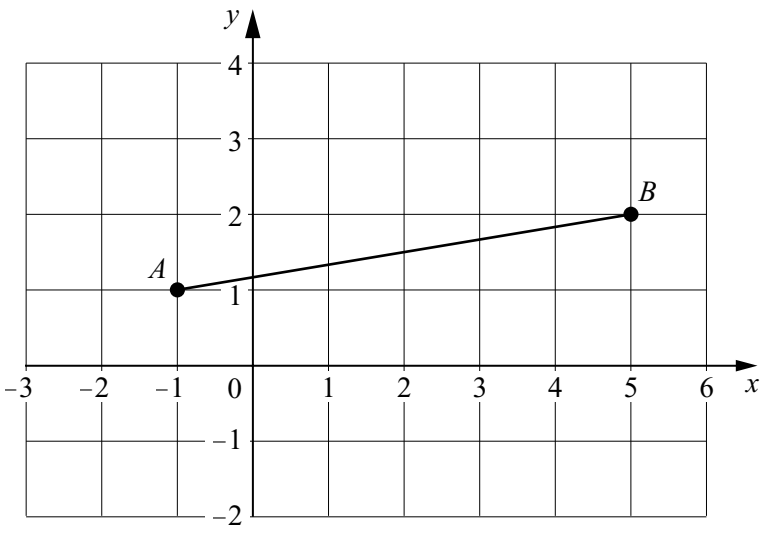
B: h is proportional to r^2.

C: h is inversely proportional to r.

D: h is inversely proportional to r^2. [2]

(ii) What happens to the height h of the cylindrical cheese when the volume remains constant but the radius is doubled? [2]

9



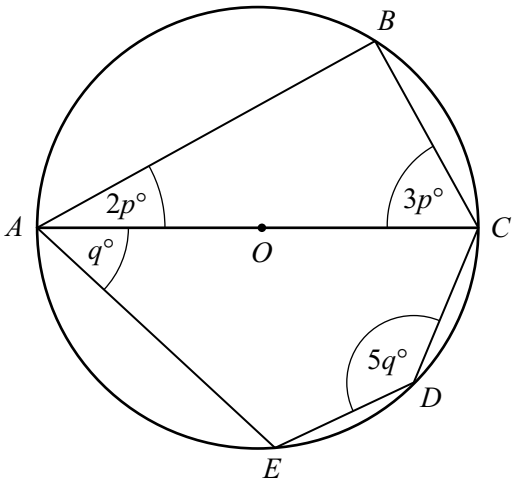
(a) Find the gradient of the line AB.

Answer (a) ..... [1]

(b) Calculate the angle that AB makes with the x-axis.

Answer (b) ..... [2]

12



NOT TO SCALE

A, B, C, D and E lie on a circle, centre O. AOC is a diameter.
Find the value of

(a) p,

Answer (a) $p =$ ..... [2]

(b) q.

Answer (b) $q =$ ..... [2]

9 **(a)**

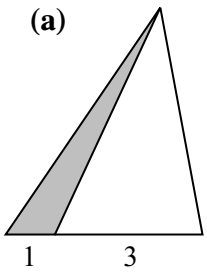


Diagram 1

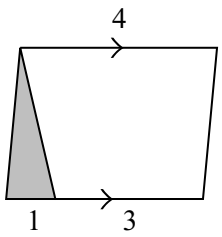


Diagram 2

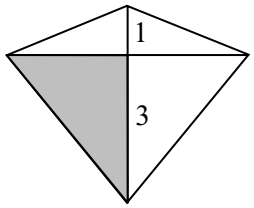


Diagram 3

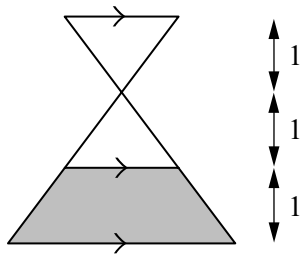


Diagram 4

Diagram 1 shows a triangle with its base divided in the ratio 1 : 3.

Diagram 2 shows a parallelogram with its base divided in the ratio 1 : 3.

Diagram 3 shows a kite with a diagonal divided in the ratio 1 : 3.

Diagram 4 shows two congruent triangles and a trapezium each of height 1 unit.

For each of the four diagrams, write down the **percentage** of the total area which is shaded. [7]

(b)

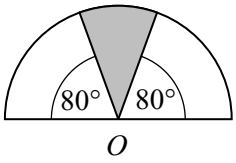


Diagram 5

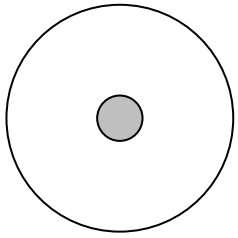


Diagram 6

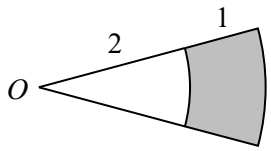


Diagram 7

Diagram 5 shows a semicircle, centre O.

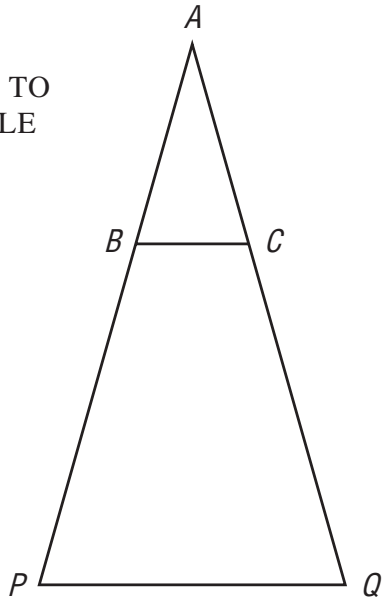
Diagram 6 shows two circles with radii 1 unit and 5 units.

Diagram 7 shows two sectors, centre O, with radii 2 units and 3 units.

For each of diagrams 5, 6 and 7, write down the **fraction** of the total area which is shaded. [6]

15

NOT TO SCALE

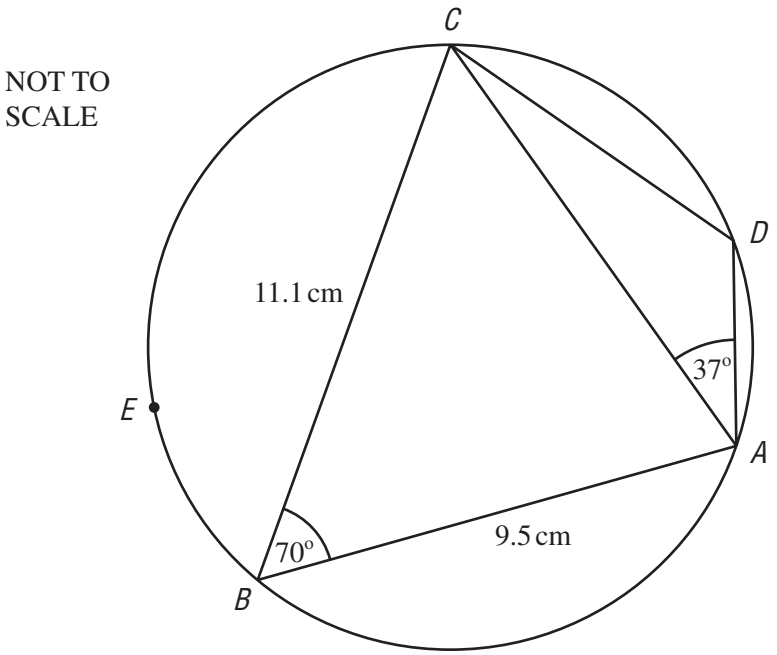


The area of triangle APQ is 99 cm^2 and the area of triangle ABC is 11 cm^2. BC is parallel to PQ and the length of PQ is 12 cm.

Calculate the length of BC.

Answer BC = ... cm [3]

4



ABCD is a cyclic quadrilateral.
AB = 9.5 cm, *BC* = 11.1 cm, angle *ABC* = 70° and angle *CAD* = 37°.

(a) Calculate the length of *AC*. [4]

(b) Explain why angle *ADC* = 110°. [1]

(c) Calculate the length of *AD*. [4]

(d) A point *E* lies on the circle such that triangle *ACE* is isosceles, with *EA* = *EC*.

(i) Write down the size of angle *AEC*. [1]

(ii) Calculate the area of triangle *ACE*. [3]

15 The points *A*(6,2) and *B*(8,5) lie on a straight line.

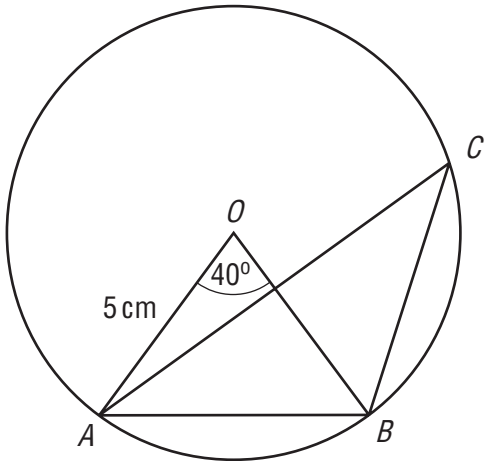
(a) Work out the gradient of this line.

Answer (a) ..... [1]

(b) Work out the equation of the line, giving your answer in the form $y = mx + c$.

Answer (b) ..... [2]

21



NOT TO SCALE

A, B and C are points on a circle, centre O.
Angle $AOB = 40^o$.

(a) (i) Write down the size of angle ACB.

Answer (a)(i) Angle ACB = ... [1]

(ii) Find the size of angle OAB.

Answer (a)(ii) Angle OAB = ... [1]

(b) The radius of the circle is 5 cm.

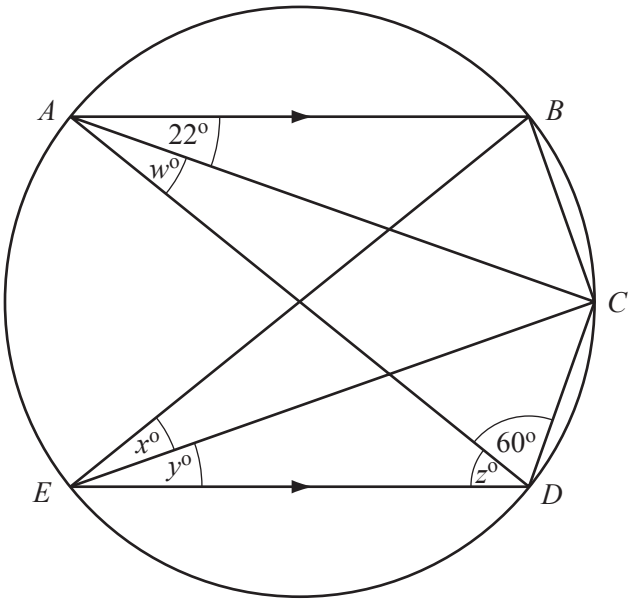
(i) Calculate the length of the minor arc AB.

Answer (b)(i) ..... cm [2]

(ii) Calculate the area of the minor sector OAB.

Answer (b)(ii) ..... cm^2 [2]

18



NOT TO SCALE

AD is a diameter of the circle *ABCDE*.
Angle *BAC* = 22° and angle *ADC* = 60°.
AB and *ED* are parallel lines.
Find the values of *w*, *x*, *y* and *z*.

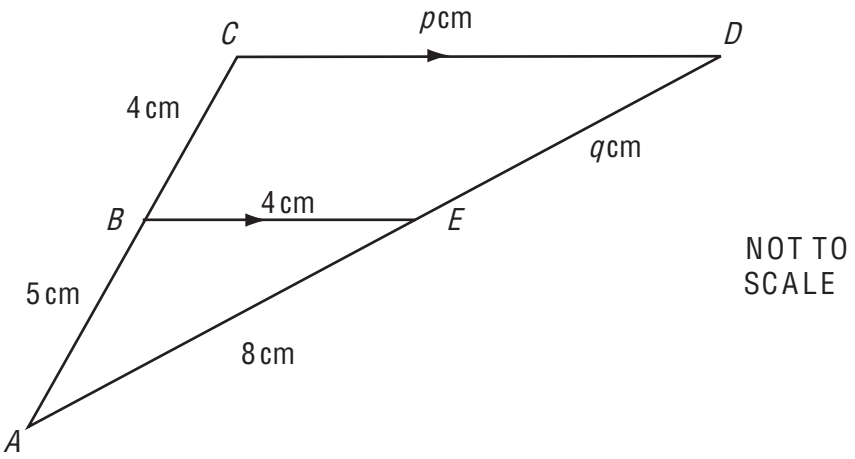
Answer $w =$ .....

$x =$ .....

$y =$ .....

$z =$ ..... [4]

22 (a)



In the diagram triangles *ABE* and *ACD* are similar.
BE is parallel to *CD*.
AB = 5 cm, *BC* = 4 cm, *BE* = 4 cm, *AE* = 8 cm, *CD* = *p* cm and *DE* = *q* cm.
Work out the values of *p* and *q*.

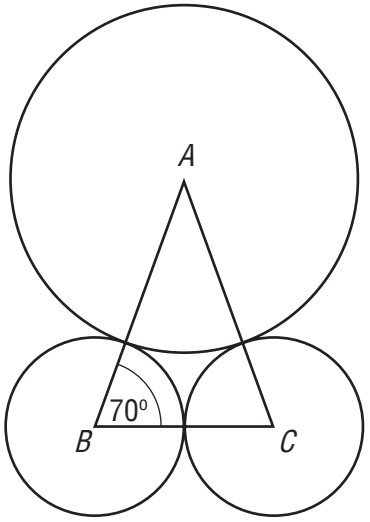
Answer(a) $p =$ .....

$q =$ ..... [4]

(b) A spherical balloon of radius 3 metres has a volume of 36π cubic metres.
It is further inflated until its radius is 12 m.
Calculate its new volume, leaving your answer in terms of π.

Answer(b) ..... m^3 [2]

14

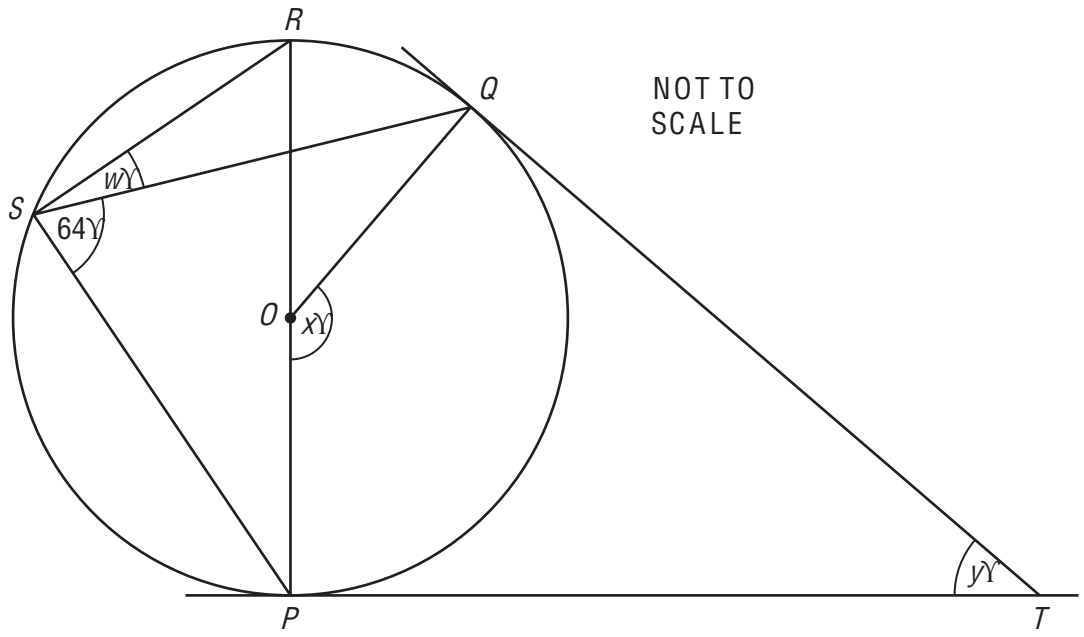


NOT TO SCALE

The diagram shows three touching circles.
A is the centre of a circle of radius x centimetres.
B and C are the centres of circles of radius 3.8 centimetres. Angle $ABC = 70°$.
Find the value of x.

Answer $x =$ ..... [3]

19



P, *Q*, *R* and *S* lie on a circle, centre *O*.
TP and *TQ* are tangents to the circle.
PR is a diameter and angle *PSQ* = 64°.

(a) Work out the values of *w* and *x*.

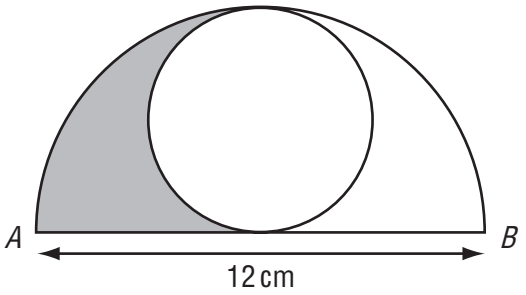
Answer(a) $w =$ ..... [1]

$x =$ ..... [1]

(b) **Showing all your working**, find the value of *y*.

Answer(b) $y =$ ..... [2]

23



NOT TO SCALE

The largest possible circle is drawn inside a semicircle, as shown in the diagram.
The distance AB is 12 centimetres.

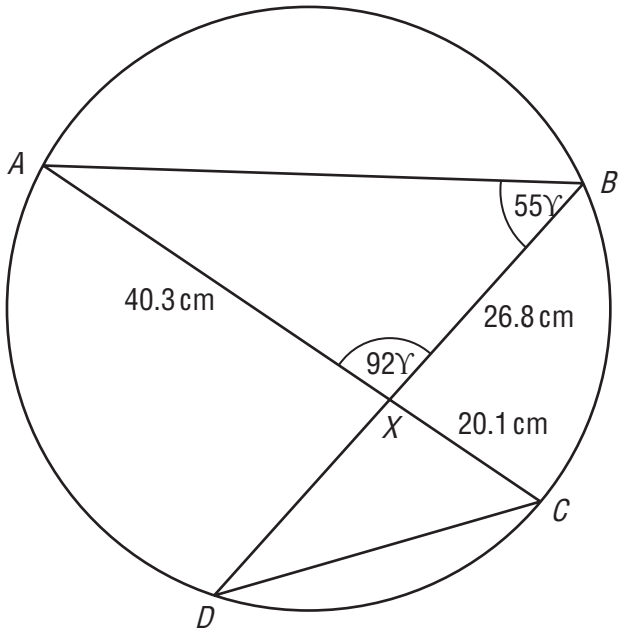
(a) Find the shaded area.

Answer(a) ..... cm^2 [4]

(b) Find the perimeter of the shaded area.

Answer(b) ..... cm [2]

3 (a)



NOT TO SCALE

A, *B*, *C* and *D* lie on a circle.

AC and *BD* intersect at *X*.

Angle *ABX* = 55° and angle *AXB* = 92°.

BX = 26.8 cm, *AX* = 40.3 cm and *XC* = 20.1 cm.

(i) Calculate the area of triangle *AXB*.
You must show your working. [2]

(ii) Calculate the length of *AB*.
You must show your working. [3]

(iii) Write down the size of angle *ACD*. Give a reason for your answer. [2]

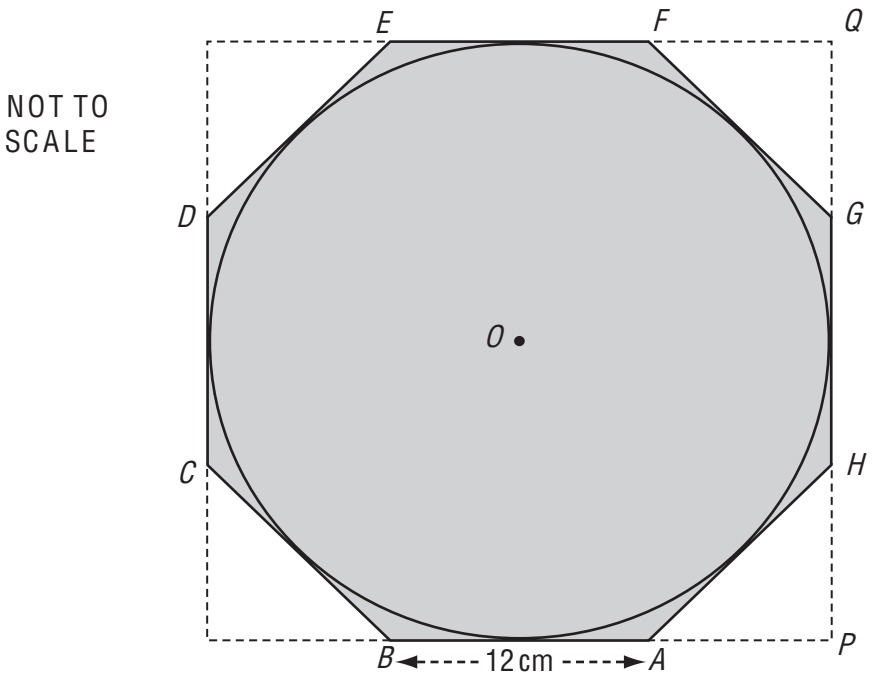
(iv) Find the size of angle *BDC*. [1]

(v) Write down the geometrical word which completes the statement

"Triangle *AXB* is ——— to triangle *DXC*." [1]

(vi) Calculate the length of *XD*.
You must show your working. [2]

5



A circle, centre O, touches all the sides of the regular octagon $ABCDEFGH$ shaded in the diagram.

The sides of the octagon are of length 12 cm.

BA and GH are extended to meet at P. HG and EF are extended to meet at Q.

(a) (i) Show that angle BAH is 135°. [2]

(ii) Show that angle APH is 90°. [1]

(b) Calculate

(i) the length of PH, [2]

(ii) the length of PQ, [2]

(iii) the area of triangle APH, [2]

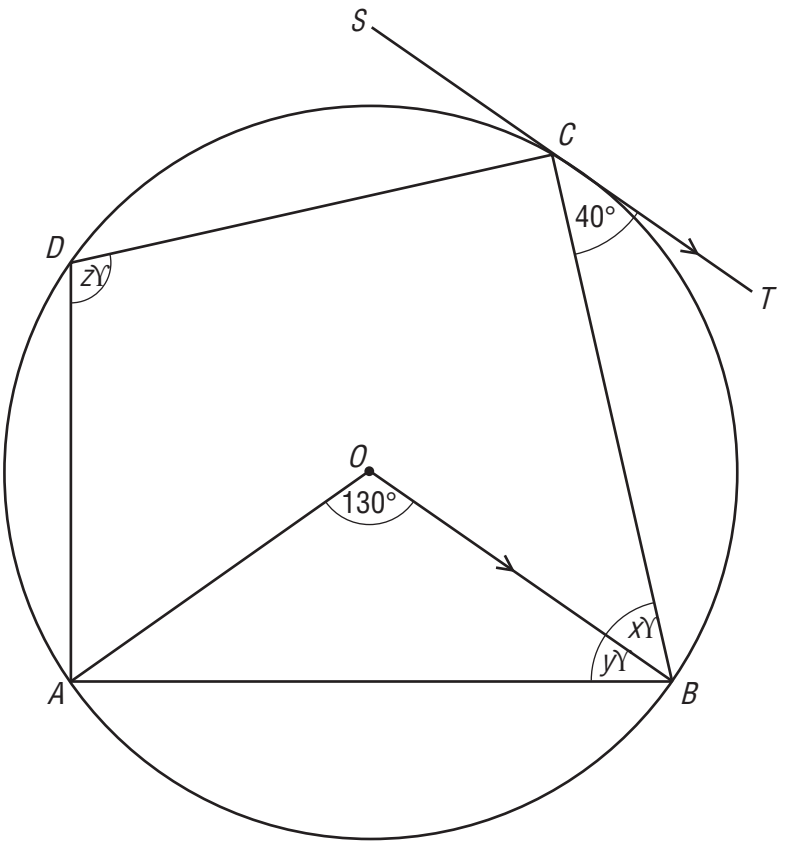
(iv) the area of the octagon. [3]

(c) Calculate

(i) the radius of the circle, [2]

(ii) the area of the circle as a percentage of the area of the octagon. [3]

7 (a)



A, *B*, *C* and *D* lie on a circle, centre *O*.
SCT is the tangent at *C* and is parallel to *OB*.
Angle *AOB* = 130°, and angle *BCT* = 40°.
Angle *OBC* = *x*°, angle *OBA* = *y*° and angle *ADC* = *z*°.

(i) Write down the geometrical word which completes the following statement.

"ABCD is a _____ quadrilateral." [1]

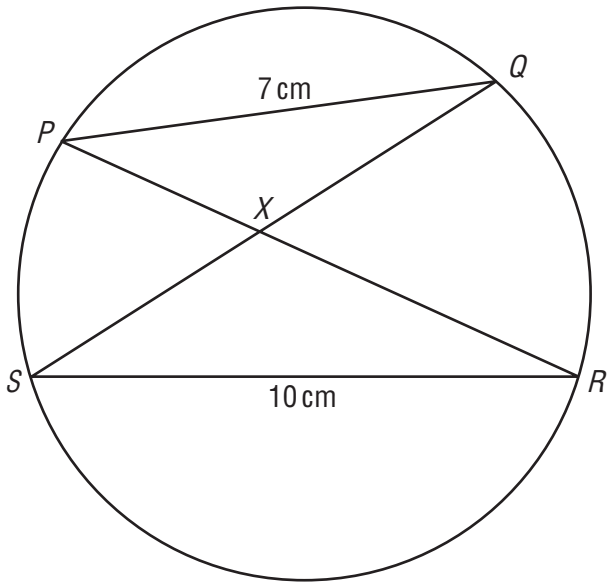
(ii) Find the values of *x*, *y* and *z*. [3]

(iii) Write down the value of angle *OCT*. [1]

(iv) Find the value of the **reflex** angle *AOC*. [1]

(b)

NOT TO SCALE



P, Q, R and *S* lie on a circle.

$PQ = 7$ cm and $SR = 10$ cm.

PR and *QS* intersect at *X*.

The area of triangle $SRX = 20\,\text{cm}^2$.

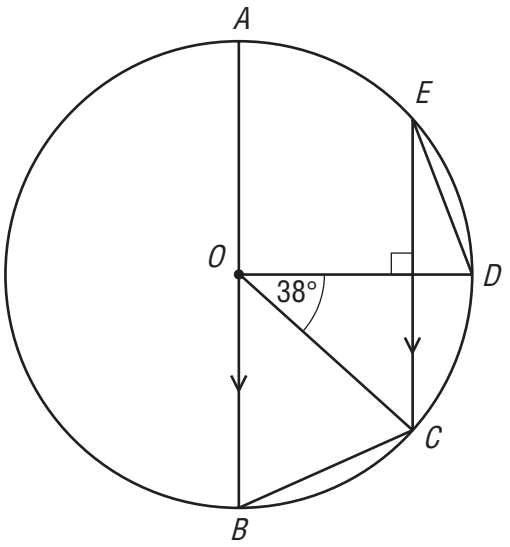
(i) Write down the geometrical word which completes the following statement.

"Triangle *PQX* is ———— to triangle *SRX*." [1]

(ii) Calculate the area of triangle *PQX*. [2]

(iii) Calculate the length of the perpendicular height from *X* to *RS*. [2]

17



NOT TO SCALE

AB is the diameter of a circle, centre *O*. *C*, *D* and *E* lie on the circle.
EC is parallel to *AB* and perpendicular to *OD*. Angle *DOC* is 38°.

Work out

(a) angle *BOC* ,

Answer(a) Angle *BOC* = ... [1]

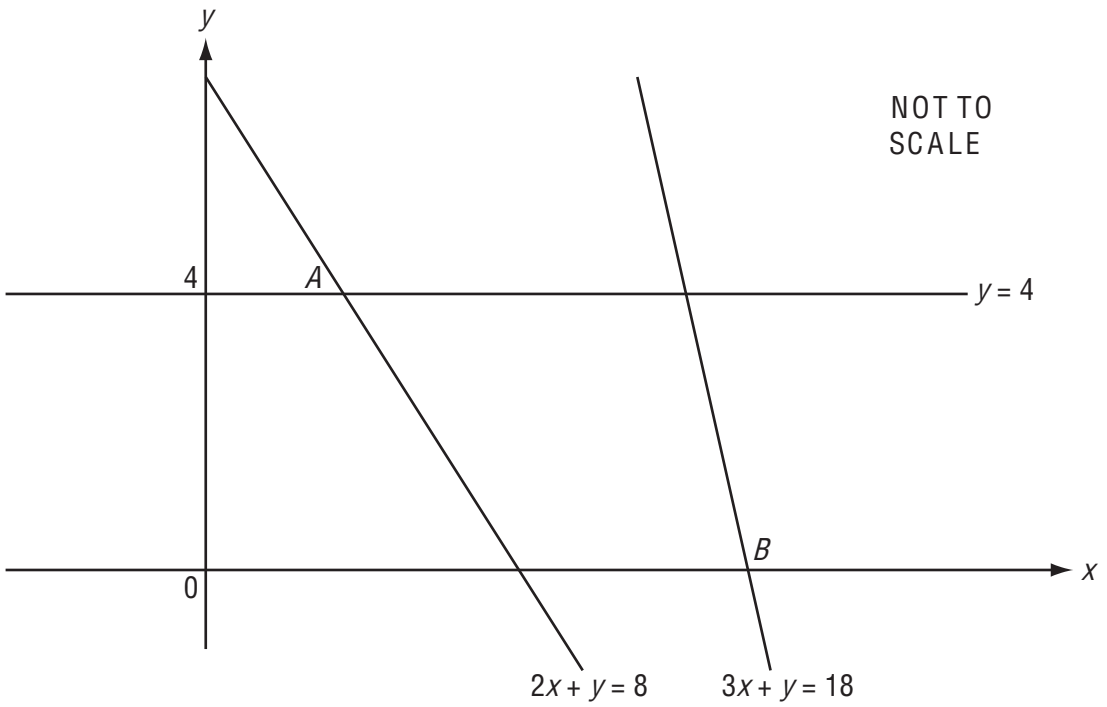
(b) angle *CBO*,

Answer(b) Angle *CBO* = ... [1]

(c) angle *EDO* .

Answer(c) Angle *EDO* = ... [2]

15



(a) The line $y = 4$ meets the line $2x + y = 8$ at the point A.
Find the co-ordinates of A.

Answer(a) A (..... , ...) [1]

(b) The line $3x + y = 18$ meets the x axis at the point B.
Find the co-ordinates of B.

Answer(b) B (..... , ...) [1]

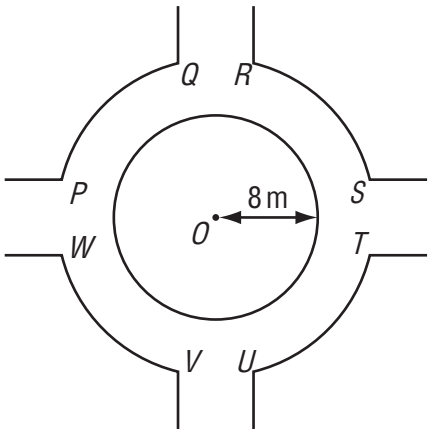
(c) **(i)** Find the co-ordinates of the mid-point M of the line joining A to B.

Answer(c)(i) M (..... , ...) [1]

(ii) Find the equation of the line through M parallel to $3x + y = 18$.

Answer(c)(ii) ..... [2]

17



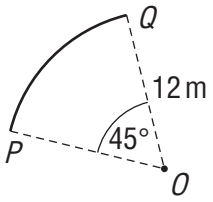
NOT TO SCALE

The diagram shows the junction of four paths.
In the junction there is a circular area covered in grass.
This circle has centre O and radius 8 m.

(a) Calculate the area of grass.

Answer(a) ..... m^2 [2]

(b)

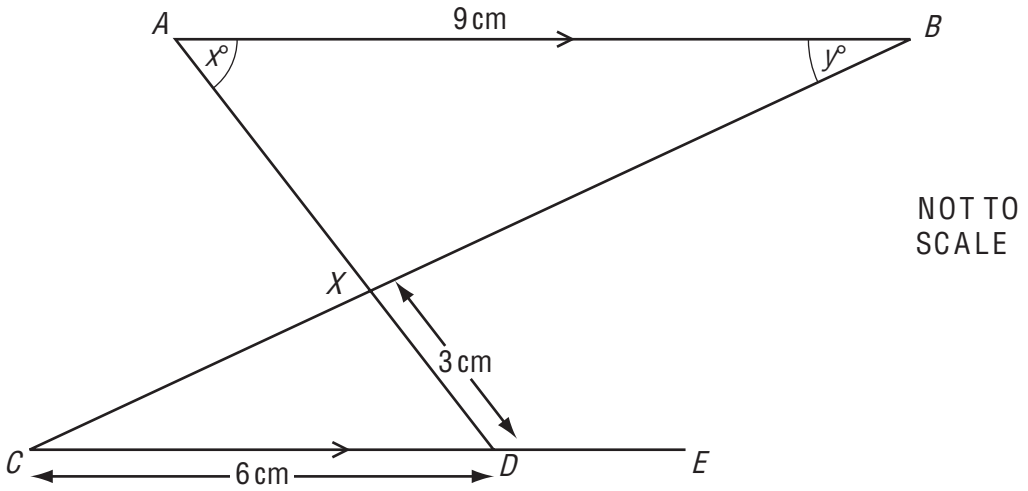


NOT TO SCALE

The arc PQ and the other three identical arcs, RS, TU and VW are each part of a circle, centre O, radius 12m.
The angle POQ is 45°.
The arcs PQ, RS, TU, VW and the circumference of the circle in **part(a)** are painted white.
Calculate the total length painted white.

Answer(b) ..... m [4]

9 (a)



The lines *AB* and *CDE* are parallel.
AD and *CB* intersect at *X*.
AB = 9 cm, *CD* = 6 cm and *DX* = 3 cm.

(i) Complete the following statement.

Triangle *ABX* is ..... to triangle *DCX*. [1]

(ii) Calculate the length of *AX*.

Answer(a)(ii) *AX* = ... cm [2]

(iii) The area of triangle *DCX* is 6 cm^2.

Calculate the area of triangle *ABX*.

Answer(a)(iii) ..... cm^2 [2]

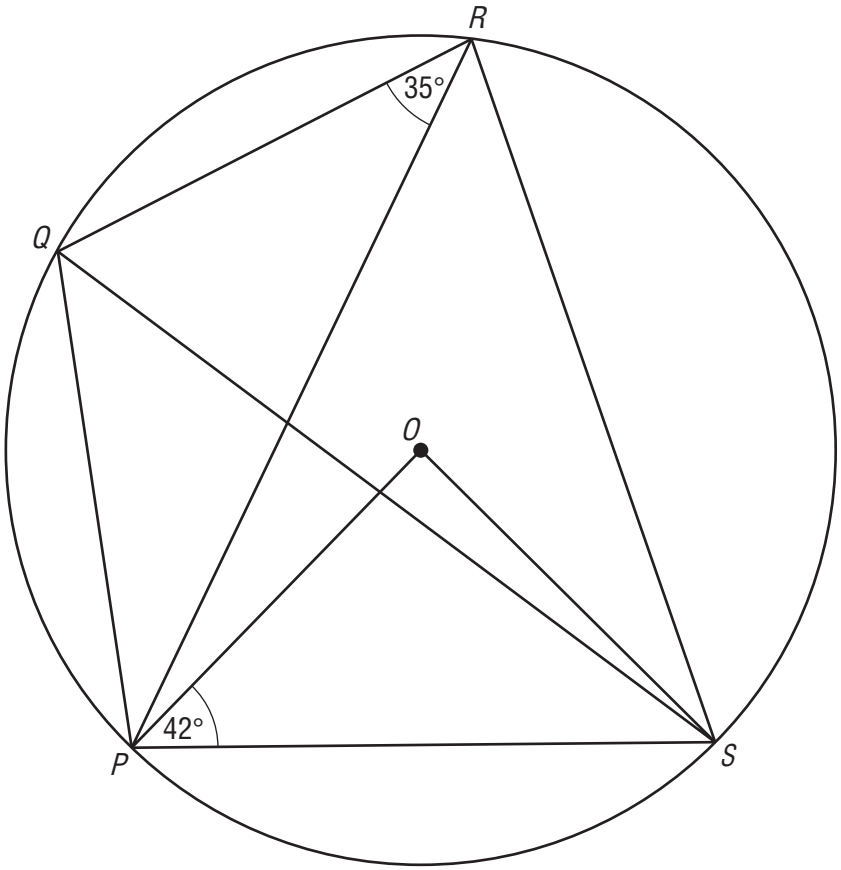
(iv) Angle *BAX* = $x°$ and angle *ABX* = $y°$.

Find angle *AXB* and angle *XDE* in terms of *x* and/or *y*.

Answer(a)(iv) Angle *AXB* = ...

Angle *XDE* = ... [2]

(b)



P, *Q*, *R* and *S* lie on a circle, centre *O*.
Angle *OPS* = 42° and angle *PRQ* = 35°.

Calculate

(i) angle *POS*,

Answer(b)(i) Angle *POS* = ... [1]

(ii) angle *PRS*,

Answer(b)(ii) Angle *PRS* = ... [1]

(iii) angle *SPQ*,

Answer(b)(iii) Angle *SPQ* = ... [1]

(iv) angle *PSQ*.

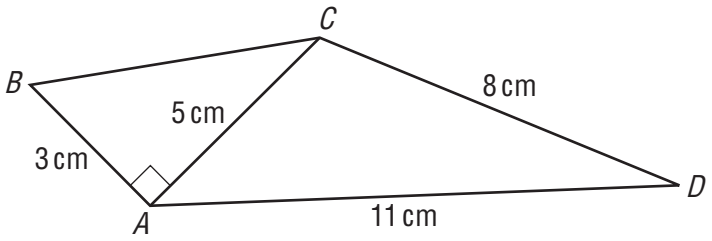
Answer(b)(iv) Angle *PSQ* = ... [1]

(c) The interior angle of a regular polygon is 8 times as large as the exterior angle.

Calculate the number of sides of the polygon.

Answer(c) ..... [3]

2



NOT TO SCALE

In the quadrilateral $ABCD$, $AB = 3$ cm, $AD = 11$ cm and $DC = 8$ cm.
The diagonal $AC = 5$ cm and angle $BAC = 90°$.

Calculate

(a) the length of BC,

Answer(a) $BC =$ ..... cm [2]

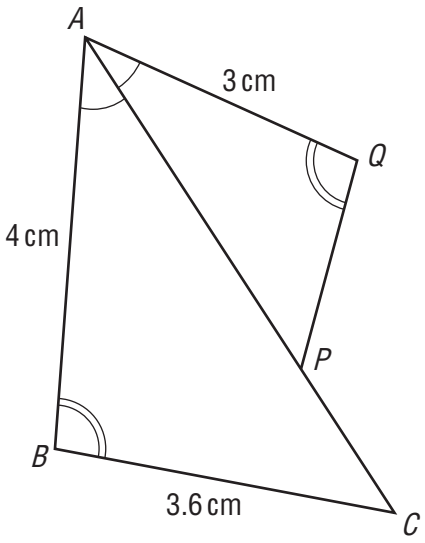
(b) angle ACD,

Answer(b) Angle $ACD =$ ..... [4]

(c) the area of the quadrilateral $ABCD$.

Answer(c) ..... cm^2 [3]

5 (a)



NOT TO SCALE

The diagram shows two triangles *ACB* and *APQ*.

Angle *PAQ* = angle *BAC* and angle *AQP* = angle *ABC*.

AB = 4 cm, *BC* = 3.6 cm and *AQ* = 3 cm.

(i) Complete the following statement.

Triangle *ACB* is ..... to triangle *APQ*. [1]

(ii) Calculate the length of *PQ*.

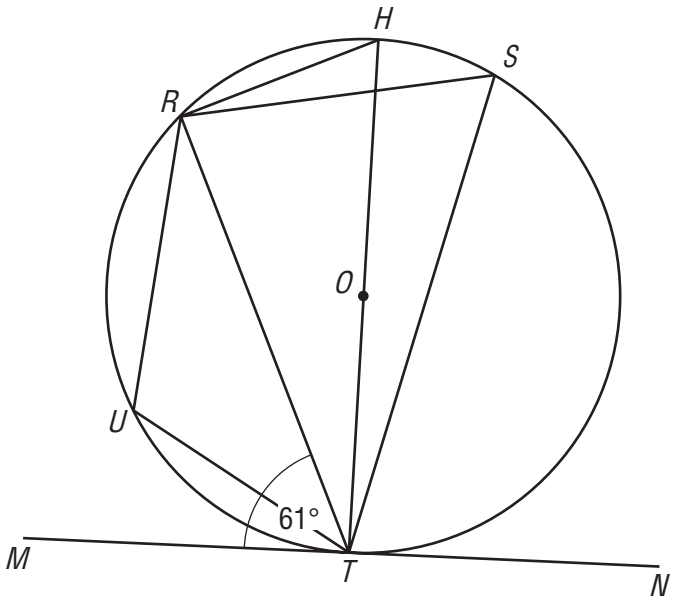
Answer(a)(ii) *PQ* = ... cm [2]

(iii) The area of triangle *ACB* is 5.6 cm^2.

Calculate the area of triangle *APQ*.

Answer(a)(iii) ..... cm^2 [2]

(b)



NOT TO SCALE

R, *H*, *S*, *T* and *U* lie on a circle, centre *O*.
HT is a diameter and *MN* is a tangent to the circle at *T*.
Angle *RTM* = 61°.

Find

(i) angle *RTH*,

Answer(b)(i) Angle *RTH* = ... [1]

(ii) angle *RHT*,

Answer(b)(ii) Angle *RHT* = ... [1]

(iii) angle *RST*,

Answer(b)(iii) Angle *RST* = ... [1]

(iv) angle *RUT*.

Answer(b)(iv) Angle *RUT* = ... [1]

(c) *ABCDEF* is a hexagon.
The interior angle *B* is 4° greater than interior angle *A*.
The interior angle *C* is 4° greater than interior angle *B*, and so on, with each of the next interior angles 4° greater than the previous one.

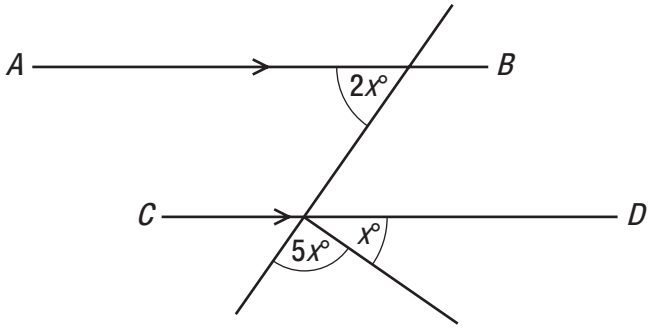
(i) By how many degrees is interior angle *F* greater than interior angle *A*?

Answer(c)(i) ..... [1]

(ii) Calculate interior angle *A*.

Answer(c)(ii) ..... [3]

9

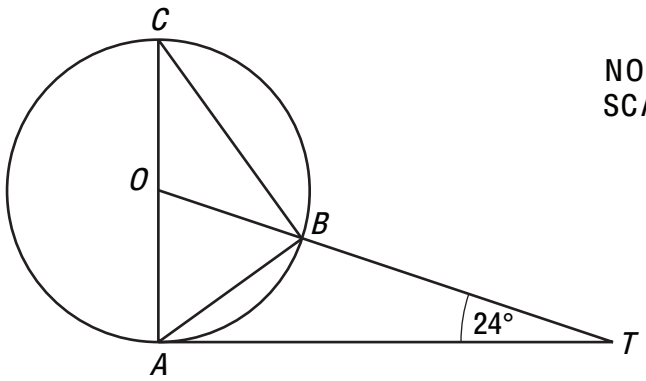


NOT TO SCALE

AB is parallel to *CD*.
Calculate the value of *x*.

Answer x = ... [3]

18



NOT TO SCALE

A, B and C are points on a circle, centre O.
TA is a tangent to the circle at A and OBT is a straight line.
AC is a diameter and angle $OTA = 24°$.

Calculate

(a) angle AOT,

Answer(a) Angle AOT = ... [2]

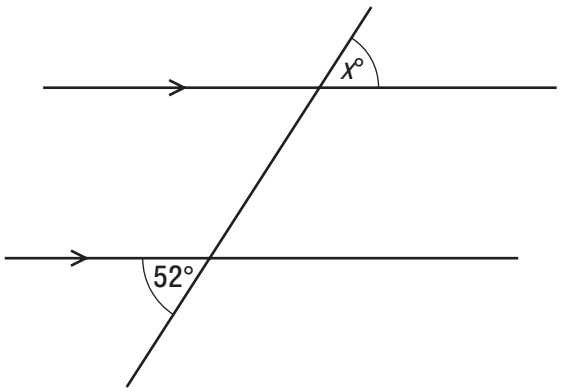
(b) angle BOC,

Answer(b) Angle BOC = ... [1]

(c) angle OCB.

Answer(c) Angle OCB = ... [1]

2



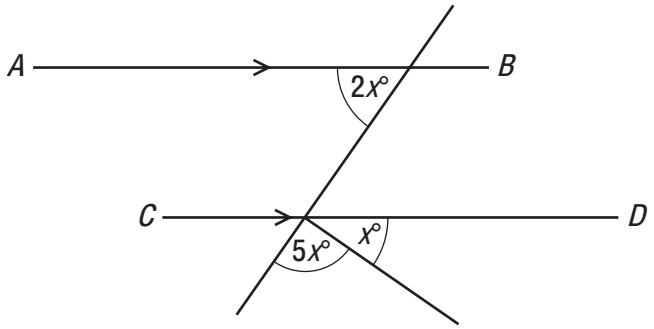
NOT TO SCALE

A straight line intersects two parallel lines as shown in the diagram.

Find the value of x.

Answer $x =$ ..... [1]

9



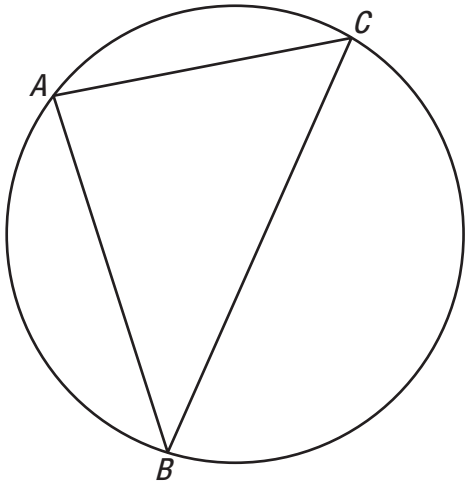
NOT TO SCALE

AB is parallel to CD.
Calculate the value of x.

Answer $x =$ ..... [3]

---

17 (a)



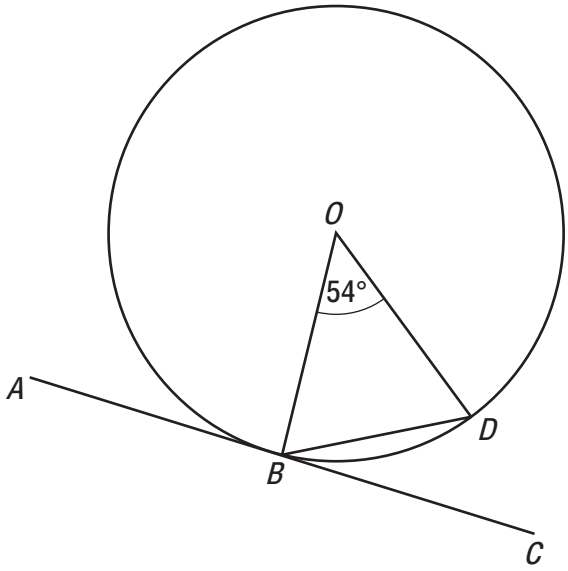
NOT TO SCALE

Points A, B and C lie on the circumference of the circle shown above.

When angle BAC is 90° write down a statement about the line BC.

Answer(a) ..... [1]

(b)



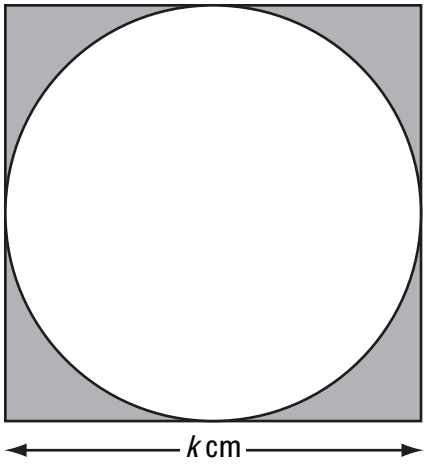
NOT TO SCALE

O is the centre of a circle and the line ABC is a tangent to the circle at B.
D is a point on the circumference and angle BOD = 54°.

Calculate angle DBC.

Answer(b) Angle DBC = ... [3]

16



The diagram shows a square of side k cm.

The circle inside the square touches all four sides of the square.

(a) The shaded area is A cm^2.

Show that $4A = 4k^2 - \pi k^2$.

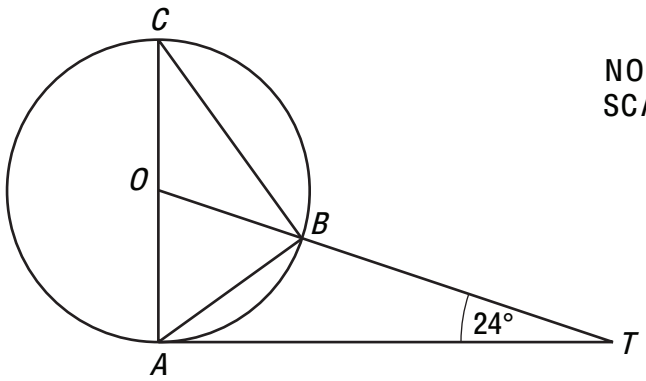
Answer (a)

[2]

(b) Make k the subject of the formula $4A = 4k^2 - \pi k^2$.

Answer(b) $k =$ ..... [3]

17



NOT TO SCALE

A, *B* and *C* are points on a circle, centre *O*.
TA is a tangent to the circle at *A* and *OBT* is a straight line.
AC is a diameter and angle *OTA* = 24°.

Calculate

(a) angle *AOT*,

Answer(a) Angle *AOT* = ... [2]

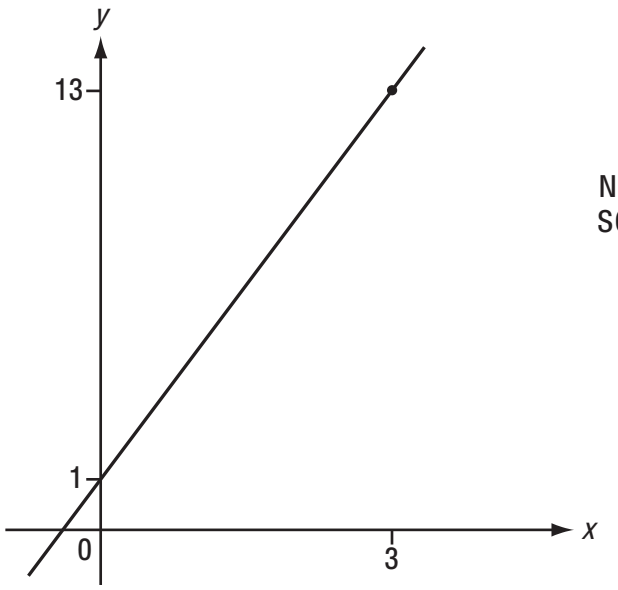
(b) angle *ACB*,

Answer(b) Angle *ACB* = ... [1]

(c) angle *ABT*.

Answer(c) Angle *ABT* = ... [2]

14



The diagram shows the straight line which passes through the points (0, 1) and (3, 13).

Find the equation of the straight line.

Answer ..... [3]

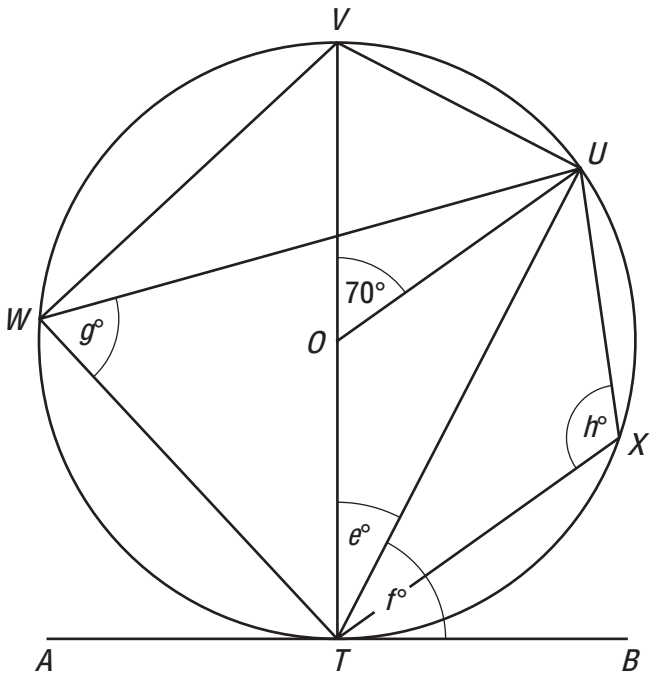
---

15 A cylinder has a height of 12 cm and a volume of 920 cm^3.

Calculate the radius of the base of the cylinder.

Answer ..... cm [3]

20



NOT TO SCALE

The diagram shows a circle, centre O.
VT is a diameter and ATB is a tangent to the circle at T.
U, V, W and X lie on the circle and angle $VOU = 70°$.

Calculate the value of

(a) e,

Answer(a) $e =$ ..... [1]

(b) f,

Answer(b) $f =$ ..... [1]

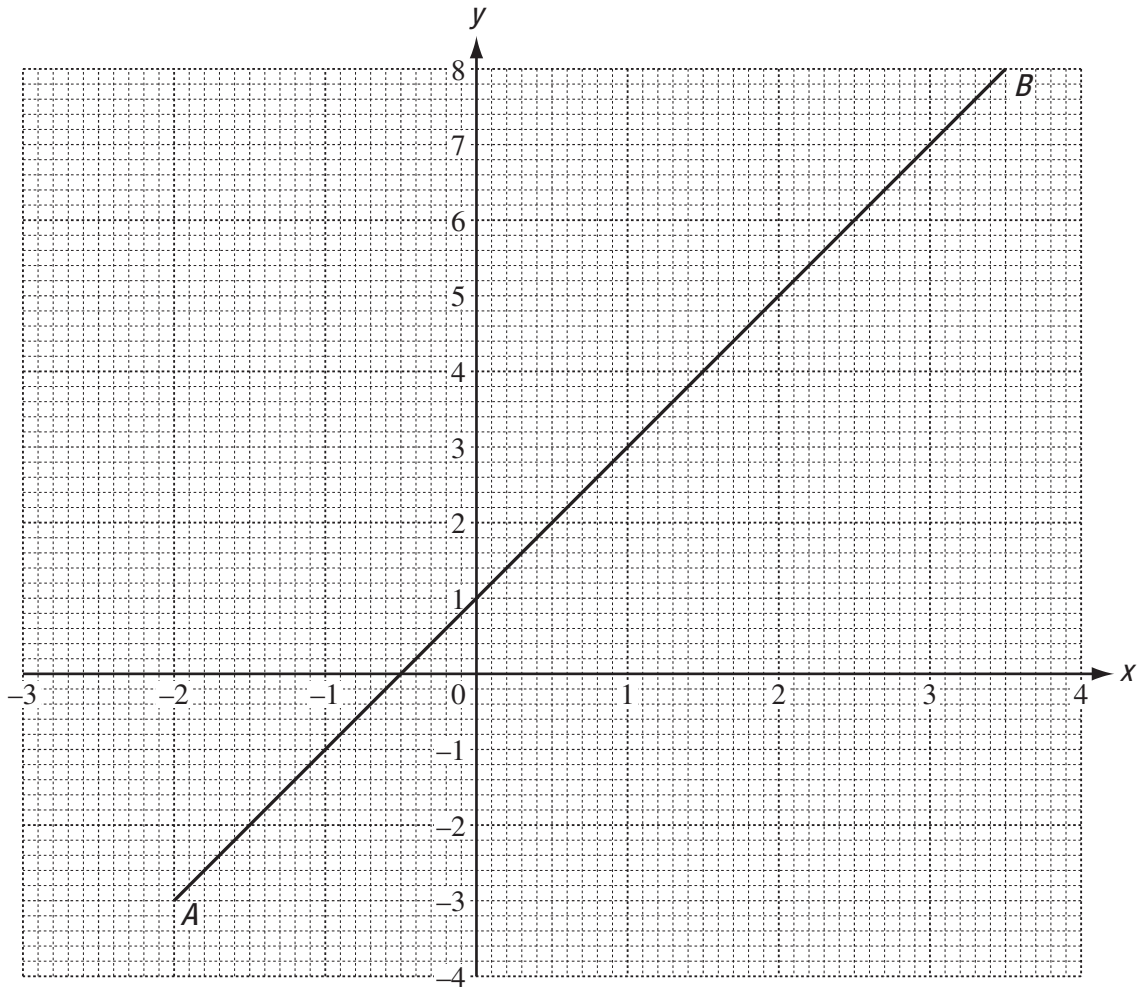
(c) g,

Answer(c) $g =$ ..... [1]

(d) h.

Answer(d) $h =$ ..... [1]

5



(a) (i) Find the gradient of the line AB.

Answer(a)(i) ..... [2]

(ii) Write down the equation of the line AB in the form $y = mx + c$.

Answer(a)(ii) $y =$ ..... [2]

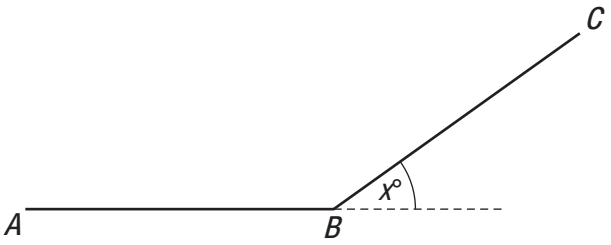
5 **(a)** The table below shows how many sides different polygons have.

Complete the table.

Name of polygon	Number of sides
	3
Quadrilateral	4
	5
Hexagon	6
Heptagon	7
	8
Nonagon	9

[3]

(b) Two sides, *AB* and *BC*, of a regular nonagon are shown in the diagram below.



NOT TO SCALE

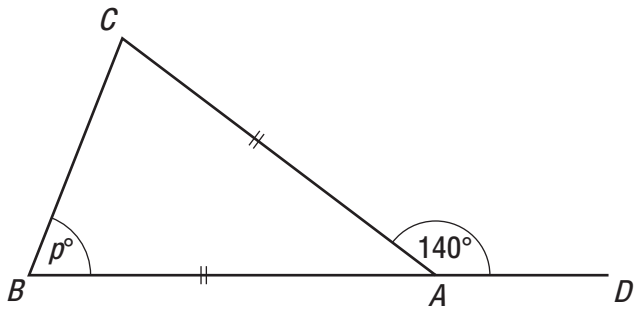
(i) Work out the value of *x*, the exterior angle.

Answer(b)(i) $x =$ ..... [2]

(ii) Find the value of angle *ABC*, the interior angle of a regular nonagon.

Answer(b)(ii) Angle *ABC* = ... [1]

6 **(a)**

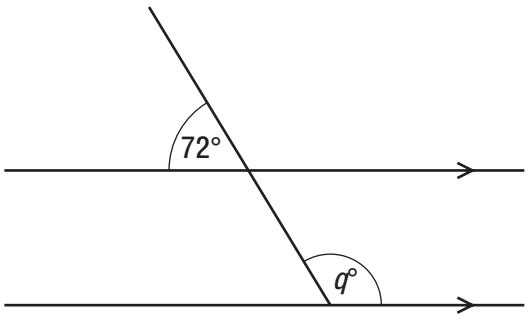


NOT TO SCALE

The diagram shows a triangle ABC with BA extended to D.
$AB = AC$ and angle $CAD = 140°$.
Find the value of p.

Answer(a) $p =$ ..... [2]

(b)

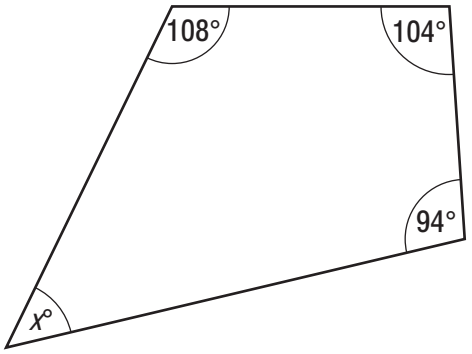


NOT TO SCALE

Find the value of q.

Answer(b) $q =$ ..... [2]

(c)

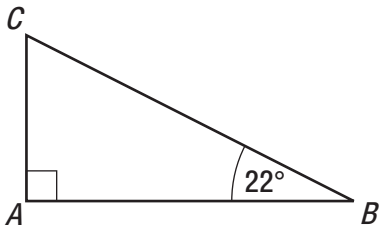


NOT TO SCALE

Find the value of x.

Answer(c) $x =$ ..... [1]

(d)



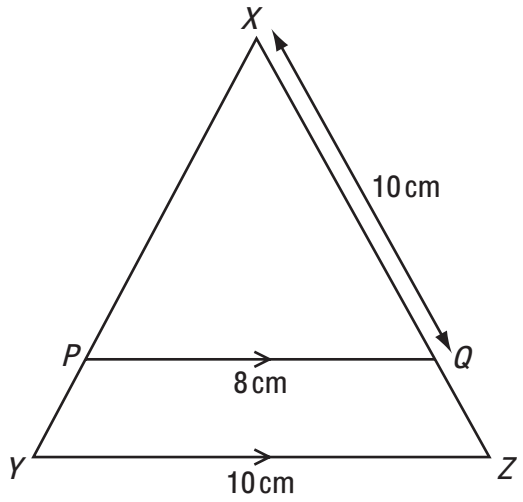
NOT TO SCALE

In triangle ABC, angle $A = 90°$ and angle $B = 22°$.

Calculate angle C.

Answer(d) Angle C = ... [1]

(e)



NOT TO SCALE

In triangle XYZ, P is a point on XY and Q is a point on XZ.
PQ is parallel to YZ.

(i) Complete the statement.

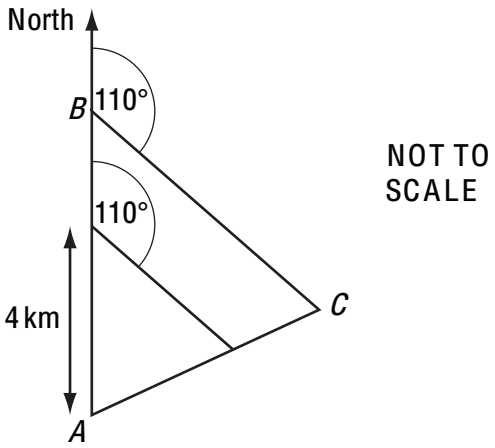
Triangle XPQ is ..... to triangle XYZ. [1]

(ii) $PQ = 8$ cm, $XQ = 10$ cm and $YZ = 10$ cm.

Calculate the length of XZ.

Answer(e)(ii) XZ = ... cm [2]

(ii)



$AB = BC = 6$ km.
Junior students follow a **similar** path but they only walk 4 km North from A, then 4 km on a bearing 110° before returning to A.

Senior students walk a total of 18.9 km.

Calculate the distance walked by junior students.

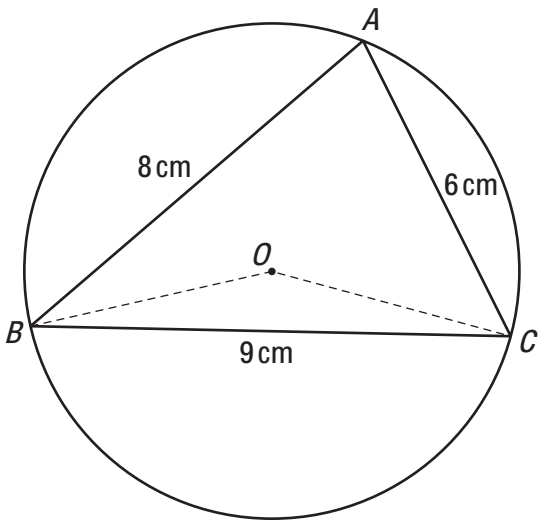
Answer(b)(ii) ..... km [3]

(c) The total amount, \$1380, raised in 2010 was 8% **less** than the total amount raised in 2009.

Calculate the total amount raised in 2009.

Answer(c) \$ ..... [3]

4



NOT TO SCALE

The circle, centre O, passes through the points A, B and C.

In the triangle ABC, $AB = 8$ cm, $BC = 9$ cm and $CA = 6$ cm.

(a) Calculate angle BAC and show that it rounds to 78.6°, correct to 1 decimal place.

Answer(a)

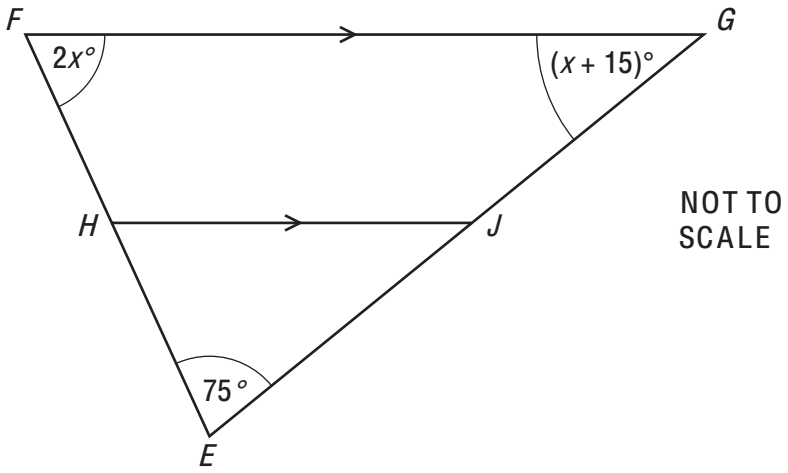
[4]

(b) M is the midpoint of BC.

(i) Find angle BOM.

Answer(b)(i) Angle BOM = ... [1]

(b)



EFG is a triangle.
HJ is parallel to *FG*.
Angle *FEG* = 75°.
Angle *EFG* = 2*x*° and angle *FGE* = (*x* + 15)°.

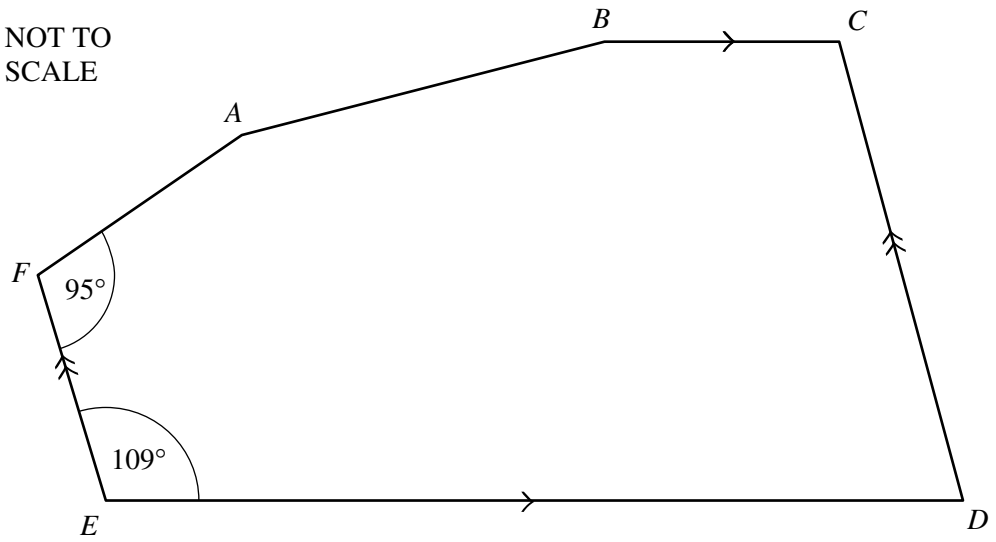
(i) Find the value of *x*.

Answer(b)(i) *x* = ... [2]

(ii) Find angle *HJG*.

Answer(b)(ii) Angle *HJG* = ... [1]

12



In the hexagon *ABCDEF*, *BC* is parallel to *ED* and *DC* is parallel to *EF*.
Angle *DEF* = 109° and angle *EFA* = 95°.
Angle *FAB* is equal to angle *ABC*.
Find the size of

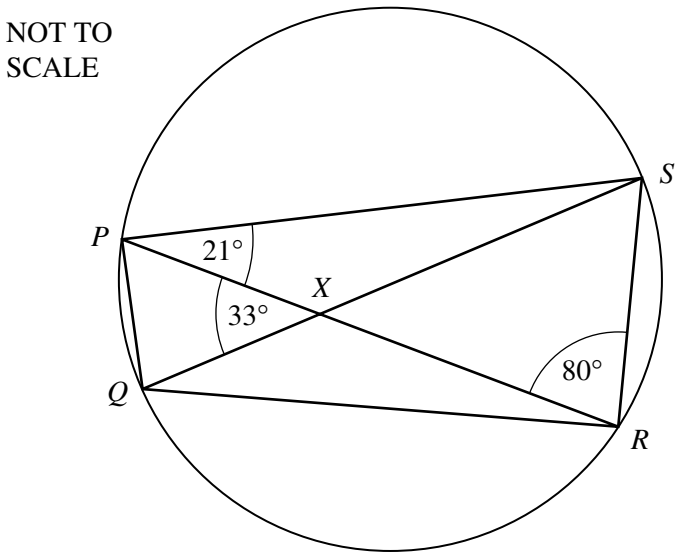
(a) angle *EDC*,

Answer (a) Angle *EDC* = ... [1]

(b) angle *FAB*.

Answer (b) Angle *FAB* = ... [2]

14



PQRS is a cyclic quadrilateral. The diagonals *PR* and *QS* intersect at *X*.
Angle *SPR* = 21°, angle *PRS* = 80° and angle *PXQ* = 33°.
Calculate

(a) angle *PQS*,

Answer (a) Angle *PQS* = ... [1]

(b) angle *QPR*,

Answer (b) Angle *QPR* = ... [1]

(c) angle *PSQ*.

Answer (c) Angle *PSQ* = ... [1]

---

15 Solve the simultaneous equations

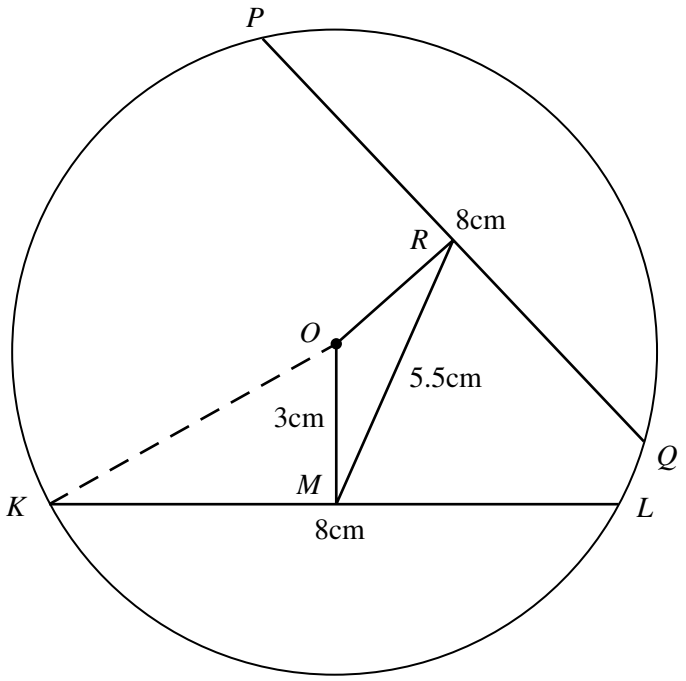
$$4x + 5y = 0,$$
$$8x - 15y = 5.$$

Answer x = ...

y = ... [4]

22

NOT TO SCALE



In the circle, centre O, the chords KL and PQ are each of length 8 cm.
M is the mid-point of KL and R is the mid-point of PQ. $OM = 3$ cm.

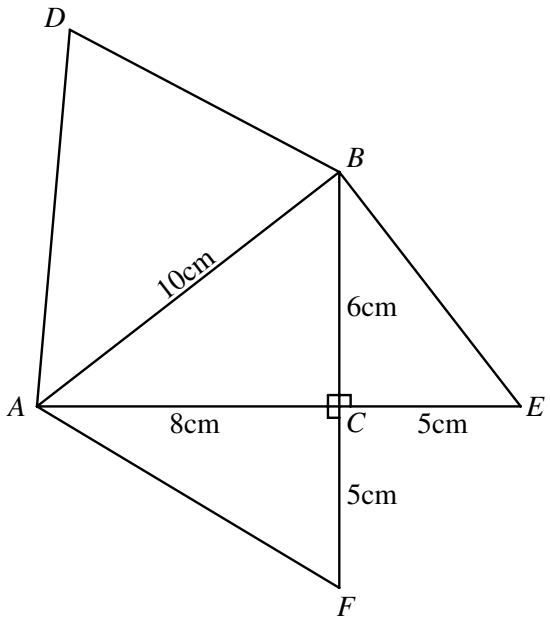
(a) Calculate the length of OK.

Answer (a) $OK =$ .....cm [2]

(b) RM has a length of 5.5 cm. Calculate angle ROM.

Answer (b) Angle $ROM =$ ..... [3]

2



NOT TO SCALE

The diagram shows a sketch of the net of a solid tetrahedron (triangular prism).
The right-angled triangle ABC is its base.
$AC = 8$ cm, $BC = 6$ cm and $AB = 10$ cm. $FC = CE = 5$ cm.

(a) **(i)** Show that $BE = \sqrt{61}$ cm. [1]

(ii) Write down the length of DB. [1]

(iii) Explain why $DA = \sqrt{89}$ cm. [2]

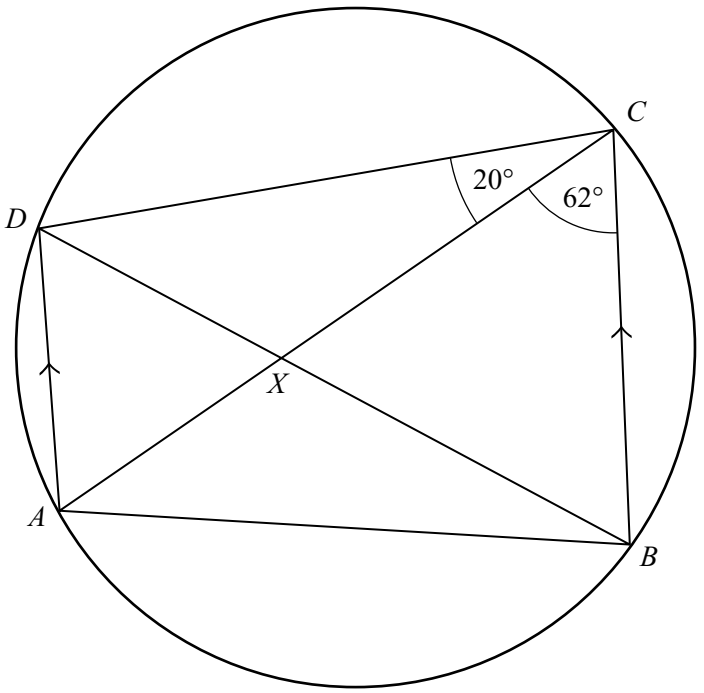
(b) **Calculate** the size of angle DBA. [4]

(c) Calculate the area of triangle DBA. [3]

(d) Find the total surface area of the solid. [3]

(e) Calculate the volume of the solid.
[The volume of a tetrahedron is $\frac{1}{3}$ (area of the base) $\times$ perpendicular height.] [3]

17



NOT TO SCALE

ABCD is a cyclic quadrilateral.
AD is parallel to *BC*. The diagonals *DB* and *AC* meet at *X*.
Angle *ACB* = 62° and angle *ACD* = 20°.
Calculate

(a) angle *DBA*,

Answer (*a*) Angle *DBA* = ... [1]

(b) angle *DAB*,

Answer (*b*) Angle *DAB* = ... [1]

(c) angle *DAC*,

Answer (*c*) Angle *DAC* = ... [1]

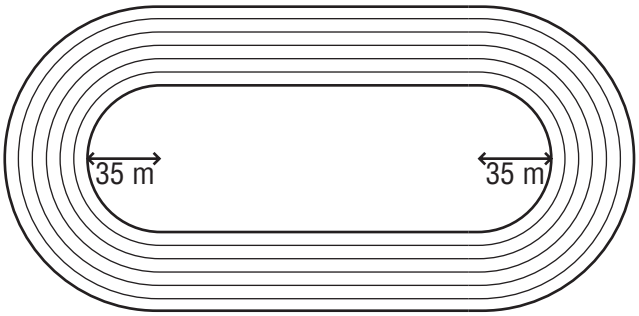
(d) angle *AXB*,

Answer (*d*) Angle *AXB* = ... [1]

(e) angle *CDB*.

Answer (*e*) Angle *CDB* = ... [1]

19



NOT TO SCALE

The diagram shows an athletics track with six lanes.
The distance around the inside of the inner lane is 400 metres.
The radius of each semicircular section of the inside of the inner lane is 35 metres.

(a) Calculate the total length of the two straight sections at the inside of the inner lane.

Answer(a) ..... m [3]

(b) Each lane is one metre wide.
Calculate the difference in the distances around the outside of the outer lane and the inside of the inner lane.

Answer(b) ..... m [2]

10 Quadrilaterals P and Q each have diagonals which

- are unequal,
- intersect at right angles.

P has two lines of symmetry. Q has one line of symmetry.

(a) **(i)** Sketch quadrilateral P.
Write down its geometrical name. [2]

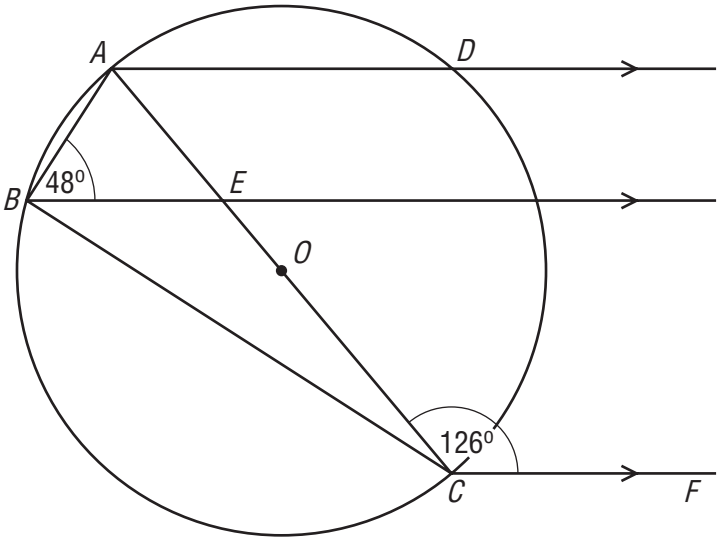
(ii) Sketch quadrilateral Q.
Write down its geometrical name. [2]

(b) In quadrilateral P, an angle between one diagonal and a side is $x°$.
Write down, in terms of x, the four angles of quadrilateral P. [2]

(c) The diagonals of quadrilateral Q have lengths 20 cm and 12 cm.
Calculate the area of quadrilateral Q. [2]

(d) Quadrilateral P has the same area as quadrilateral Q.
The lengths of the diagonals and sides of quadrilateral P are all integer values.
Find the length of a side of quadrilateral P. [3]

15



NOT TO SCALE

A, B, C and D lie on a circle centre O. AC is a diameter of the circle.
AD, BE and CF are parallel lines. Angle $ABE = 48°$ and angle $ACF = 126°$.
Find

(a) angle DAE,

Answer(a) Angle DAE = ... [1]

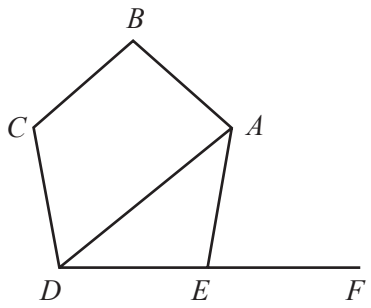
(b) angle EBC,

Answer(b) Angle EBC = ... [1]

(c) angle BAE.

Answer(c) Angle BAE = ... [1]

17



NOT TO SCALE

ABCDE is a regular pentagon.
DEF is a straight line.
Calculate

(a) angle *AEF*,

Answer(a) Angle *AEF* = ... [2]

(b) angle *DAE*.

Answer(b) Angle *DAE* = ... [1]

---

18 Simplify

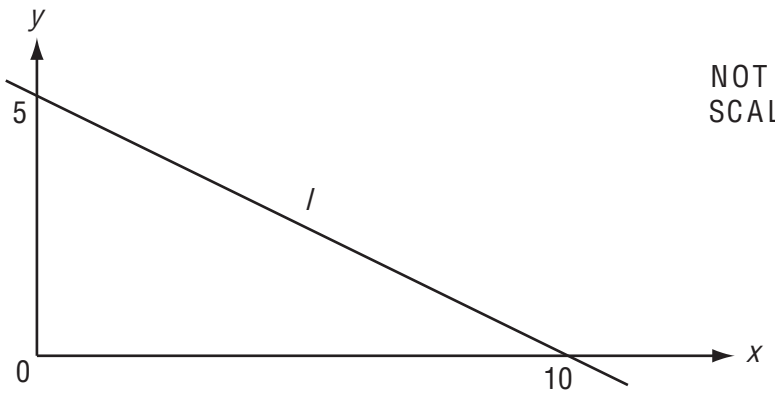
(a) $\left(\frac{x^{27}}{27}\right)^{\frac{2}{3}}$,

Answer(a) ..... [2]

(b) $\left(\frac{x^{-2}}{4}\right)^{-\frac{1}{2}}$.

Answer(b) ..... [2]

19



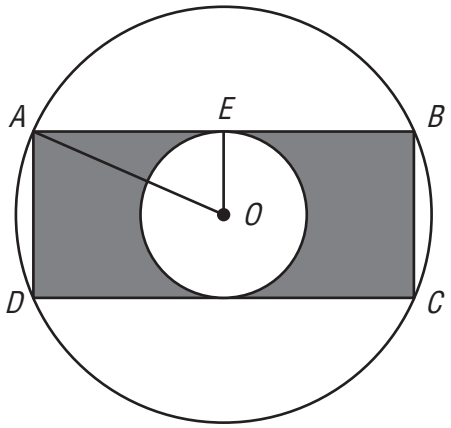
(a) Calculate the gradient of the line *l*.

Answer(a) ..... [2]

(b) Write down the equation of the line *l*.

Answer(b) ..... [2]

21



NOT TO SCALE

A,B,C and *D* lie on a circle, centre *O*, radius 8 cm.
AB and *CD* are tangents to a circle, centre *O*, radius 4 cm.
ABCD is a rectangle.

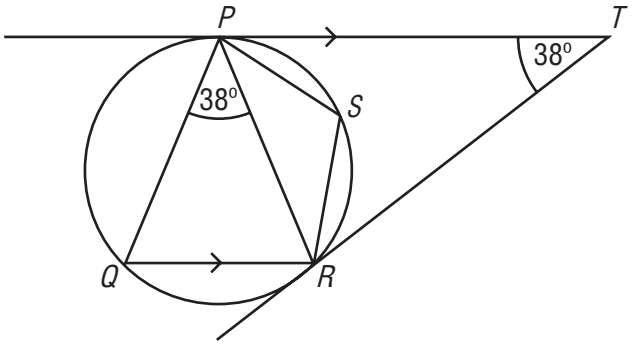
(a) Calculate the distance *AE*.

Answer(a) AE = ... cm [2]

(b) Calculate the shaded area.

Answer(b) ..... cm^2 [3]

12



In the diagram *PT* and *QR* are parallel. *TP* and *TR* are tangents to the circle *PQRS*.
Angle *PTR* = angle *RPQ* = 38°.

(a) What is the special name of triangle *TPR*. Give a reason for your answer.

Answer(a) name .....

reason ..... [1]

(b) Calculate

(i) angle *PQR*,

Answer(b)(i) Angle *PQR* = ... [1]

(ii) angle *PSR*.

Answer(b)(ii)Angle *PSR* = ... [1]

---

13 A statue two metres high has a volume of five cubic metres.
A similar model of the statue has a height of four centimetres.

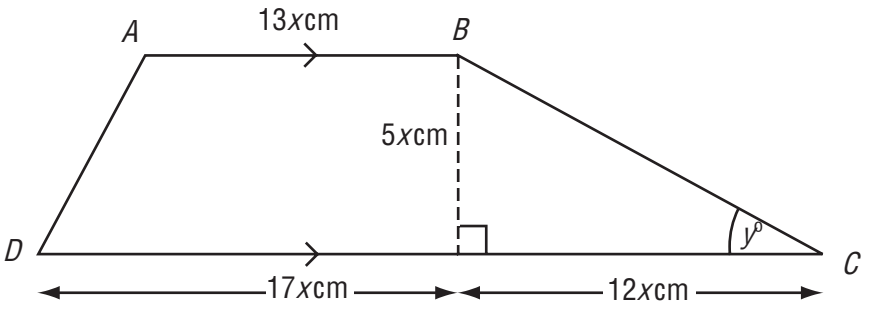
(a) Calculate the volume of the model statue in cubic centimetres.

Answer(a) ..... cm^3 [2]

(b) Write your answer to **part (a)** in cubic metres.

Answer(b) ..... m^3 [1]

16



ABCD is a trapezium.

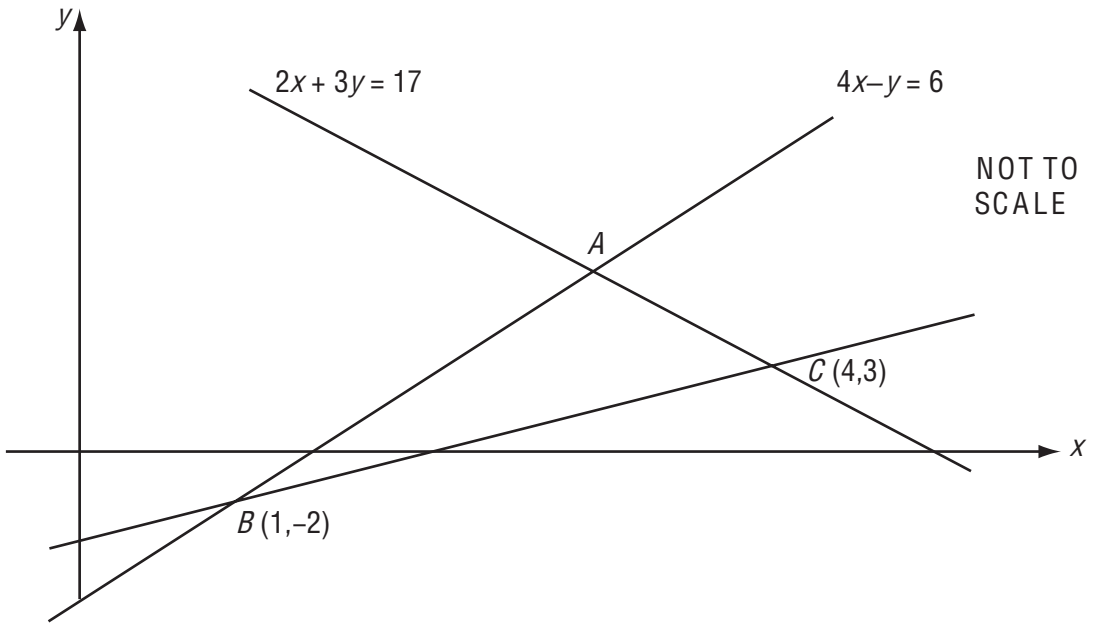
(a) Find the area of the trapezium in terms of x and simplify your answer.

Answer(a) ..... cm^2 [2]

(b) Angle $BCD = y°$. Calculate the value of y.

Answer(b) $y =$ ..... [2]

21



In the diagram, the line AC has equation $2x + 3y = 17$ and the line AB has equation $4x - y = 6$.
The lines BC and AB intersect at $B(1, -2)$.
The lines AC and BC intersect at $C(4, 3)$.

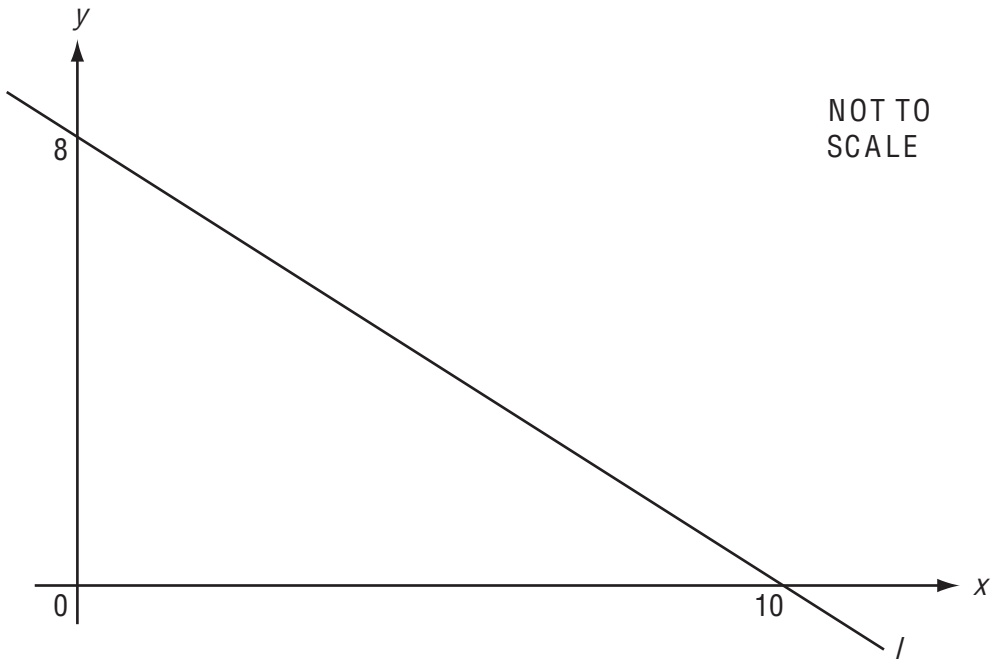
(a) Use algebra to find the coordinates of the point A.

Answer(a) ..... [3]

(b) Find the equation of the line BC.

Answer(b) ..... [3]

18



The line l passes through the points (10, 0) and (0, 8) as shown in the diagram.

(a) Find the gradient of the line as a fraction in its simplest form.

Answer(a) ..... [1]

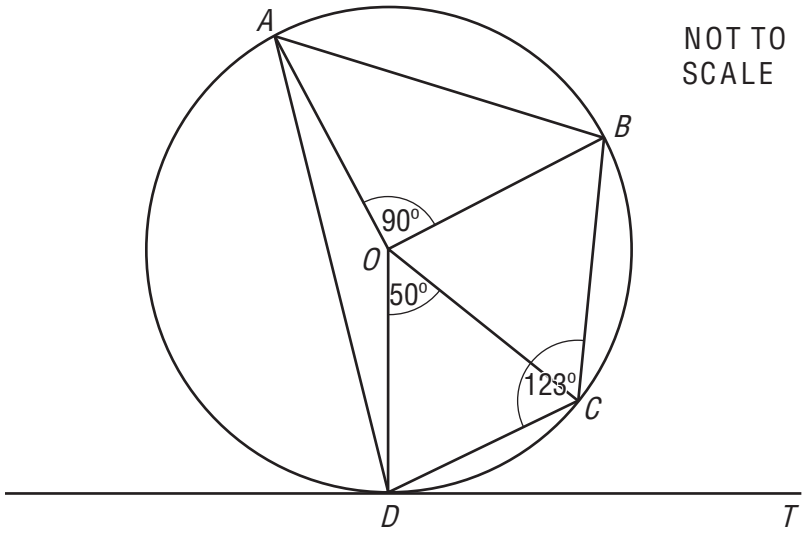
(b) **Write down** the equation of the line parallel to l which passes through the origin.

Answer(b) ..... [1]

(c) Find the equation of the line parallel to l which passes through the point (3, 1).

Answer(c) $y =$ ..... [2]

20



The points A, B, C and D lie on a circle centre O.
Angle $AOB = 90°$, angle $COD = 50°$ and angle $BCD = 123°$.
The line DT is a tangent to the circle at D.

Find

(a) angle OCD,

Answer(a) Angle OCD = ... [1]

(b) angle TDC,

Answer(b) Angle TDC = ... [1]

(c) angle ABC,

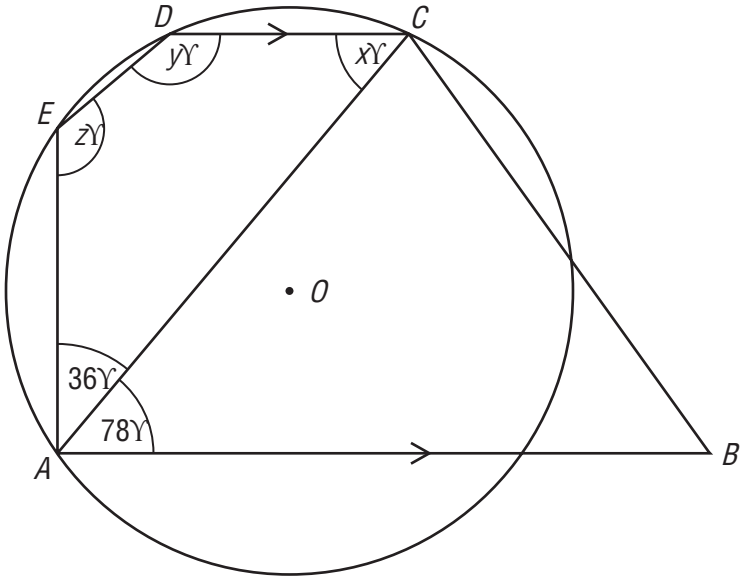
Answer(c) Angle ABC = ... [1]

(d) reflex angle AOC.

Answer(d) Angle AOC = ... [1]

8

NOT TO SCALE



ABCDE is a pentagon.
A circle, centre *O*, passes through the points *A*, *C*, *D* and *E*.
Angle *EAC* = 36°, angle *CAB* = 78° and *AB* is parallel to *DC*.

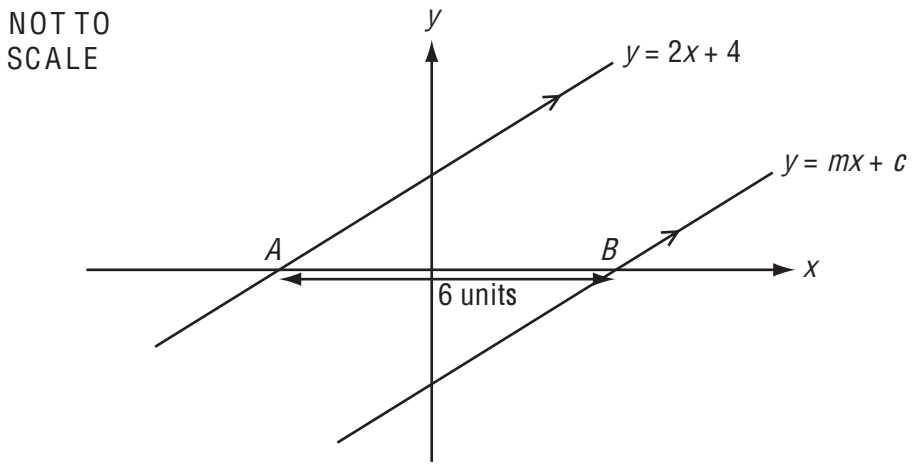
(a) Find the values of *x*, *y* and *z*, giving a reason for each. [6]

(b) Explain why *ED* is **not** parallel to *AC*. [1]

(c) Find the value of angle *EOC*. [1]

(d) *AB* = *AC*.
Find the value of angle *ABC*. [1]

18



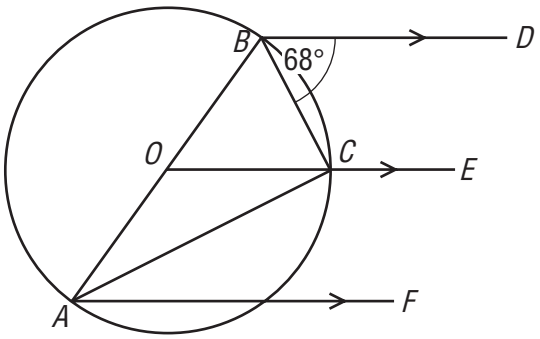
The line $y = mx + c$ is parallel to the line $y = 2x + 4$.
The distance AB is 6 units.

Find the value of m and the value of c.

Answer $m =$ ..... and $c =$ ..... [4]

19

NOT TO SCALE



Points A, B and C lie on a circle, centre O, with diameter AB.
BD, OCE and AF are parallel lines.
Angle $CBD = 68°$.

Calculate

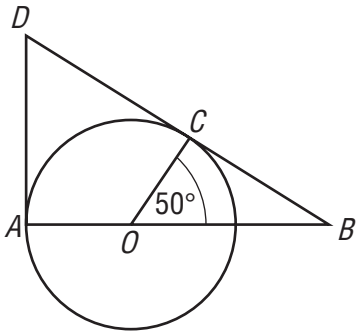
(a) angle BOC,

Answer(a) Angle BOC = ... [2]

(b) angle ACE.

Answer(b) Angle ACE = ... [2]

4



NOT TO SCALE

O is the centre of the circle.
DA is the tangent to the circle at *A* and *DB* is the tangent to the circle at *C*.
AOB is a straight line. Angle *COB* = 50°.
Calculate

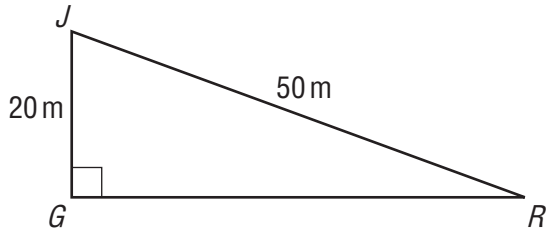
(a) angle *CBO*,

Answer(a) Angle *CBO* = ... [1]

(b) angle *DOC*.

Answer(b) Angle *DOC* = ... [1]

5



NOT TO SCALE

JGR is a right-angled triangle. *JR* = 50m and *JG* = 20m.
Calculate angle *JRG*.

Answer Angle *JRG* = ... [2]

---

6 Write 0.00658

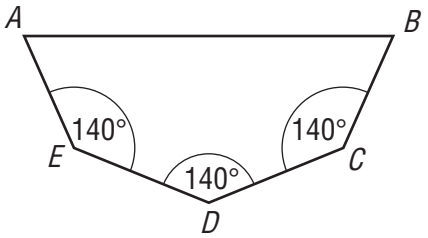
(a) in standard form,

Answer(a) ..... [1]

(b) correct to 2 significant figures.

Answer(b) ..... [1]

10

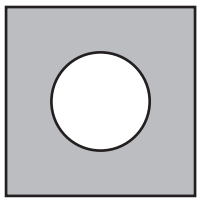


NOT TO SCALE

The pentagon has three angles which are each 140°.
The other two interior angles are equal.
Calculate the size of one of these angles.

Answer ..... [3]

13



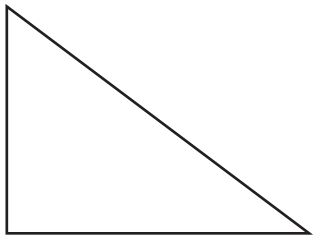
NOT TO SCALE

The diagram shows a circle of radius 5cm in a square of side 18cm.

Calculate the shaded area.

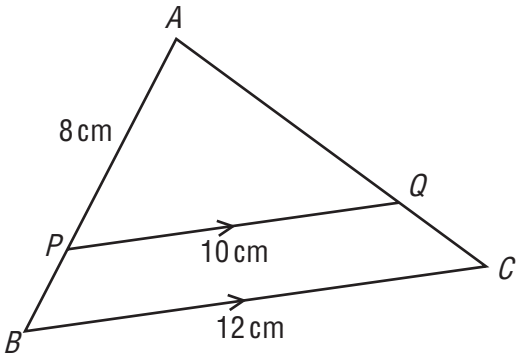
Answer ..... cm^2 [3]

14



Draw, accurately, the locus of all the points **outside** the triangle which are 3 centimetres away from the triangle. [3]

9

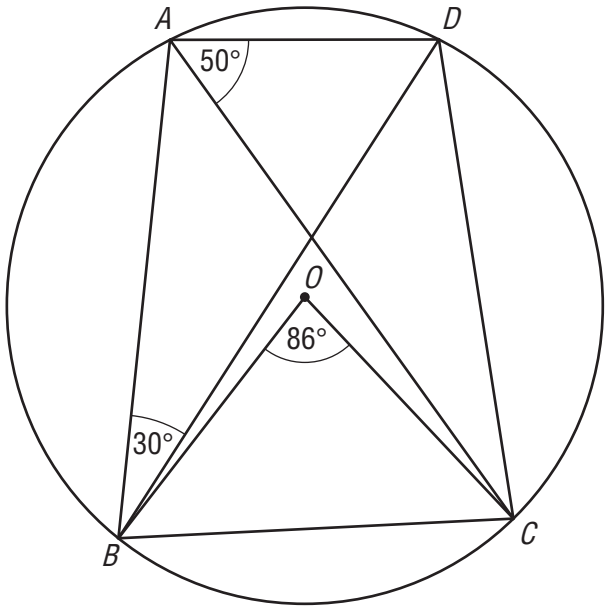


NOT TO SCALE

APB and *AQC* are straight lines. *PQ* is parallel to *BC*.
AP = 8 cm, *PQ* = 10 cm and *BC* = 12 cm.
Calculate the length of *AB*.

Answer AB = ... cm [2]

23



NOT TO SCALE

The points A, B, C and D lie on the circumference of the circle, centre O.

Angle $ABD = 30°$, angle $CAD = 50°$ and angle $BOC = 86°$.

(a) Give the reason why angle $DBC = 50°$.

Answer(a) ..... [1]

(b) Find

(i) angle ADC,

Answer(b)(i) Angle ADC = ... [1]

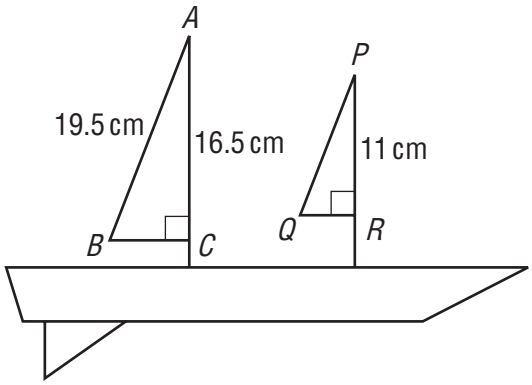
(ii) angle BDC,

Answer(b)(ii) Angle BDC = ... [1]

(iii) angle OBD.

Answer(b)(iii) Angle OBD = ... [2]

6 (a)



The diagram shows a toy boat.
$AC = 16.5$ cm, $AB = 19.5$ cm and $PR = 11$ cm.
Triangles ABC and PQR are **similar**.

(i) Calculate PQ.

Answer(a)(i) $PQ =$ ..... cm [2]

(ii) Calculate BC.

Answer(a)(ii) $BC =$ ..... cm [3]

(iii) Calculate angle ABC.

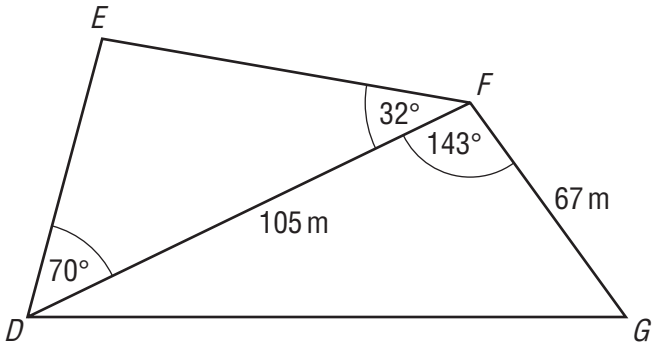
Answer(a)(iii) Angle $ABC =$ ..... [2]

(iv) The toy boat is mathematically similar to a real boat.
The length of the real boat is 32 times the length of the toy boat.
The fuel tank in the toy boat holds 0.02 litres of diesel.

Calculate how many litres of diesel the fuel tank of the real boat holds.

Answer(a)(iv) ..... litres [2]

(b)



NOT TO SCALE

The diagram shows a field *DEFG*, in the shape of a quadrilateral, with a footpath along the diagonal *DF*.
DF = 105 m and *FG* = 67 m.
Angle *EDF* = 70°, angle *EFD* = 32° and angle *DFG* = 143°.

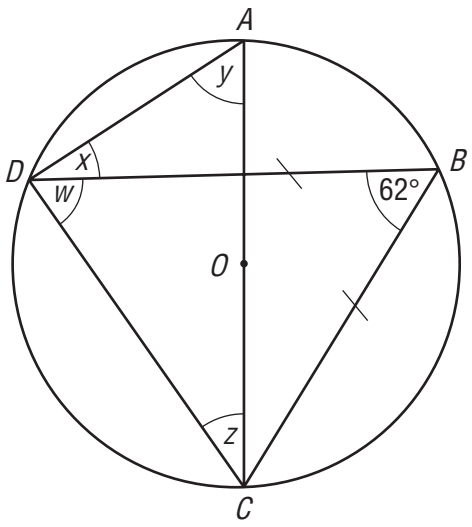
(i) Calculate *DG*.

Answer(b)(i) *DG* = ... m [4]

(ii) Calculate *EF*.

Answer(b)(ii) *EF* = ... m [4]

7 (a)



NOT TO SCALE

A, *B*, *C* and *D* are points on the circumference of a circle centre *O*.
AC is a diameter.
BD = *BC* and angle *DBC* = 62°.

Work out the values of *w*, *x*, *y* and *z*.
Give a reason for each of your answers.

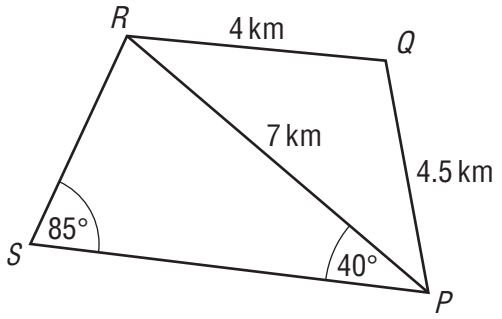
w = ... because ..... [2]

x = ... because ..... [2]

y = ... because ..... [2]

z = ... because ..... [2]

2



NOT TO SCALE

The diagram shows five straight roads.
$PQ = 4.5$ km, $QR = 4$ km and $PR = 7$ km.
Angle $RPS = 40°$ and angle $PSR = 85°$.

(a) Calculate angle PQR and show that it rounds to 110.7°.

Answer(a)

[4]

(b) Calculate the length of the road RS and show that it rounds to 4.52 km.

Answer(b)

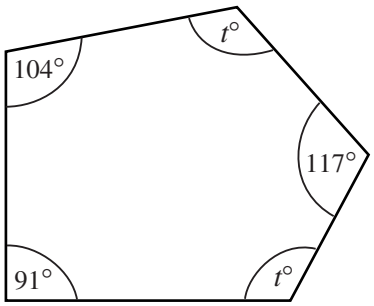
[3]

(c) Calculate the area of the quadrilateral $PQRS$.
[Use the value of 110.7° for angle PQR and the value of 4.52 km for RS.]

Answer(c) ..... km^2 [5]

9

NOT TO SCALE



In the pentagon the two angles labelled $t°$ are equal.
Calculate the value of t.

Answer t = ... [3]