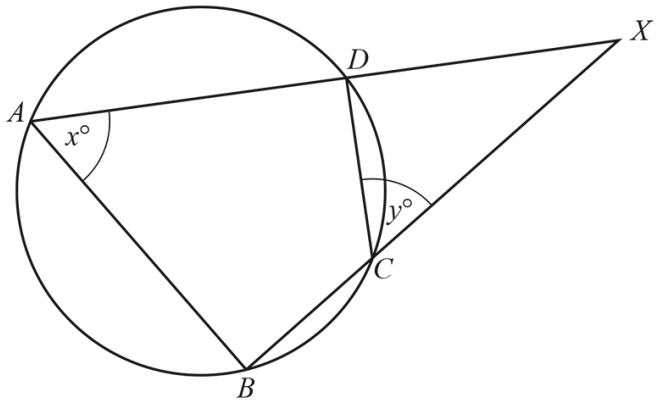
Chapter 4

Geometry

01. 0580_m24_qp_42 Q: 2



NOT TO SCALE

A, B, C and D are points on a circle.
ADX and BCX are straight lines.
Angle $BAD = x°$ and angle $DCX = y°$.

(a) Explain why $x = y$.
Give a geometrical reason for each statement you make.

[2]

(b) Show that triangle ABX is similar to triangle CDX.

[2]

(c) $AD = 15\,\text{cm}$, $DX = 9\,\text{cm}$ and $CX = 12\,\text{cm}$.

(i) Find BC.

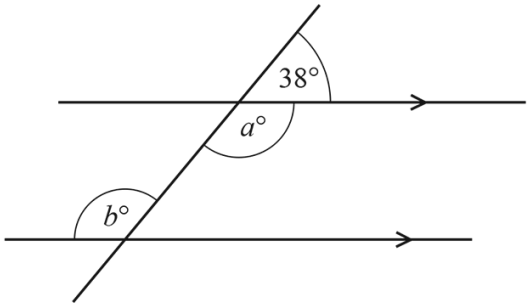
$BC =$ ..... cm [3]

(ii) Complete the statement.

The ratio area of triangle ABX : area of triangle CDX = ... : 1. [1]

02. 0580_s24_qp_42 Q: 2

(a)



NOT TO SCALE

The diagram shows a straight line intersecting two parallel lines.

Find the value of a and the value of b.

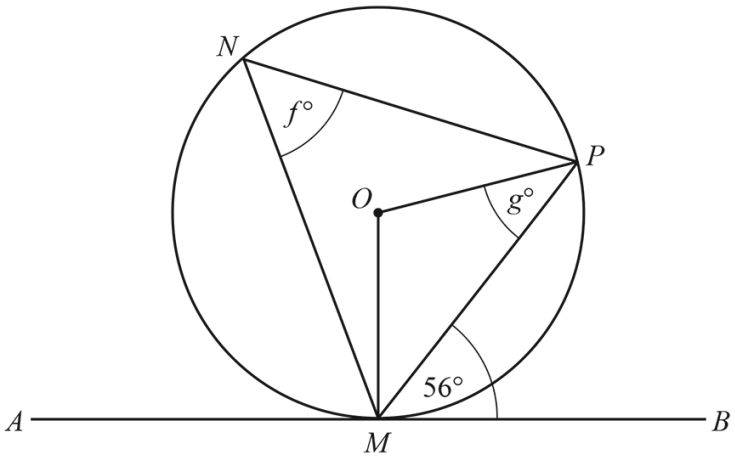
$a =$ .....

$b =$ ..... [2]

(b) Calculate the interior angle of a regular 12-sided polygon.

..... [2]

(c)



NOT TO SCALE

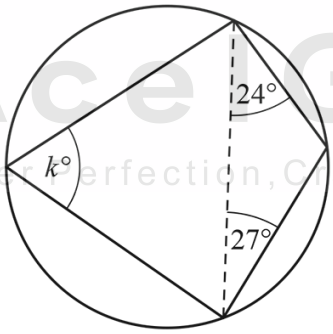
The diagram shows a circle, centre O.
The points M, N and P lie on the circumference of the circle.
AMB is a tangent to the circle at M.

Find the value of f and the value of g.

$f =$ .....

$g =$ ..... [3]

(d)



NOT TO SCALE

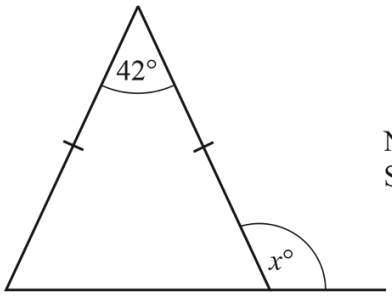
The diagram shows a cyclic quadrilateral.

Find the value of k.

$k =$ ..... [2]

03. 0580_s23_qp_42 Q: 1

(a)



NOT TO SCALE

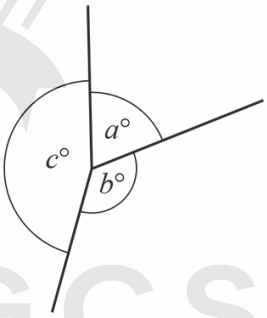
The diagram shows an isosceles triangle with the base extended.

Find the value of x.

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

(b) The diagram shows three lines meeting at a point.
The ratio $a : b : c = 3 : 4 : 5$.

Find the value of c.



NOT TO SCALE

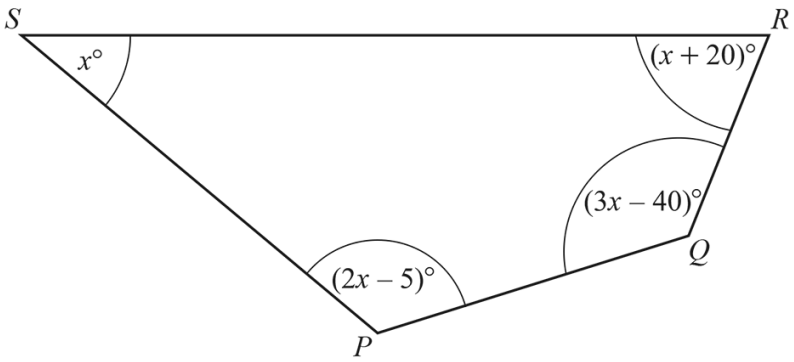
$c =$ ..... [3]

(c) A regular pentagon has an exterior angle, d.
A regular hexagon has an interior angle, h.

Find the fraction $\frac{d}{h}$.
Give your answer in its simplest form.

..... [4]

(d)

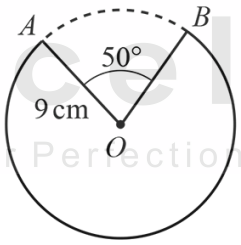


NOT TO SCALE

Show that *PQRS* is a cyclic quadrilateral.

[5]

(e)



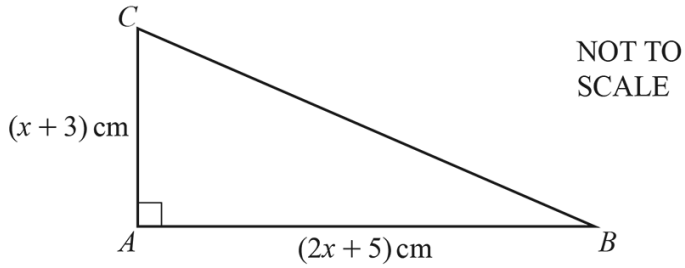
NOT TO SCALE

The diagram shows a circle of radius 9 cm, centre *O*.
The minor sector *AOB*, with sector angle 50°, is removed from the circle.

Calculate the length of the major arc *AB*.

..... cm [3]

04. 0580_s23_qp_42 Q: 3



The diagram shows a right-angled triangle ABC.

(a) (i) The area of the triangle is $60\,\text{cm}^2$.

Show that $2x^2 + 11x - 105 = 0$.

[3]

(ii) Solve by factorisation.

$2x^2 + 11x - 105 = 0$

$x =$ ..... or $x =$ ..... [3]

(iii) Calculate angle ACB.

..... [3]

(b) Triangle ABC is similar to triangle DEF.
Triangle DEF has an area of $93.75\,\text{cm}^2$.

(i) Find the size of the smallest angle of triangle DEF.

..... [1]

(ii) Find the length of the shortest side of triangle DEF.

..... cm [3]

05. 0580_s23_qp_43 Q: 3

(a) The scale drawing shows two sides, AB and BC, of a field.
The scale is 5 centimetres represents 200 metres.

Scale: 5 cm to 200 m

(i) Measure angle ABC.

Angle ABC = ... [1]

(ii) X is a point on BC.
$BX = 332$ m.

Mark the point X on the diagram. [2]

(iii) Find the scale in the form 1 : n.

1: ..... [2]

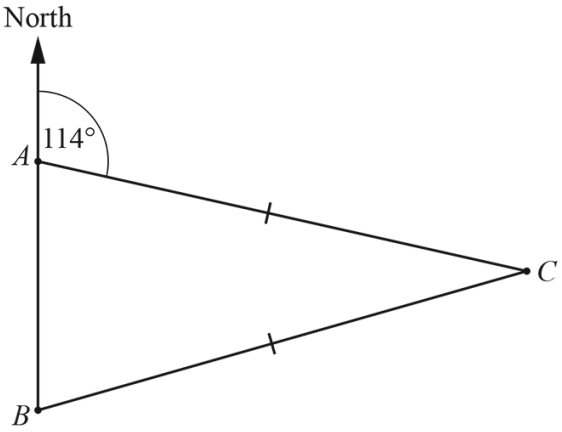
(b) A bronze statue is 4.5 m high and has a mass of 195 200 kg.
The density of bronze is 8000 kg / m^3.
The volume of a mathematically similar model of the statue is 0.385 m^3.

Calculate the height of the model.
[Density = Mass ÷ Volume]

..... m [5]

06. 0580_s23_qp_43 Q: 4

(a)



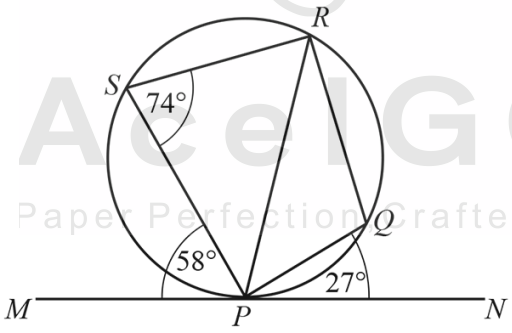
NOT TO SCALE

A, B and C are three towns and the bearing of C from A is 114°.
B is due south of A and $AC = BC$.

Calculate the bearing of B from C.

..... [3]

(b)



NOT TO SCALE

P, Q, R and S lie on a circle.
MPN is a tangent to the circle at P.
Angle $MPS = 58°$, angle $PSR = 74°$ and angle $QPN = 27°$.

(i) Find angle PRS.

Angle PRS = ... [1]

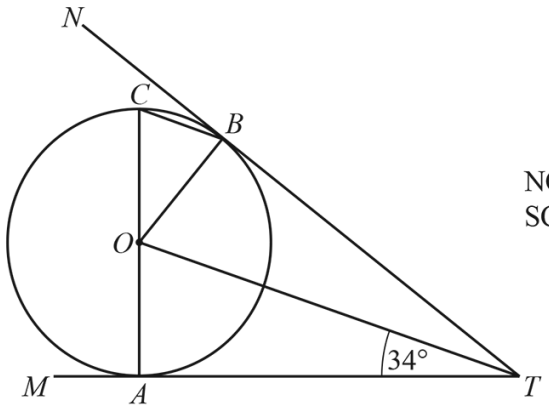
(ii) Find angle PQR.

Angle PQR = ... [1]

(iii) Find angle RPQ.

Angle RPQ = ... [2]

(c)



NOT TO SCALE

A, B and C lie on a circle, centre O, with diameter AC.
TAM and TBN are tangents to the circle and angle $ATO = 34°$.

Using values and geometrical reasons, complete these statements to show that CB is parallel to OT.

In triangles AOT and BOT, OT is common.
Angle OAT = angle OBT = 90° because .....

.....

$AT = BT$ because .....

.....

Triangle AOT is congruent to triangle BOT because of congruence criterion .....

Angle AOT = angle BOT = 56° because angles in a triangle add up to 180°.

Angle BOC = ... ° because .....

Angle OBC = ... ° because .....

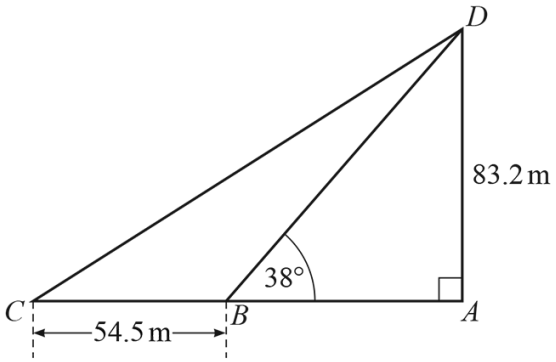
.....

CB is parallel to OT because .....

[6]

07. 0580_w23_qp_41 Q: 5

(a)



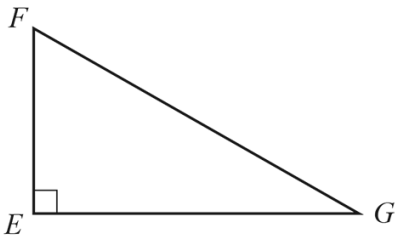
NOT TO SCALE

ACD is a right-angled triangle.
B is on *AC* and *BC* = 54.5 m.
AD = 83.2 m and angle *ABD* = 38°.

Calculate angle *ACD*.

Angle *ACD* = ... [5]

(b)



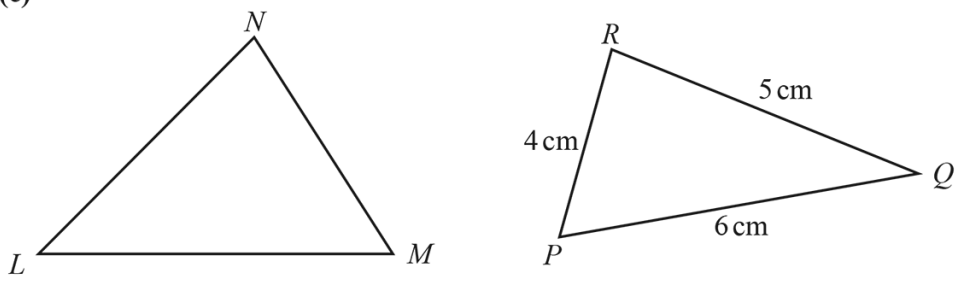
EFG is a right-angled triangle.
A circle can be drawn that passes through the three vertices of the triangle.

On the diagram, mark the position of the centre of the circle with a cross.
Explain how you decide.

.....

..... [2]

(c)



NOT TO SCALE

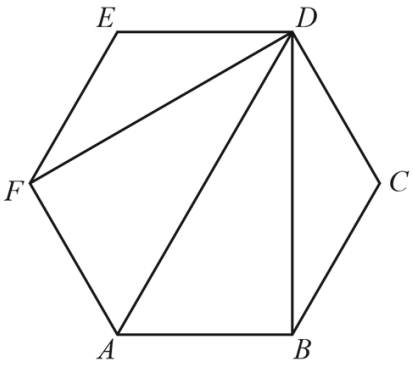
In triangle LMN, the ratio angle L : angle M : angle $N = 4 : 5 : 6$.
In triangle PQR, $PQ = 6\,\text{cm}$, $PR = 4\,\text{cm}$ and $QR = 5\,\text{cm}$.

Calculate the difference between the largest angle in triangle PQR and the largest angle in triangle LMN.

..... [7]

08. 0580_w23_qp_42 Q: 10

(a)



NOT TO SCALE

ABCDEF is a regular hexagon.
DF, *DA* and *DB* are diagonals.

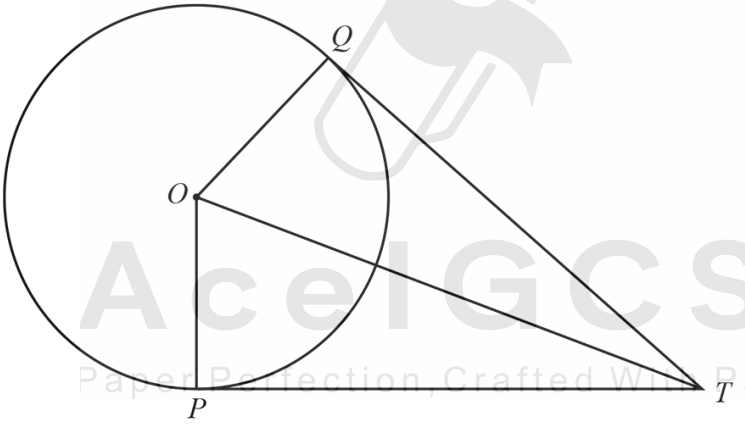
Complete the following statements using three different triangles.

Triangle *DEF* is congruent to triangle .....

Triangle ..... is congruent to triangle .....

[2]

(b)



NOT TO SCALE

P and *Q* are points on the circle with centre *O*.
TP and *TQ* are tangents to the circle from the point *T*.

Complete the following statements and reasons.

In triangles *OPT* and *OQT*

OP = ... because each is a radius of the circle

OT is a common side

Angle *OPT* = angle ..... = 90° because .....

Triangles *OPT* and *OQT* are congruent using the criterion .....

This proves that the tangents *TP* and *TQ* are .....

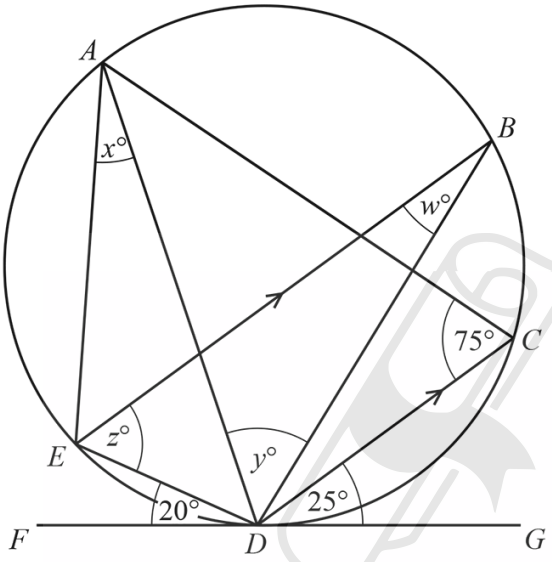
[5]

09. 0580_w23_qp_43 Q: 4

(a) Find the size of one interior angle of a regular 10-sided polygon.

..... [2]

(b)



NOT TO SCALE

The points A, B, C, D and E lie on a circle.
FG is a tangent to the circle at D.
EB is parallel to DC.

Find the value of each of w, x, y and z.

$w =$ .....

$x =$ .....

$y =$ .....

$z =$ ..... [5]

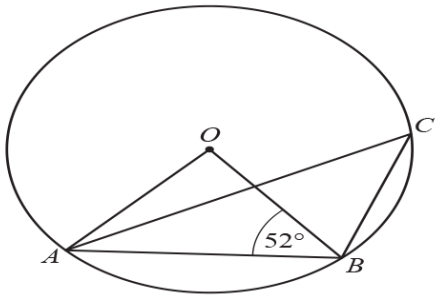
10. 0580_m22_qp_42 Q: 6

(a) The interior angle of a regular polygon is 156°.

Calculate the number of sides of this polygon.

..... [2]

(b)

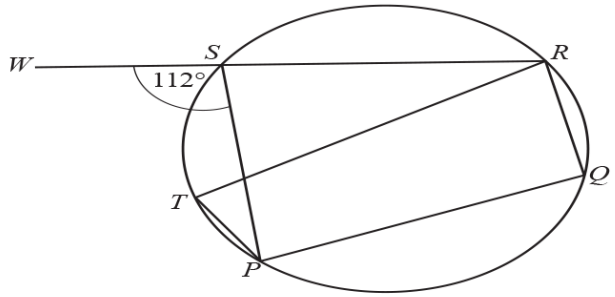


A, B and C lie on a circle, centre O.
Angle $OBA = 52°$.

Calculate angle ACB.

Angle ACB = ... [2]

(c)

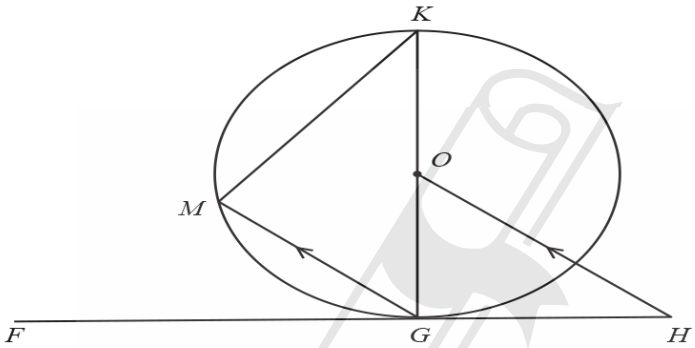


P, Q, R, S and T lie on a circle.
WSR is a straight line and angle $WSP = 112°$.

Calculate angle PTR.

Angle PTR = ... [2]

(d)



G, K and M lie on a circle, centre O.
FGH is a tangent to the circle at G and MG is parallel to OH.

Show that triangle GKM is mathematically similar to triangle OHG.
Give a geometrical reason for each statement you make.

.....

.....

.....

.....

..... [4]

11. 0580_m22_qp_42 Q: 7

Two rectangular picture frames are mathematically similar.

(a) The areas of the frames are 350 cm^2 and 1134 cm^2.
The width of the smaller frame is 17.5 cm.

Calculate the width of the larger frame.

..... cm [3]

(b) A picture in the smaller frame has length 15 cm and width 10.5 cm, both correct to the nearest 5 mm.

Calculate the upper bound for the area of this picture.

..... cm^2 [2]

(c) In a sale, the price of a large frame is reduced by 18%.
Parthi pays $166.05 for 5 large frames in the sale.

Calculate the original price of one large frame.

$ ..... [2]

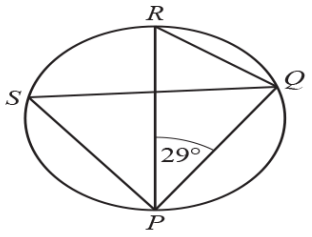
(d) Parthi advertises a large frame for a price of $57 or 48.20 euros.
The exchange rate is $1= 0.88 euros.

Calculate the difference between these prices, in dollars and cents, correct to the nearest cent.

$ ..... [3]

12. 0580_s22_qp_42 Q: 2

(a)



The points P, Q, R and S lie on a circle with diameter PR.

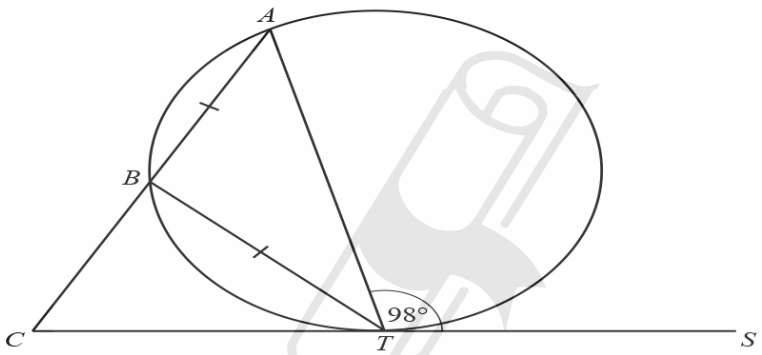
Work out the size of angle PSQ, giving a geometrical reason for each step of your working.

.....

.....

..... [3]

(b)



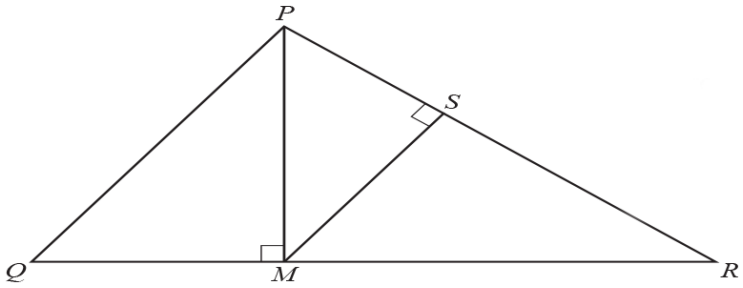
The points A, B and T lie on a circle and CTS is a tangent to the circle at T.
ABC is a straight line and $AB = BT$.
Angle $ATS = 98°$.

Work out the size of angle ACT.

Angle $ACT =$ ..... [4]

13. 0580_s22_qp_42 Q: 9

(a)



In triangle PQR, M lies on QR and S lies on PR.

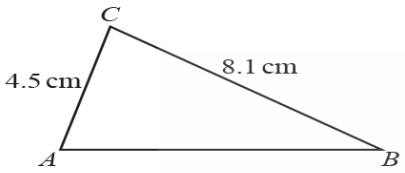
Explain, giving reasons, why triangle PMR is similar to triangle MSR.

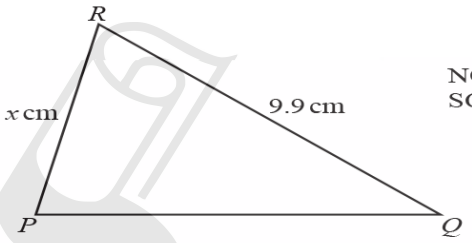
.....

.....

..... [3]

(b)





NOT TO SCALE

Triangle ABC is similar to triangle PQR.

(i) Find the value of x.

$x =$ ..... [2]

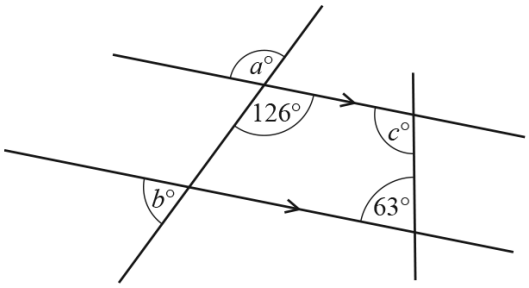
(ii) The area of triangle PQR is $25\,\text{cm}^2$.

Calculate the area of triangle ABC.

..... cm^2 [2]

14. 0580_m21_qp_42 Q: 3

(a)



NOT TO SCALE

The diagram shows two straight lines intersecting two parallel lines.

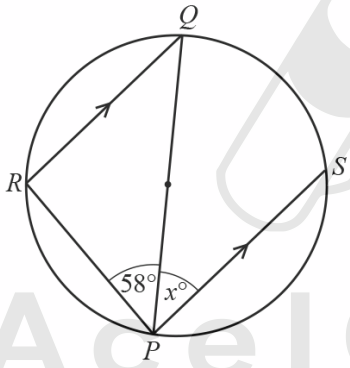
Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [3]

(b)



NOT TO SCALE

Points R and S lie on a circle with diameter PQ.
RQ is parallel to PS.
Angle $RPQ = 58°$.

Find the value of x, giving a geometrical reason for each stage of your working.

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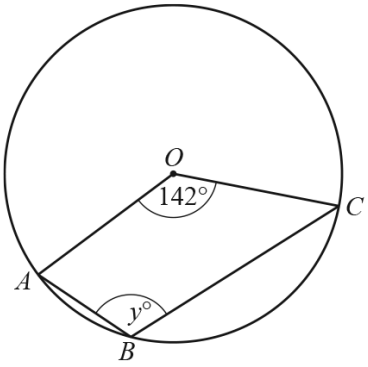
.....

.....

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

(c)



NOT TO SCALE

Points A, B and C lie on a circle, centre O.
Angle $AOC = 142°$.

Find the value of y.

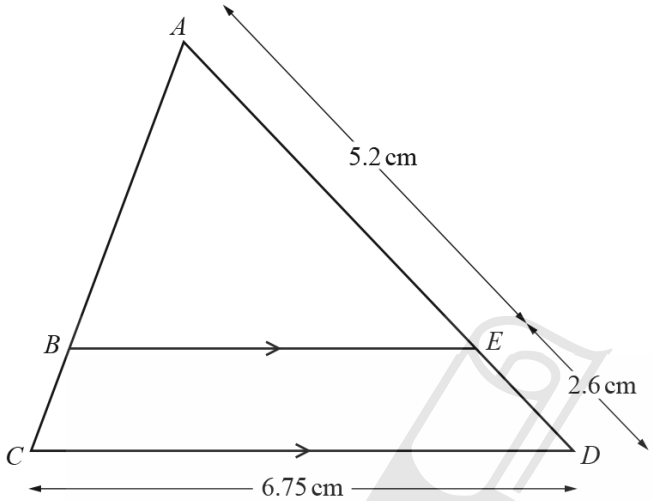
$y =$ ..... [2]

15. 0580_s21_qp_41 Q: 11

(a) Find the size of an exterior angle of a regular polygon with 18 sides.

..... [2]

(b)



In triangle ACD, B lies on AC and E lies on AD such that BE is parallel to CD.
$AE = 5.2$ cm and $ED = 2.6$ cm.

Calculate BE.

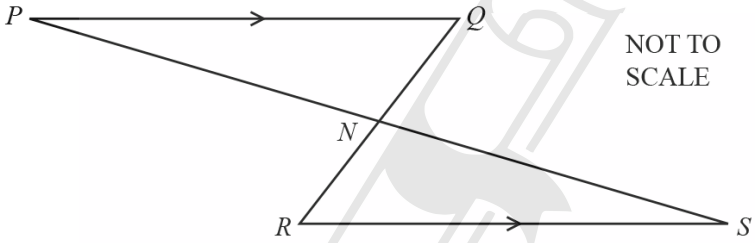
$BE =$ ..... cm [2]

(c) Two solids are mathematically similar.
The smaller solid has height 2 cm and volume 32 cm^3.
The larger solid has volume 780 cm^3.

Calculate the height of the larger solid.

..... cm [3]

(d)



PQ is parallel to *RS*, *PNS* is a straight line and *N* is the midpoint of *RQ*.

Explain, giving reasons, why triangle *PQN* is congruent to triangle *SRN*.

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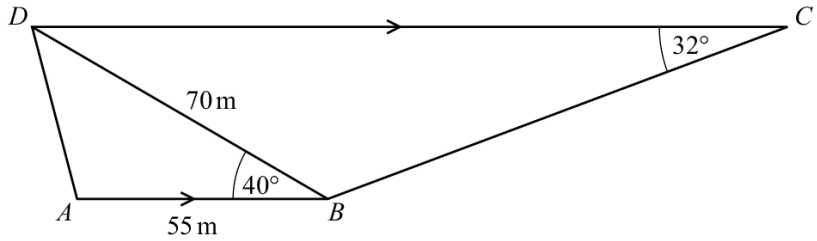
.....

..... [4]

16. 0580_p20_qp_40 Q: 9



NOT TO SCALE

The diagram shows a trapezium $ABCD$.
AB is parallel to DC.
$AB = 55$ m, $BD = 70$ m, angle $ABD = 40°$ and angle $BCD = 32°$.

(a) Calculate AD.

$AD =$ ..... m [4]

(b) Calculate BC.

$BC =$ ..... m [4]

(c) Calculate the area of $ABCD$.

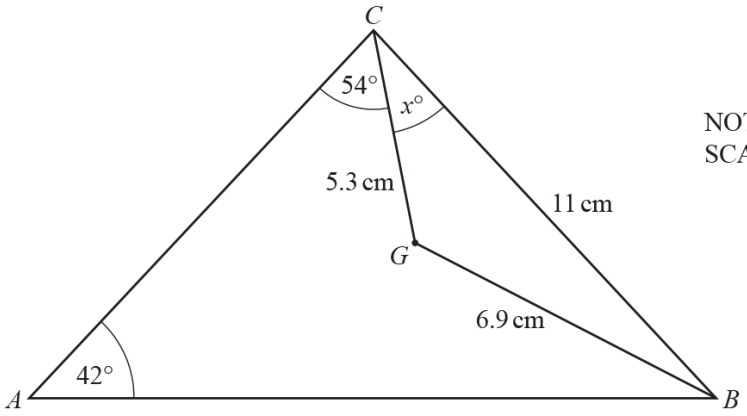
..... m^2 [3]

(d) Calculate the shortest distance from A to BD.

..... m [2]

17. 0580_s20_qp_43 Q: 6

(a)



The diagram shows triangle ABC with point G inside.
$CB = 11$ cm, $CG = 5.3$ cm and $BG = 6.9$ cm.
Angle $CAB = 42°$ and angle $ACG = 54°$.

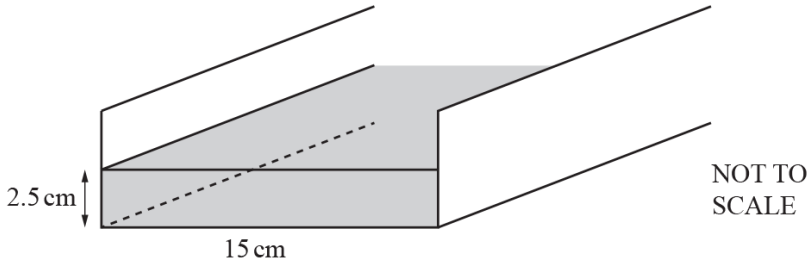
(i) Calculate the value of x.

$x =$ ..... [4]

(ii) Calculate AC.

$AC =$ ..... cm [4]

(b)



Water flows at a speed of 20 cm/s along a rectangular channel into a lake.
The width of the channel is 15 cm.
The depth of the water is 2.5 cm.

Calculate the amount of water that flows from the channel into the lake in 1 hour.
Give your answer in litres.

..... litres [4]

18. 0580_s20_qp_43 Q: 8

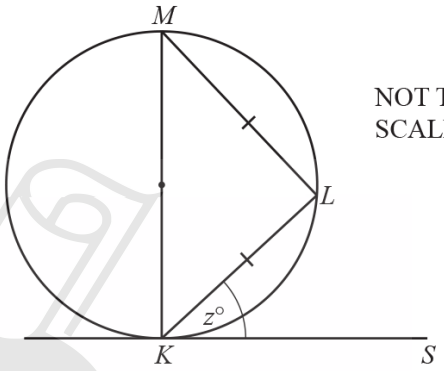
(a) The interior angle of a regular polygon with n sides is 150°.

Calculate the value of n.

$n =$ ..... [2]

(b) **(i)** K, L and M are points on the circle.
KS is a tangent to the circle at K.
KM is a diameter and
triangle KLM is isosceles.

Find the value of z.

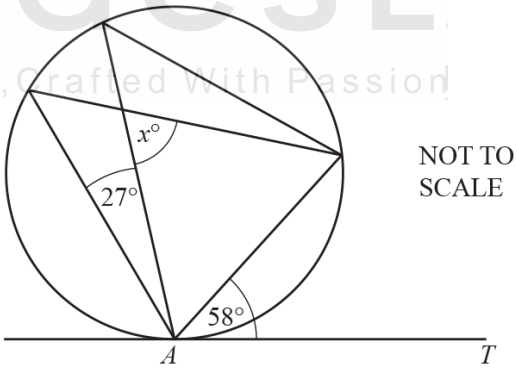


NOT TO SCALE

$z =$ ..... [2]

(ii) AT is a tangent to the circle at A.

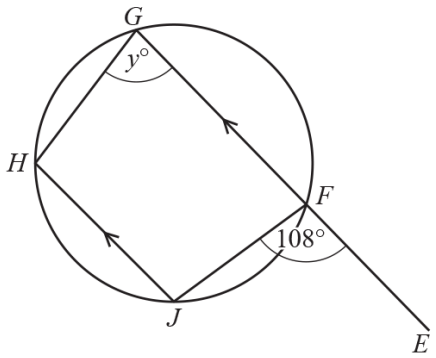
Find the value of x.



NOT TO SCALE

$x =$ ..... [2]

(iii)



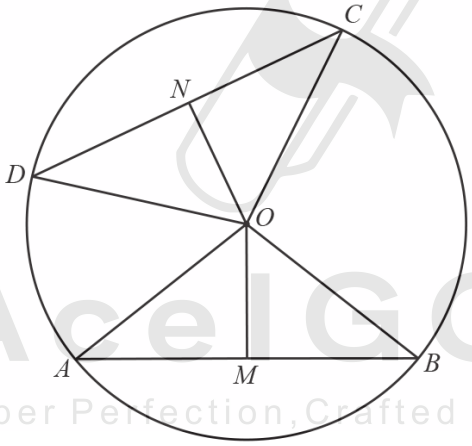
NOT TO SCALE

F, G, H and J are points on the circle.
EFG is a straight line parallel to JH.

Find the value of y.

$y =$ ..... [2]

(c)



NOT TO SCALE

A, B, C and D are points on the circle, centre O.
M is the midpoint of AB and N is the midpoint of CD.
$OM = ON$

Explain, giving reasons, why triangle OAB is congruent to triangle OCD.

.....

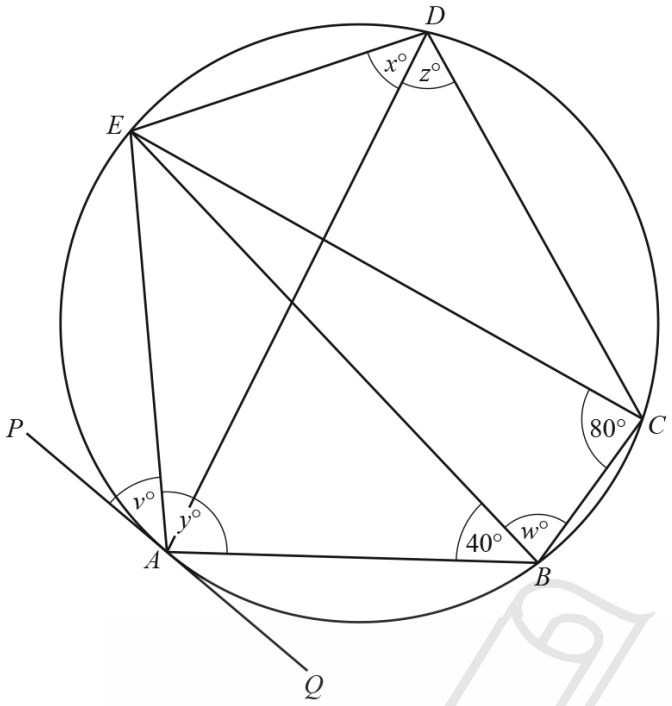
.....

.....

..... [3]

19. 0580_w20_qp_42 Q: 8

(a)

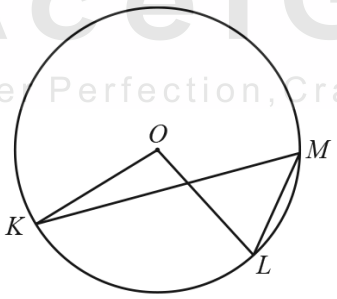


The points A, B, C, D and E lie on the circle.
PAQ is a tangent to the circle at A and $EC = EB$.
Angle $ECB = 80°$ and angle $ABE = 40°$.

Find the values of v, w, x, y and z.

$v =$ ..... $w =$ ..... $x =$ ..... $y =$ ..... $z =$ ..... [5]

(b)

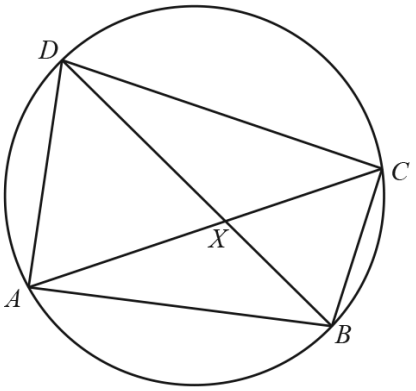


In the diagram, K, L and M lie on the circle, centre O.
Angle $KML = 2x°$ and reflex angle $KOL = 11x°$.

Find the value of x.

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

(c)



NOT TO SCALE

The diagonals of the cyclic quadrilateral $ABCD$ intersect at X.

(i) Explain why triangle ADX is similar to triangle BCX.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

(ii) $AD = 10\,\text{cm}$, $BC = 8\,\text{cm}$, $BX = 5\,\text{cm}$ and $CX = 7\,\text{cm}$.

(a) Calculate DX.

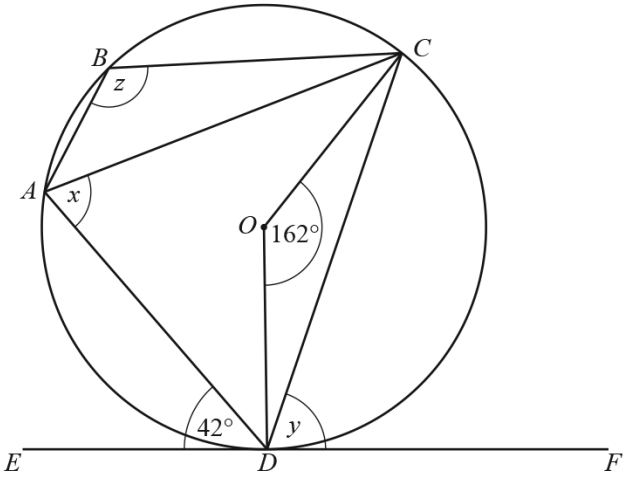
$DX =$ ..... cm [2]

(b) Calculate angle BXC.

Angle $BXC =$ ..... [4]

20. 0580_w20_qp_43 Q: 5

(a)



NOT TO SCALE

A, B, C and D are points on the circle, centre O.
EF is a tangent to the circle at D.
Angle $ADE = 42°$ and angle $COD = 162°$.

Find the following angles, giving reasons for each of your answers.

(i) Angle x

$x =$ ..... because .....

..... [2]

(ii) Angle y

$y =$ ..... because .....

..... [2]

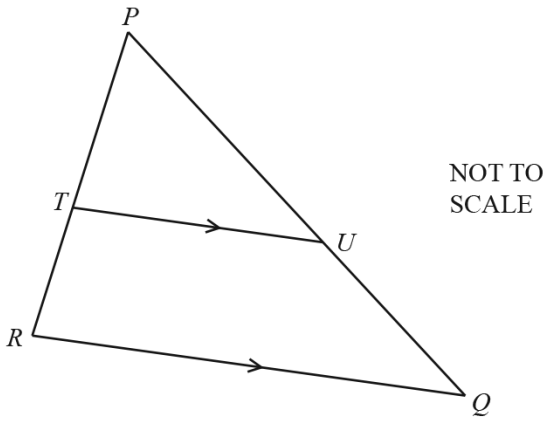
(iii) Angle z

$z =$ ..... because .....

.....

..... [3]

(b)



PQR is a triangle.
T is a point on *PR* and *U* is a point on *PQ*.
RQ is parallel to *TU*.

(i) Explain why triangle *PQR* is similar to triangle *PUT*.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

(ii) $PT : TR = 4 : 3$

(a) Find the ratio $PU : PQ$.

..... : ..... [1]

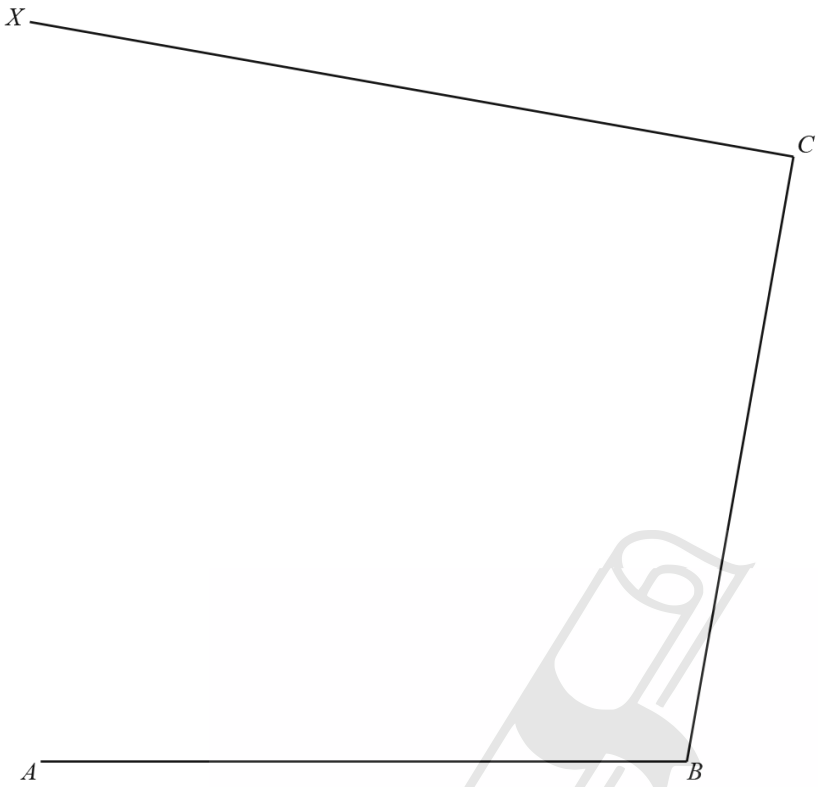
(b) The area of triangle *PUT* is $20\,cm^2$.

Find the area of the quadrilateral *QRTU*.

..... cm^2 [3]

21. 0580_m19_qp_42 Q: 4

The diagram shows an incomplete scale drawing of a market place, $ABCD$, where D is on CX.
The scale is 1 centimetre represents 5 metres.



Scale : 1 cm to 5 m

D lies on CX such that angle $DAB = 75°$.

(a) On the diagram, draw the line AD and mark the position of D. [2]

(b) Find the actual length of the side BC of the market place.

..... m [2]

(c) In this part, use a ruler and compasses only.

Street sellers are allowed in the part of the market place that is

- more than 35 metres from A

and

- nearer to C than to B

and

- nearer to CD than to BC.

On the diagram, construct and shade the region where street sellers are allowed. [7]

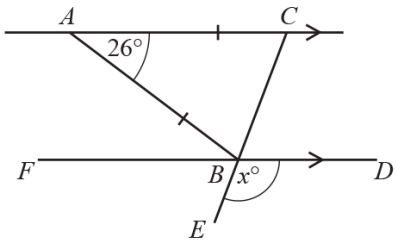
(d) Write the scale of the drawing in the form $1 : n$.

1 : ..... [1]

---

22. 0580_s19_qp_42 Q: 2

(a)



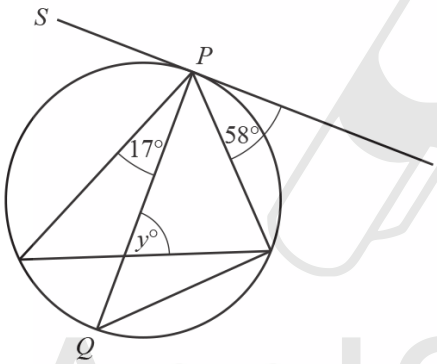
NOT TO SCALE

AC is parallel to FBD, ABC is an isosceles triangle and CBE is a straight line.

Find the value of x.

x = ... [3]

(b)



NOT TO SCALE

The diagram shows a circle with diameter PQ.
SPT is a tangent to the circle at P.

Find the value of y.

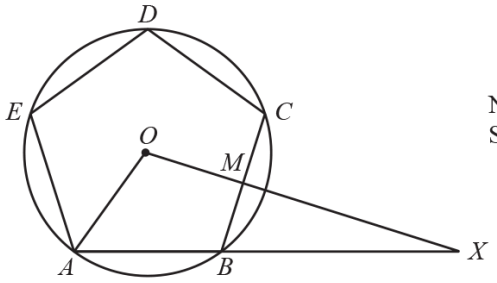
y = ... [5]

23. 0580_s19_qp_42 Q: 7

(a) Show that each interior angle of a regular pentagon is 108°.

[2]

(b)



NOT TO SCALE

The diagram shows a regular pentagon $ABCDE$.
The vertices of the pentagon lie on a circle, centre O, radius 12 cm.
M is the midpoint of BC.

(i) Find BM.

$BM =$ ..... cm [3]

(ii) OMX and ABX are straight lines.

(a) Find BX.

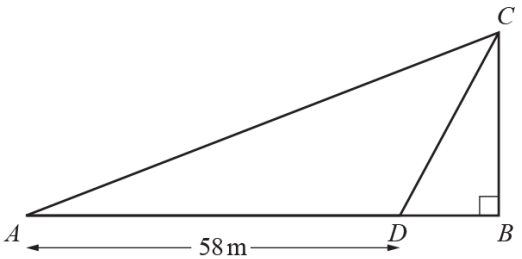
$BX =$ ..... cm [3]

(b) Calculate the area of triangle AOX.

..... cm^2 [3]

24. 0580_s19_qp_43 Q: 9

(a)



NOT TO SCALE

In the diagram, BC is a vertical wall standing on horizontal ground AB.
D is the point on AB where $AD = 58$ m.
The angle of elevation of C from A is 26°.
The angle of elevation of C from D is 72°.

(i) Show that $AC = 76.7$ m, correct to 1 decimal place.

[5]

(ii) Calculate BD.

$BD =$ ..... m [3]

(b) Triangle EFG has an area of $70\,m^2$.
$EF : FG = 1 : 2$ and angle $EFG = 40°$.

(i) Calculate EF.

$EF =$ ..... m [4]

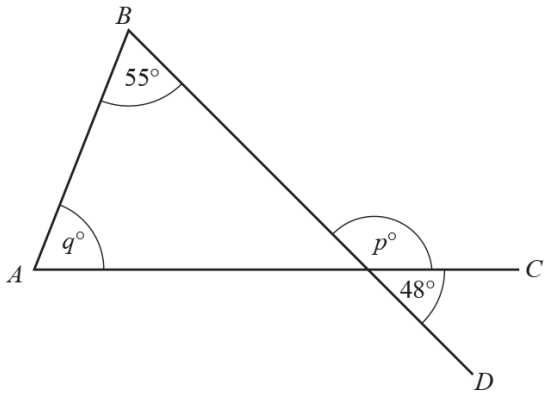
(ii) A **different** triangle PQR also has an area of $70\,m^2$.
$PQ : QR = 1 : 2$ and $PQ = EF$.

Find angle PQR.

Angle $PQR =$ ..... [1]

25. 0580_w19_qp_41 Q: 1

(a)



NOT TO SCALE

In the diagram, AC and BD are straight lines.

Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [3]

(b) The angles of a quadrilateral are $x°$, $(x+5)°$, $(2x-25)°$ and $(x+10)°$.

Find the value of x.

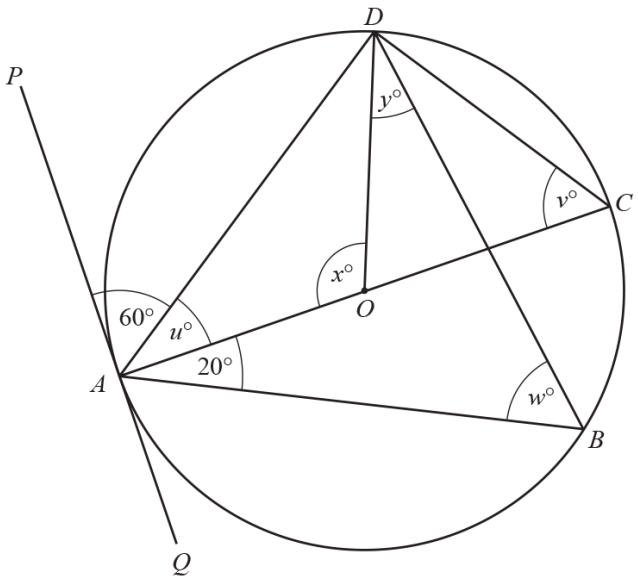
$x =$ ..... [3]

(c) A regular polygon has 72 sides.

Find the size of an interior angle.

..... [3]

(d)



NOT TO SCALE

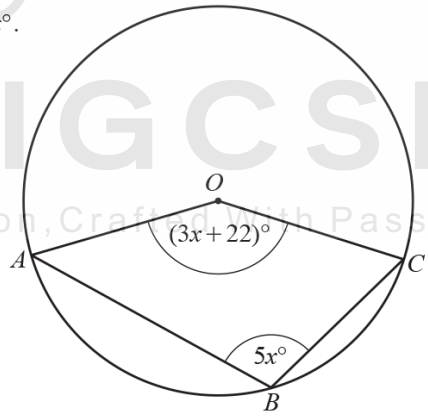
A, B, C and D lie on the circle, centre O, with diameter AC.
PQ is a tangent to the circle at A.
Angle $PAD = 60°$ and angle $BAC = 20°$.

Find the values of u, v, w, x and y.

$u =$ ....., $v =$ ....., $w =$ ....., $x =$ ....., $y =$ ..... [6]

(e) A, B and C lie on the circle, centre O.
Angle $AOC = (3x + 22)°$ and angle $ABC = 5x°$.

Find the value of x.

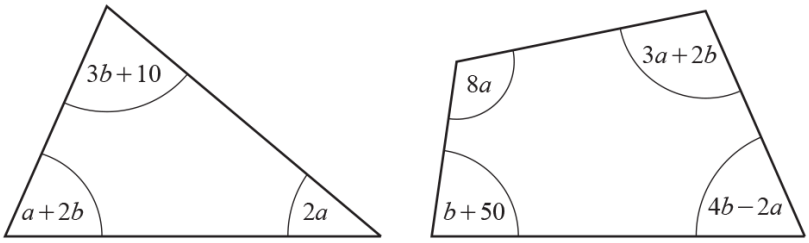


NOT TO SCALE

$x =$ ..... [4]

26. 0580_w19_qp_43 Q: 2

(a) The diagram shows a triangle and a quadrilateral.
All angles are in degrees.



NOT TO SCALE

(i) For the triangle, show that $3a + 5b = 170$.

[1]

(ii) For the quadrilateral, show that $9a + 7b = 310$.

[1]

(iii) Solve these simultaneous equations.
Show all your working.

$a =$ .....

$b =$ ..... [3]

(iv) Find the size of the smallest angle in the triangle.

..... [1]

(b) Solve the equation $6x - 3 = -12$.

$x =$ ..... [2]

(c) Rearrange $2(4x - y) = 5x - 3$ to make y the subject.

$y =$ ..... [3]

(d) Simplify.

$(27x^9)^{\frac{2}{3}}$

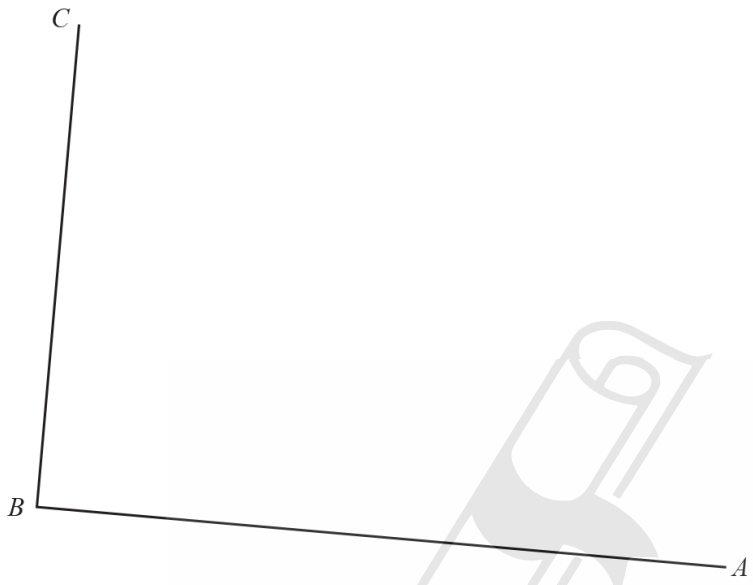
..... [2]

(e) Simplify.

$$\frac{x^2 + 5x}{x^2 - 25}$$

..... [3]

27. 0580_s18_qp_41 Q: 2
The scale drawing shows two boundaries, *AB* and *BC*, of a field *ABCD*.
The scale of the drawing is 1 cm represents 8 m.



Scale: 1 cm to 8 m

(a) The boundaries *CD* and *AD* of the field are each 72 m long.

(i) Work out the length of *CD* and *AD* on the scale drawing.

..... cm [1]

(ii) **Using a ruler and compasses only**, complete accurately the scale drawing of the field. [2]

(b) A tree in the field is

- equidistant from *A* and *B*

and

- equidistant from *AB* and *BC*.

On the scale drawing, construct two lines to find the position of the tree.
Use a straight edge and compasses only and leave in your construction arcs. [4]

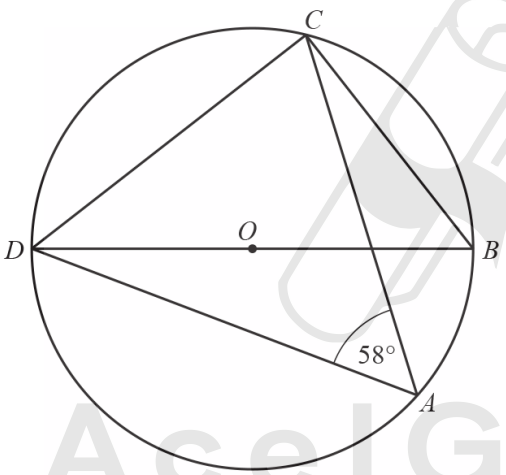
28. 0580_s18_qp_41 Q: 8

(a) The exterior angle of a regular polygon is $x°$ and the interior angle is $8x°$.

Calculate the number of sides of the polygon.

..... [3]

(b)



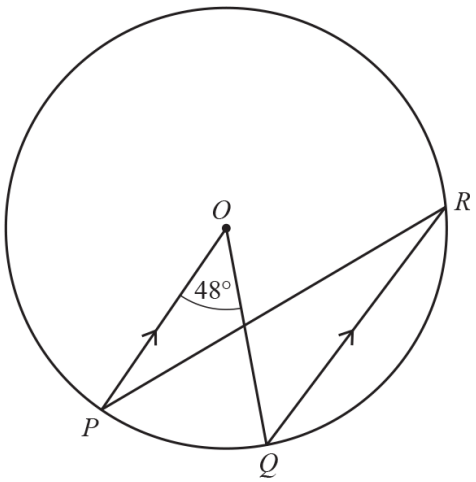
NOT TO SCALE

A, B, C and D are points on the circumference of the circle, centre O.
DOB is a straight line and angle $DAC = 58°$.

Find angle CDB.

Angle CDB = ... [3]

(c)



NOT TO SCALE

P, Q and R are points on the circumference of the circle, centre O.
PO is parallel to QR and angle $POQ = 48°$.

(i) Find angle OPR.

Angle OPR = ... [2]

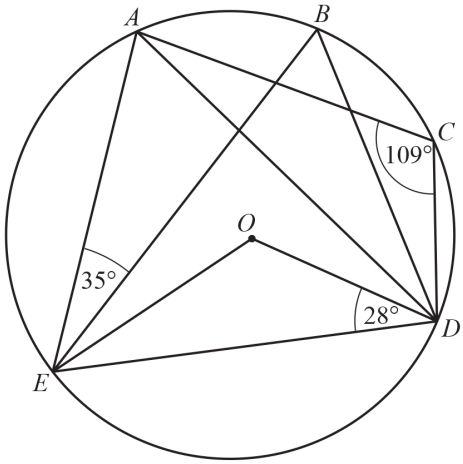
(ii) The radius of the circle is 5.4 cm.

Calculate the length of the **major** arc PQ.

..... cm [3]

29. 0580_s18_qp_42 Q: 9

(a)



NOT TO SCALE

A, B, C, D and E lie on the circle, centre O.
Angle $AEB = 35°$, angle $ODE = 28°$ and angle $ACD = 109°$.

(i) Work out the following angles, giving reasons for your answers.

(a) Angle EBD = ... because .....

.....

..... [3]

(b) Angle EAD = ... because .....

..... [2]

(ii) Work out angle BEO.

Angle BEO = ... [3]

(b) In a regular polygon, the interior angle is 11 times the exterior angle.

(i) Work out the number of sides of this polygon.

..... [3]

(ii) Find the sum of the interior angles of this polygon.

..... [2]

30. 0580_w18_qp_41 Q: 1

Marianne sells photos.

(a) The selling price of each photo is $6.

(i) The selling price for each photo is made up of two parts, printing cost and profit.
For each photo, the ratio printing cost : profit = 5 : 3.

Calculate the profit she makes on each photo.

$ ..... [2]

(ii) Calculate her profit as a percentage of the selling price.

.....% [1]

(iii) Calculate the selling price of a photo in euros (€) when the exchange rate is €1 = $1.091 .

€ ..... [2]

(b) Marianne sells two sizes of photo.
These photos are mathematically similar rectangles.
The smaller photo has length 15 cm and width 12 cm.
The larger photo has area 352.8 cm^2.

Calculate the length of the larger photo.

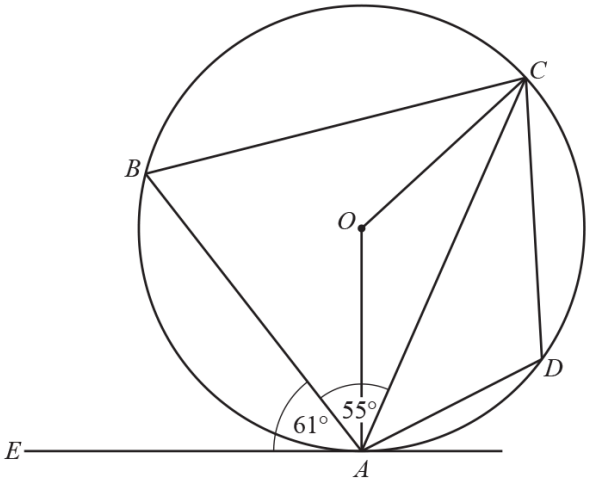
..... cm [3]

(c) In a sale, Marianne buys a new camera for $483.
This is a reduction of 8% on the original price.

Calculate the original price of the camera.

$ ..... [3]

31. 0580_w18_qp_42 Q: 7



NOT TO SCALE

In the diagram, A, B, C and D lie on the circle, centre O.
EA is a tangent to the circle at A.
Angle $EAB = 61°$ and angle $BAC = 55°$.

(a) Find angle BAO.

Angle BAO = ... [1]

(b) Find angle AOC.

Angle AOC = ... [2]

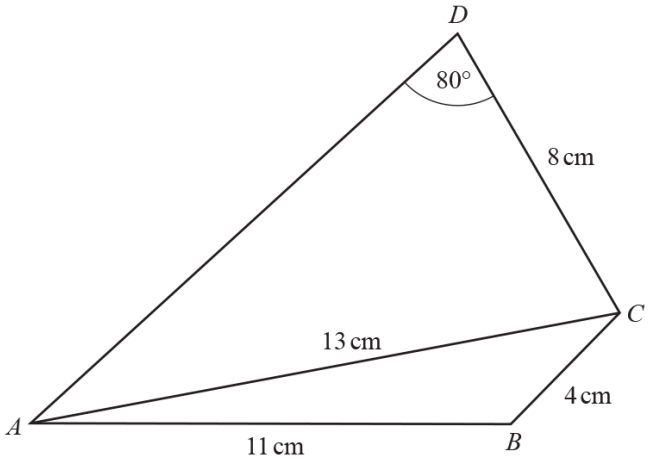
(c) Find angle ABC.

Angle ABC = ... [1]

(d) Find angle CDA.

Angle CDA = ... [1]

32. 0580_w18_qp_43 Q: 6



NOT TO SCALE

(a) Calculate angle *ACB*.

Angle *ACB* = ... [4]

(b) Calculate angle *ACD*.

Angle *ACD* = ... [4]

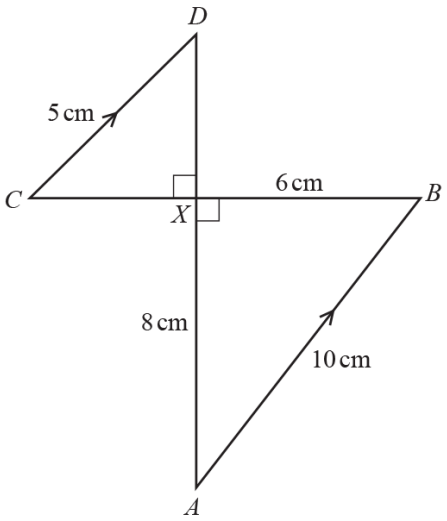
(c) Calculate the area of the quadrilateral $ABCD$.

..... cm^2 [3]

---

33. 0580_w18_qp_43 Q: 8

(a)



NOT TO SCALE

In the diagram, AB and CD are parallel.
AD and BC intersect at right angles at the point X.
$AB = 10$ cm, $CD = 5$ cm, $AX = 8$ cm and $BX = 6$ cm.

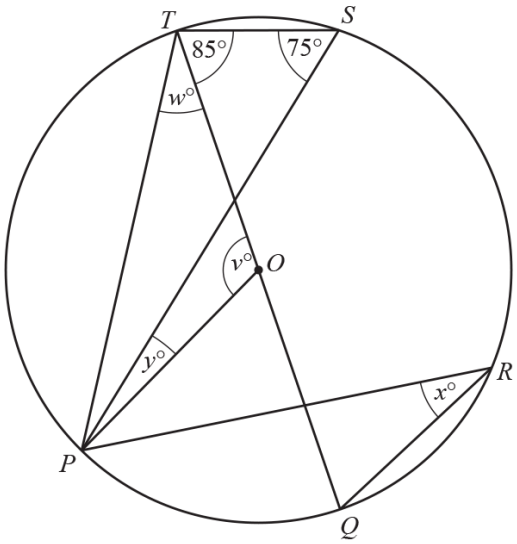
(i) Use similar triangles to calculate DX.

$DX =$ ..... cm [2]

(ii) Calculate angle XAB.

Angle $XAB =$ ..... [2]

(b)



NOT TO SCALE

P, Q, R, S and T lie on the circle, centre O.
Angle $PST = 75°$ and angle $QTS = 85°$.

Find the values of v, w, x and y.

$v =$ .....

$w =$ .....

$x =$ .....

$y =$ ..... [6]

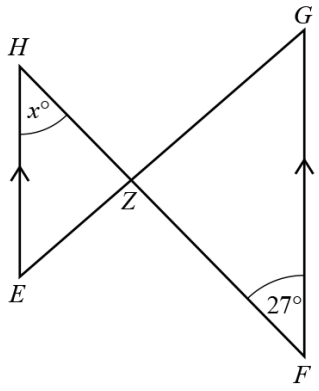
(c) Two containers are mathematically similar.
The surface area of the larger container is $226\,cm^2$ and the surface area of the smaller container is $94\,cm^2$.
The volume of the larger container is $680\,cm^3$.

Find the volume of the smaller container.

..... cm^3 [3]

34. 0580_m17_qp_42 Q: 6

(a)



NOT TO SCALE

In the diagram, EH is parallel to FG.
The straight lines EG and FH intersect at Z.
Angle $ZFG = 27°$.

(i) Find the value of x.

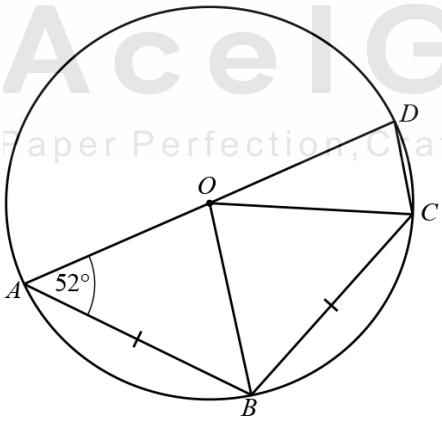
$x =$ ..... [1]

(ii) $EH = 5$ cm, $FG = 9$ cm and $ZG = 7$ cm.

Calculate EZ.

$EZ =$ ..... cm [2]

(b) The diagram shows points A, B, C and D on the circumference of a circle, centre O.
AD is a straight line, $AB = BC$ and angle $OAB = 52°$.

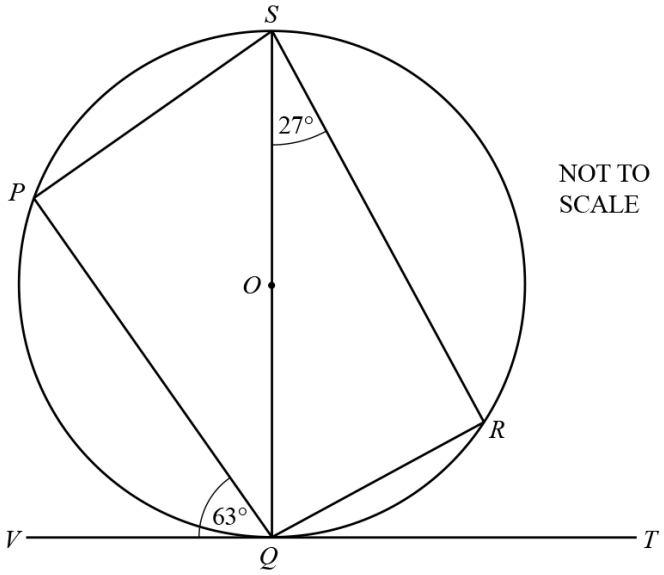


NOT TO SCALE

Find angle ADC.

Angle $ADC =$ ..... [3]

(c) The diagram shows points P, Q, R and S on the circumference of a circle, centre O.
VT is the tangent to the circle at Q.



NOT TO SCALE

Complete the statements.

(i) Angle QPS = angle QRS = ... ° because .....

..... [2]

(ii) Angle SQP = ... ° because .....

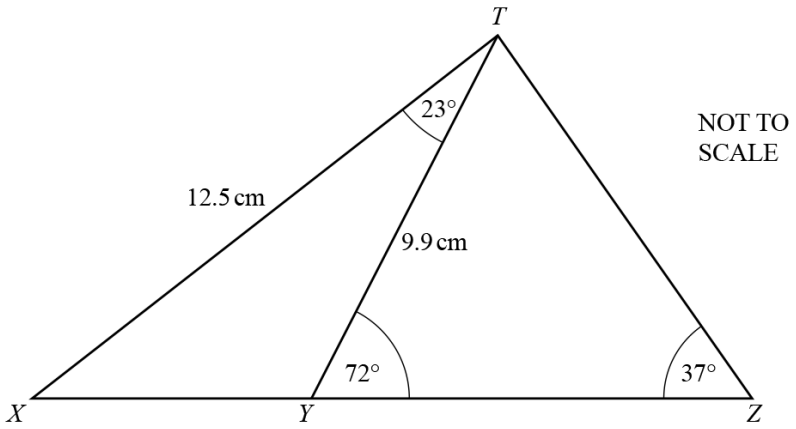
..... [2]

(iii) **Part (c)(i)** and **part (c)(ii)** show that

the cyclic quadrilateral $PQRS$ is a ..... [1]

35. 0580_m17_qp_42 Q: 8

(a) In triangle TXZ, $TX = 12.5$ cm and angle $TZX = 37°$.
Y is a point on the line XZ such that $TY = 9.9$ cm, angle $XTY = 23°$ and angle $TYZ = 72°$.



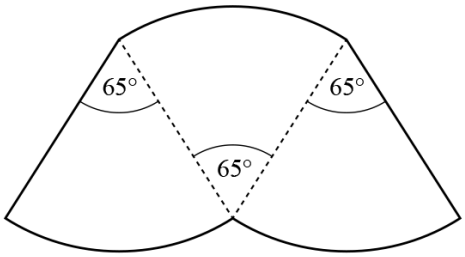
(i) Calculate XY.

$XY =$ ..... cm [4]

(ii) Calculate TZ.

$TZ =$ ..... cm [3]

(b) The diagram shows a shape made up of three identical sectors of a circle, each with sector angle 65°.
The perimeter of the shape is 20.5 cm.



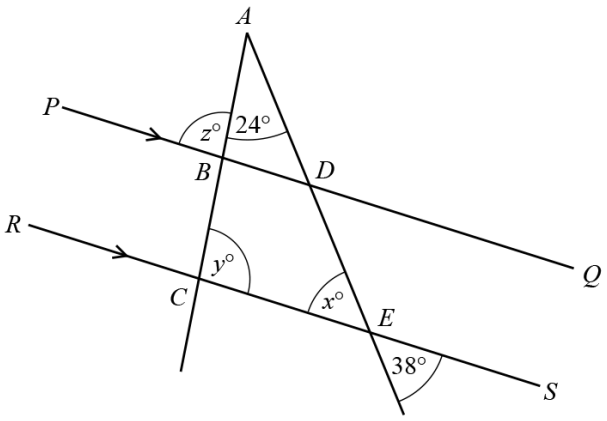
NOT TO SCALE

Calculate the radius of the circle.

..... cm [4]

36. 0580_s17_qp_43 Q: 2

(a)



NOT TO SCALE

PQ is parallel to *RS*.
ABC and *ADE* are straight lines.

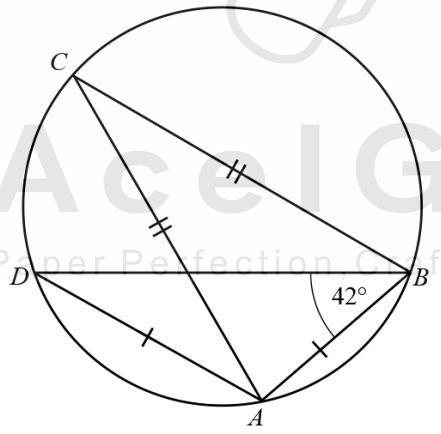
Find the values of x, y and z.

x = ...

y = ...

z = ... [3]

(b)



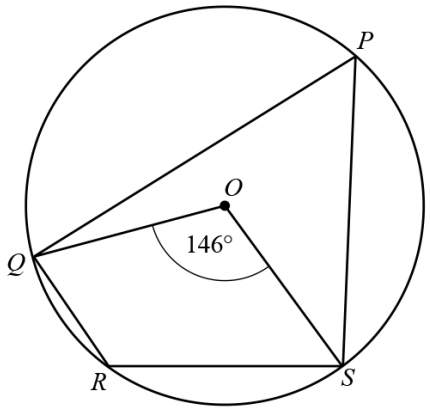
NOT TO SCALE

The points *A*, *B*, *C* and *D* lie on the circumference of the circle.
AB = *AD*, *AC* = *BC* and angle *ABD* = 42°.

Find angle *CAB*.

Angle *CAB* = ... [3]

(c)



NOT TO SCALE

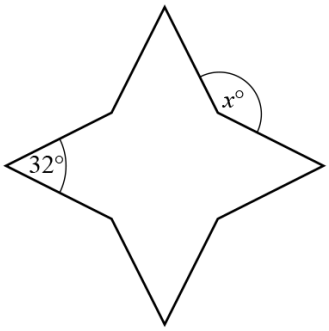
The points P, Q, R and S lie on the circumference of the circle, centre O.
Angle $QOS = 146°$.

Find angle QRS.

Angle QRS = ... [2]

37. 0580_w17_qp_41 Q: 2

(a)



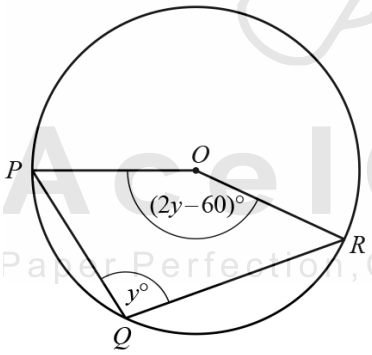
NOT TO SCALE

The diagram shows an octagon.
All of the sides are the same length.
Four of the interior angles are each 32°.
The other four interior angles are equal.

Find the value of x.

x = ... [4]

(b)



NOT TO SCALE

P, Q and R lie on a circle, centre O.
Angle $PQR = y°$ and angle $POR = (2y - 60)°$.

Find the value of y.

y = ... [3]

01. 0580_m24_ms_42 Q: 2

Question	Answer	Marks	Partial Marks
(a)	$y + \text{angle } BCD = 180$ oe AND angles on a straight line AND $x + \text{angle } BCD = 180$ oe AND opposite angles of a cyclic quadrilateral are supplementary OR angles in opposite segments are supplementary leading to $x = y$ with no errors	**B2**	**B1** for angles on a straight line OR opposite angles of a cyclic quadrilateral are supplementary OR angles in opposite segments are supplementary

Question	Answer	Marks	Partial Marks
(b)	Allow any two statements from: CXD is common angle or angle AXB = angle CXD $x = y$ or angle BAX = angle DCX angle ABX = angle CDX	**M1**	
	States all three equal pairs of angles OR 2/all angles equal so triangles similar	**A1**	
(c)(i)	6 nfww	**3**	**B2** for $BX = 18$ nfww or **M2** for $\frac{24}{12} = \frac{BC+12}{9}$ oe or **M1** for $\frac{24}{12} = \frac{BX}{9}$ oe If 0 scored, **SC1** for answer 18
(c)(ii)	4	**1**	

02. 0580_s24_ms_42 Q: 2

Question	Answer	Marks	Partial Marks
(a)	142 142	2	**B1** for each **FT** angle b = *their* angle a
(b)	150	2	**M1** for $\frac{360}{12}$ oe isw or $180\times(12-2)$ oe isw

Question	Answer	Marks	Partial Marks
(c)	56	B1	
	34	B2	**M1** for angle at centre = 2 × *their* 56 oe soi or for angle OMB = 90 oe soi
(d)	51	2	**B1** for opp angle = 129 soi

03. 0580_s23_ms_42 Q: 1

Question	Answer	Marks	Partial Marks
(a)	111	**3**	**M2** for $180 - \frac{180-42}{2}$ oe or $42 + \frac{180-42}{2}$ oe or **M1** for $\frac{180-42}{2}$ oe
(b)	150	**3**	**M1** for $k \div (3 + 4 + 5)$ [$\times p$] where $p = 1, 3, 4$ or 5 or $\frac{5}{12}$ oe **B1** for 360 used
(c)	$\frac{3}{5}$ cao nfww	**4**	**B3** for $\frac{72}{120}$ or **B2** for [$d =$] 72 or [$h =$] 120 or **M1** for $360 \div 5$ oe isw or $180 - (360 \div 6)$ isw or for $(6 - 2) \times 180$ [$\div 6$]
(d)	$x + 2x - 5 + x + 20 + 3x - 40 = 360$	**M1**	Accept equivalent equation e.g. $7x - 25 = 360$
	$7x = 360 + 5 - 20 + 40$ or better	**M1**	**FT** *their* equation, accept e.g. $7x = 385$
	$x = 55$	**B1**	
	55 and 125 or 105 and 75	**B1dep**	**Dep on M1M1B1** Accept $55 + 3 \times 55 - 40 = 180$ or $2 \times 55 - 5 + 55 + 20 = 180$ If B0 scored, **SC1** for 55, 75, 105 and 125
	Opposite angles sum to 180 oe [so *PQRS* is a cyclic quadrilateral]	**A1**	**Dep on M1M1B1B1**
(e)	48.7 or 48.69 to 48.70…	**3**	**M2** for $\frac{360-50}{360} \times 2 \times \pi \times 9$ oe or **M1** for $\frac{50}{360} \times 2 \times \pi \times 9$ oe

Question	Answer	Marks	Partial Marks
(a)(i)	$\frac{(x+3)(2x+5)}{2} = 60$	**M1**	Accept $(x + 3)(2x + 5) = 2 \times 60$ or 120 Accept e.g. $(x + 3)(x + 2.5) = 60$ without division by 2 shown for M1 (but not A1)
	$2x^2 + 6x + 5x + 15$ seen	**B1**	Accept $2x^2 + 11x + 15$ seen
	$2x^2 + 11x - 105 = 0$	**A1**	Correct completion after M1B1 with the fraction seen removed with no errors or omissions seen
(a)(ii)	$(2x + 21)(x - 5)$ [= 0]	**M2**	**M1** for partial factors $2x(x - 5) + 21(x - 5)$ [= 0] or $x(2x + 21) - 5(2x + 21)$ [= 0] OR $(2x + a)(x + b)$ [= 0] where $ab = -105$ or $2b + a = 11$
	–10.5 and 5	**B1**	

Question	Answer	Marks	Partial Marks
(a)(iii)	61.9 or 61.92 to 61.93	**3**	**M2** for $\tan = \frac{2 \times \textit{their}\ 5 + 5}{\textit{their}\ 5 + 3}$ oe or **B1FT** for $2 \times$ *their* $5 + 5$ and *their* $5 + 3$
(b)(i)	28.1 or 28.07 to 28.08	**1**	**FT** *their* 90 – *their* **(a)(iii)** unless *their* **(a)(iii)** < 45, in which case FT *their* **(a)(iii)**
(b)(ii)	10	**3**	**M2** for $(\textit{their}\ 5 + 3) \times \sqrt{\frac{93.75}{60}}$ oe or **M1** for $\sqrt{\frac{93.75}{60}}$ or $\sqrt{\frac{60}{93.75}}$ oe seen or $\left(\frac{\textit{their}\ 5 + 3}{x}\right)^2 = \frac{60}{93.75}$ oe

05. 0580_s23_ms_43 Q: 3

Question	Answer	Marks	Partial Marks
(a)(i)	118	1	
(a)(ii)	X is 8.3 cm from B	2	**M1** for $(332 \div 200) \times 5$ oe
(a)(iii)	1 : 4000	2	**M1** for $200 \div 5$ or 200×100, both soi
(b)	1.13 or 1.128 to 1.129	5	**M4** for $4.5 \times \sqrt[3]{\frac{0.385 \times 8000}{195200}}$ oe or $\sqrt[3]{\frac{4.5^3 \times 0.385 \times 8000}{195200}}$ oe or **M3** for $\sqrt[3]{\frac{0.385}{their 24.4}}$ or $\sqrt[3]{\frac{their 3080}{195200}}$ or $\frac{0.385}{their 24.4} = \frac{l^3}{4.5^3}$ oe or **M2** for $\frac{their 24.4}{0.385}$ or $\frac{0.385}{their 24.4}$ oe or **B2** for 24.4 or 3080 seen or **M1** for $195\,200 \div 8000$ or for 0.385×8000

Question	Answer	Marks	Partial Marks
(a)	246	**3**	**B2** for *BCS*(outh) = 66 or *BCA* = 48 **and** *ACN*(orth) = 66 or *BCW*(est) = 24 or *ACS*(outh) = 114 or **B1** for *ABC* = 66 or *BAC* = 66 or *BCA* = 48 or *ACN*(orth) = 66
(b)(i)	58	**1**	
(b)(ii)	106	**1**	
(b)(iii)	47	**2**	**B1** for *PRQ* = 27 or **B1FT** for *SPR*, either = 48 or = 106 – *their* **(b)(i)** or **B1FT** for *RPQ* = *their* **(b)(i)** – 11
(c)	Radius perpendicular to tangent	**1**	
	Tangents to circle from a/same point oe	**1**	
	RHS	**1**	
	68 angles on a [straight] line add up/sum to 180 oe	**1**	
	56 [base angles of] isosceles triangle	**1**	
	OBC = *BOT* Alternate angles	**1**	Angles and reason required and dependent on *OBC* and *BOT* correct

07. 0580_w23_ms_41 Q: 5

Question	Answer	Marks	Partial Marks
(a)	27.3 or 27.32 to 27.33	**5**	**M4** for $\tan[\angle ACD] = \dfrac{83.2}{\dfrac{83.2}{\tan 38} + 54.5}$ oe or **M3** for $[AC =] \dfrac{83.2}{\tan 38} + 54.5$ oe or for $[CD =] \sqrt{54.5^2 + \left(\dfrac{83.2}{\sin 38}\right)^2 - 2(54.5)\left(\dfrac{83.2}{\sin 38}\right)\cos(180-38)}$ oe or **M2** for $[AB =] \dfrac{83.2}{\tan 38}$ oe or for $[BD =] \dfrac{83.2}{sin38}$ oe or **M1** for $\tan 38 = \dfrac{83.2}{AB}$ oe or $\sin 38 = \dfrac{83.2}{BD}$ oe
(b)	Centre marked at midpoint of FG. and **Angle** in a **semi-circle** is **90**	**B2**	**B1** for marking the centre at mid-point of FG

Question	Answer	Marks	Partial Marks
(c)	10.8 or 10.81 to 10.82	**7**	**B2** for 72 or **M1** for $\dfrac{180}{4+5+6}$ [× 6] and, for triangle PQR **B4** for [angle R=]82.8 or 82.81 to 82.83 or **B3** for $[\cos R =] \dfrac{5}{40}$ oe or better or **M2** for $\dfrac{4^2+5^2-6^2}{2\times 4\times 5}$ or **M1** for $6^2 = 4^2 + 5^2 - 2\times4\times5\times\cos R$ After **0** scored for triangle PQR, **SC1** for $[P =]$ 55.8 or 55.77 to 55.78 or $[Q =] 41.4 or 41.40 to 41.41$

08. 0580_w23_ms_42 Q: 10

Question	Answer	Marks	Partial Marks
(a)	[*DEF*], *BCD* *ADF*, *ADB*	2	**B1** for each pair
(b)	*OQ* *OQT* Tangent perpendicular to radius RHS equal	5	**B1** for each

09. 0580_w23_ms_43 Q: 4

Question	Answer	Marks	Partial Marks
(a)	144	2	**M1** for $180 - \frac{360}{10}$ or $\frac{180(10-2)}{10}$ oe
(b)	$w = 20$ $x = 20$ $y = 60$ $z = 45$	5	**B1** for w **B1FT** for x = *their* w **B2FT** for $y = 80 -$ *their* w or **B1** for angle $BDC = 20$ FT *their* w or angle $ADE = 55$ or angle $CAD = 25$ **B1FT** for $z = 25 +$ *their* w or $105 -$ *their* y

10. 0580_m22_ms_42 Q: 6

Question	Answer	Marks	Partial Marks
(d)	Two pairs of equal angles identified with fully correct reasons	**M3**	**M2** for one pair of equal angles identified with fully correct reasons *KMG* = 90 angle in semicircle and *OGH* = 90 angle between tangent and radius OR *KMG* = *OGH* alternate segment OR *GOH* = *MGK* alternate angles OR Angle *FGM* = angle *GHO* corresponding **and** angle *FGM* = *GKM* alternate segment **and** angle *H* = angle *K* **or M1** for *KMG* = 90, angle in semicircle **or** *OGH* = 90, angle between tangent and radius
	Two or three pairs of angles equal [so similar] oe	**A1**	Dep on M3 with no incorrect work seen

Question	Answer	Marks	Partial Marks
(d)	Two pairs of equal angles identified with fully correct reasons	**M3**	**M2** for one pair of equal angles identified with fully correct reasons *KMG* = 90 angle in semicircle and *OGH* = 90 angle between tangent and radius OR *KMG* = *OGH* alternate segment OR *GOH* = *MGK* alternate angles OR Angle *FGM* = angle *GHO* corresponding **and** angle *FGM* = *GKM* alternate segment **and** angle *H* = angle *K* **or M1** for *KMG* = 90, angle in semicircle **or** *OGH* = 90, angle between tangent and radius
	Two or three pairs of angles equal [so similar] oe	**A1**	Dep on M3 with no incorrect work seen

11. 0580_m22_ms_42 Q: 7

Question	Answer	Marks	Partial Marks
(a)	31.5	3	**M2** for $17.5\times\sqrt{\frac{1134}{350}}$ oe or **M1** for $\sqrt{\frac{1134}{350}}$ oe isw or $\sqrt{\frac{350}{1134}}$ oe isw or for $\frac{1134}{350}=\left(\frac{x}{17.5}\right)^2$ oe
(b)	163.9375 or $163\frac{15}{16}$ final answer	2	**B1** for 15 + 0.25 or 10.5 + 0.25 or better seen
(c)	40.5[0]	2	**M1** for $x\times\left(1-\frac{18}{100}\right)=\frac{166.05}{[5]}$ oe
(d)	$2.23 final answer	3	**B2** for 2.227... or 2.23 seen OR **M2** for $57-\frac{48.2}{0.88}$ oe or **M1** for $\frac{48.2}{0.88}$ oe If 0 scored **SC1** for 57 × 0.88 oe seen

12. 0580_s22_ms_42 Q: 2

Question	Answer	Marks	Partial Marks
(a)	*PQR* = 90 angle in semi-circle	**B1**	
	PRQ = 61 angle sum of triangle [= 180]	**B1**	
	PSQ = 61 angle in same segment	**B1**	If 0 scored **SC1** for *PSQ* = *PRQ* [= 61] soi
(b)	57	4	**B1** for *ABT* = 98 **B1** for *TAB* or *ATB* = 41 **B1** for *BTC* = 41 or *TBC* = 82 or *ATC* =82 soi

13. 0580_s22_ms_42 Q: 9

Question	Answer	Marks	Partial Marks
(a)	*PMR* = *MSR* = right angle[s] or 90°	**B1**	
	PRM = *MRS* same angle	**B1**	
	AAA oe OR *MPR* = *SMR* 3rd angle of triangle	**B1**	**Dep** on B1B1 and no errors seen

Question	Answer	Marks	Partial Marks
(b)(i)	5.5	**2**	**M1** for $\frac{x}{4.5}=\frac{9.9}{8.1}$ oe
(b)(ii)	16.7 or 16.73 to 16.74	**2**	**M1** for $25\times\left(\frac{8.1}{9.9}\right)^2$ oe or $25\times\left(\frac{4.5}{\textit{their } 5.5}\right)^2$ oe

14. 0580_m21_ms_42 Q: 3

	Answer	Mark	Partial Marks
(a)	126 54 117	**3**	**B1** for each
(b)	angle [in a] semicircle is 90	**B1**	Do not accept triangle for angle
	Allied, co-interior [add to 180] or Angles in triangle [= 180] **and** alternate oe	**B1**	
	32	**B1**	
(c)	109	**2**	**B1** for 218 or 71 in correct places or correctly labelled

15. 0580_s21_ms_41 Q: 11

	Answer	Mark	Partial Marks
(a)	20	**2**	**M1** for $\frac{360}{18}$ or $180-\frac{16\times180}{18}$
(b)	4.5	**2**	**M1** for $\frac{BE}{6.75}=\frac{5.2}{5.2+2.6}$ oe
(c)	5.8[0] or 5.798 to 5.799	**3**	**M2** for $2\times\sqrt[3]{\frac{780}{32}}$ oe or **M1** for $\sqrt[3]{\frac{780}{32}}$ or $\sqrt[3]{\frac{32}{780}}$ or $\frac{2^3}{l^3}=\frac{32}{780}$
(d)	$QN = NR$ [given]	**B1**	
	Two correct pairs of angles with reasons from angle PQN = angle SRN alternate angle QPN = angle RSN alternate angle PNQ = angle SNR [vertically] opposite	**B2**	**B1** for any correct pair of angles with reason or two correct pairs of angles with no/wrong reasons
	ASA [implies congruent]	**B1**	dep on B1 B2

16. 0580_p20_ms_40 Q: 9

	Answer	Mark	Partial Marks
(a)	45.[0] or 45.01 to 45.02 nfww	**4**	**M2** for $55^2 + 70^2 - 2 \times 55 \times 70\cos 40$ or **M1** for correct implicit equation **A1** for 2026.[...]
(b)	84.9 or 84.90 to 84.91	**4**	**B1** for angle $BDC = 40$ soi **M2** for $\frac{70\sin(their\ 40)}{\sin 32}$ or **M1** for correct implicit equation
(c)	4060 or 4063 to 4064 nfww	**3**	**M2** for $\frac{1}{2}(55 \times 70\sin 40)$ $+\frac{1}{2}(70 \times their$ **(b)** $\sin(180 - their\ 40 - 32))$ oe or **M1** for correct method for one of the triangle areas
(d)	35.4 or 35.35... nfww	**2**	**M1** for $\sin 40 = \frac{\text{distance}}{55}$ or better or for $= \frac{1}{2}(55 \times 70\sin 40) = (70 \times \text{distance}) \div 2$ or better

17. 0580_s20_ms_43 Q: 6

	Answer	Mark	Partial Marks
(a)(i)	29.5 or 29.50…	4	**M2** for $\frac{11^2+5.3^2-6.9^2}{2\times11\times5.3}$ or **M1** for $6.9^2 = 11^2 + 5.3^2 - 2\times11\times5.3\cos x$ **A1** for 0.87[0…] oe

	Answer	Mark	Partial Marks
(a)(ii)	13.4 or 13.38…	4	**B1FT** 84 – *their* **(*a*)(i)** **M2** for $\frac{11}{\sin 42}\times\sin$ *their* 54.5 or **M1** for implicit form
(b)	2700	4	**M2** for $15\times2.5\times20\times60\times60$ or **M1** for $15\times2.5\times20$ **M1** for *their* volume ÷ 1000 If 0 scored, **SC1** for figs 27 with no working

18. 0580_s20_ms_43 Q: 8

	Answer	Mark	Partial Marks
(a)	12	2	**M1** for $150=\frac{(n-2)\times180}{n}$ or $\frac{360}{180-150}$ oe
(b)(i)	45	2	**B1** for angles at M or K = 45 or angle at L = 90
(b)(ii)	85	2	**B1** for either angle in alt segment = 58
(b)(iii)	72	2	**B1** for either angle at J or H=108 or angle at F=72
(c)	$OA = OB = OC = OD$ Radii	B1	
	$AB = CD$ chords equidistant from centre are equal	B1	
	SSS implies congruent	B1	

19. 0580_w20_ms_42 Q: 8

	Answer	Mark	Partial Marks
(a)	[v =] 40 [w =] 80 [x =] 40 [y =] 100 [z =] 60	**5**	**B1** for each **FT** angle z as 140 – *their w*
(b)	24	**3**	**M2** for $360 - 11x = 2 \times 2x$ oe or **M1** for $360 - 11x$ seen or obtuse angle $KOL = 2 \times 2x$ oe
(c)(i)	angle ADX = angle BCX oe same segment oe angle DAX = angle CBX oe same segment oe angle AXD = BXC oe [vertically] opposite oe	**M2**	Accept in any order **M1** for one correct pair with reason If 0 scored, **SC1** for two correct pairs of equal angles identified with incorrect/no reasons
	corresponding angles are equal oe	**A1**	
(c)(ii)(a)	8.75 or 8¾	**2**	**M1** for $\frac{8}{10} = \frac{7}{DX}$ oe
(c)(ii)(b)	81.8 or 81.78 to 81.79	**4**	**M2** for [cos[BXC] =] $\frac{5^2 + 7^2 - 8^2}{2 \times 5 \times 7}$ oe or **M1** for $8^2 = 5^2 + 7^2 - 2 \times 5 \times 7 \times \cos(...)$ oe **A1** for $\frac{10}{70}$ oe

20. 0580_w20_ms_43 Q: 5

	Answer	Mark	Partial Marks
(a)(i)	81° Angle at centre is twice angle at circumference oe	**2**	**B1** for 81°
(a)(ii)	81° Alternate segment [theorem] oe	**2**	**FT** *their* **(a)(i)** **B1FT** for 81°

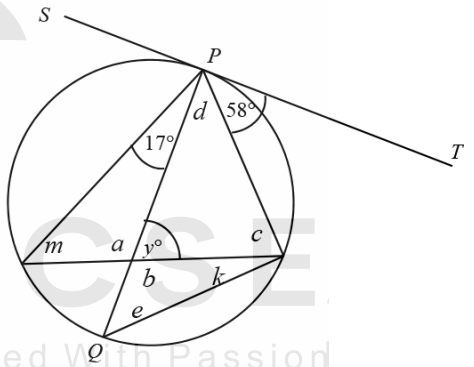
	Answer	Mark	Partial Marks
(a)(iii)	123° Angles on a straight line [= 180] Opposite angles in a cyclic quadrilateral are supplementary oe	3	**FT** *their* acute **(a)(ii)** + 42 **B1** for each element
(b)(i)	Angle *PTU* = angle *PRQ* corresponding Angle *PUT* = angle *PQR* corresponding Angle *RPQ* is common oe	**M2**	Accept in any order **M1** for one correct pair with reason If 0 scored, **SC1** for two correct pairs of equal angles identified with incorrect/no reasons
	Corresponding angles are equal oe	**A1**	
(b)(ii)(a)	4 : 7 oe	1	
(b)(ii)(b)	41.25 oe	3	**M2** for $20\times\left(\frac{7}{4}\right)^2$ oe or $20\times\frac{7^2-4^2}{4^2}$ oe or **M1** for $\left(\frac{7}{4}\right)^2$ or $\left(\frac{4}{7}\right)^2$ or $\frac{7^2-4^2}{4^2}$ or $\frac{4^2}{7^2-4^2}$

21. 0580_m19_ms_42 Q: 4

	Answer	Mark	Partial Marks
(a)	Correct ruled line with *D* marked	2	**B1** for correct ruled line or short line
(b)	47.5	2	**B1** for 9.5 or 95 mm seen or for answer figs 465 to figs 485
(c)	Correct arc radius 7 cm	2	**B1** for complete arc other radius, centre *A* or correct but short arc
	Correct ruled perpendicular bisector of *BC* with correct pairs of arcs	2	**B1** for correct perpendicular bisector without correct arcs or for correct arcs, no/incorrect line
	Correct ruled bisector of angle *BCD* with correct pairs of arcs	2	**B1** for correct angle bisector without correct arcs or for correct arcs, no/incorrect line
	correct region shaded	1	Dep on at least **B1B1B1** and five boundaries one of which is an arc
(d)	[1 :] 500	1	

22. 0580_s19_ms_42 Q: 2

	Answer	Mark	Partial Marks
(a)	103	**3**	**M1** for angle ABC or angle $ACB = \frac{1}{2}(180 - 26)$ oe **M1** for angle $ABF = 26$ or angle CBD or angle $FBE = 77$ or exterior angle $ACB = 103$ correctly identified or in correct position

	Answer	Mark	Partial Marks
(b)	75	**5**	**B4** for 105 at a or b **or** 73 at c **and** 32 at d or **B3** for 58 at m **or** 58 at e **and** 17 at k or **B2** for 32 at d **and** 90 soi at $(c+k)$ **or** 32 at d **and** 17 at k **or** 73 at c or **B1** for 90 soi at $(c + k)$ or between tangent and radius **or** 32 at d **or** 17 at k 

23. 0580_s19_ms_42 Q: 7

	Answer	Mark	Partial Marks
(a)	$180-\frac{360}{5}$ or $\frac{(5-2)\times180}{5}$ or $\frac{(2\times5-4)\times90}{5}$ or $\frac{5\times180-360}{5}$	**M2**	or **M1** for $\frac{360}{5}$ or $(5-2)\times180$ or $90(2\times5-4)$ or $3\times180\div5$ or $6\times90\div5$ or $5\times180-360$ If 0 scored, **SC1** for $\frac{5-2\times180}{5}$
(b)(i)	7.05 or 7.053…	**3**	**M2** for $12\times\cos54$ oe or **M1** for implicit form or **B1** for length of edge of pentagon = 14.1 to 14.11 If 0 scored, **SC1** for right angle at M
(b)(ii)(a)	22.8 or 22.81 to 22.83… nfww	**3**	**M2** for $\frac{\textit{their}\ \textbf{(b)(i)}}{\cos72}$ oe or **M1** for implicit form oe or **B1** for $AX = 36.9$ or 36.93 to 36.94
(b)(ii)(b)	179 or 179.1 to 179.3…	**3**	**M2** for $\frac{1}{2}\times12\times\textit{their}\ AX\times\sin54$ oe or $\frac{1}{2}\times12\times\textit{their}\ OX\times\sin108$ oe or $\frac{1}{2}\times\textit{their}\ AX\times\textit{their}\ OX\times\sin18$ or $\frac{1}{2}\times12^2\times\sin72+\text{area}\ OBX$ oe or $\frac{1}{2}\times12^2\times\sin72+\text{area}\ OMB+\text{area}\ MBX$ oe or **M1** for a correct method to find area of one relevant triangle AOB, OMB, MBX, OBX or ONX **seen**

24. 0580_s19_ms_43 Q: 9

	Answer	Mark	Partial Marks
(a)(i)	$\angle ACD = 46$ soi or $\angle CDE = 44$ soi	**B2**	**B1** for angle $ADC = 108$ or angle $DCB = 18$
	$\frac{58\sin 108}{\sin their 46}$	**M2**	**M1** for $\frac{\sin 108}{x} = \frac{\sin their 46}{58}$ oe
	76.68… nfww	**A1**	
(a)(ii)	10.9 or 10.91 to 10.94	**3**	**B2** for $[AB =]$ 68.9 or 68.91 to 68.94 or **M2** for a correct explicit statement for AB or BD or **M1** for $\frac{AB}{76.7} = \cos 26$ oe
(b)(i)	10.4 or 10.43 to 10.44	**4**	**M3** for $\sqrt{\frac{70}{\sin 40}}$ oe or **M2** for $x^2 \times \sin 40 = 70$ oe or **M1** for $\frac{1}{2}x \times 2x \times \sin 40 = 70$
(b)(ii)	140	**1**	

25. 0580_w19_ms_41 Q: 1

	Answer	Mark	Partial Marks
(a)	[p =] 132 [q =] 77	**3**	**B1** for 132 [=p] **B2** for 77 [=q] or **M1** for 180 – (55 + 48) oe or for *their* p – 55
(b)	74	**3**	**B2** for $5x - 10 = 360$ or **M1** for $x + (x + 5) + (2x - 25) + (x + 10) = 360$ or for $5x - 10 = k$
(c)	175	**3**	**M2** for $180 - \frac{360}{72}$ or for $\frac{180(72 - 2)}{72}$ or **M1** for $\frac{360}{72}$ or for 180 (72 – 2)
(d)	[u =] 30 [v =] 60 [w =] 60 [x =] 120 [y =] 40	**6**	**B1** for 30 **B1** for 60 **B1** for 60 FT *their v* **B1** for 120 FT 2 × *their w* **B2** for 40 or **B1** for angle $BDC = 20$ or angle $ADO = 30$ or angle $ADB = 70$
(e)	26	**4**	**B3** for $360 - 22 = 10x + 3x$ oe or better or for $5x + 1.5x = 180 - 11$ oe or better or **M2** for $360 - (3x + 22) = 2 \times 5x$ oe or for $5x + \frac{1}{2}(3x + 22) = 180$ oe or **SC2** for $360 + 22 = 10x + 3x$ oe or better or **M1** for $180 - 5x$, $10x$ or $360 - (3x + 22)$ correctly placed on the diagram or identified or for angle A + angle $C = 5x$

26. 0580_w19_ms_43 Q: 2

	Answer	Mark	Partial Marks
(a)(i)	$2a + a + 2b + 3b + 10 = 180$ leading to $3a + 5b = 170$ without error or omission	**1**	
(a)(ii)	$8a + 3a + 2b + b + 50 + 4b - 2a = 360$ leading to $9a + 7b = 310$ without error or omission	**1**	
(a)(iii)	Correct method to eliminate one variable	**M1**	
	$[a =]15$ $[b =]25$	**A2**	**A1** for each correct value If 0 scored, **SC1** for two values that satisfy one of the equations or for two correct answers with no/incorrect working
(a)(iv)	30	**1**	
(b)	-1.5 or $-1\frac{1}{2}$ or $-\frac{3}{2}$	**2**	**M1** for $6x = -12 + 3$ or better
(c)	$\frac{3x+3}{2}$ oe final answer	**3**	**M1** for $8x - 2y = 5x - 3$ or $4x - y = \frac{1}{2}(5x - 3)$ **M1FT** for isolating the y term correctly
(d)	$9x^6$	**2**	**M1** for $(3x^3)^2$ or $\left(729x^{18}\right)^{\frac{1}{3}}$ seen or for $9x^k$ or kx^6 as final answer
(e)	$\frac{x}{x-5}$ final answer nfww	**3**	**M1** for $x(x + 5)$ **M1** for $(x - 5)(x + 5)$

27. 0580_s18_ms_41 Q: 2

	Answer	Mark	Partial Marks
(a)(i)	9	**1**	
(a)(ii)	*ABCD* completed accurately with arcs	**2**	**M1** for intersecting arcs radius *their* 9 cm or for *ABCD* completed accurately with no arcs
(b)	Correct ruled perpendicular bisector of *AB* with 2 correct pairs of arcs Correct ruled bisector of angle *ABC* with 2 correct pairs of arcs Lines intersecting	**4**	**B2** for correct ruled perpendicular bisector of *AB* with 2 correct pairs of arcs or **B1** for correct perpendicular bisector without/wrong arcs and **B2** for correct ruled bisector of angle *ABC* with 2 correct pairs of arcs or **B1** for correct bisector of angle *ABC* without/wrong arcs If lines do not intersect, max **B3**

28. 0580_s18_ms_41 Q: 8

	Answer	Mark	Partial Marks
(a)	18	**3**	**B2** for 20 nfww or **M1** for $8x + x = 180$ or better
(b)	32	**3**	**B1** for angle $DBC = 58$ **B1** for angle $BCD = 90$
(c)(i)	24	**2**	**B1** for angle $PRQ = 24$
(c)(ii)	29.4 or 29.40 to 29.41	**3**	**M2** for $\frac{360-48}{360} \times 2 \times \pi \times 5.4$ or **B2** for answer (minor arc) 4.52 or 4.523 to 4.524… or **M1** for $\frac{48}{360} \times 2 \times \pi \times 5.4$

29. 0580_s18_ms_42 Q: 9

	Answer	Mark	Partial Marks
(a)(i)(a)	62 and Isosceles [triangle] and Angle at centre is twice angle at circumference oe	**3**	**B2** for 62 and one correct reason or **B1** for 62 with no/wrong reason or for angle *EOD* = 124 soi or for no/wrong angle with correct reason
(a)(i)(b)	62 and [Angles in] same segment oe or angle at centre is twice angle at circumference oe	**2**	**2FT** *their* **(a)(i)(a)** and correct reason **B1FT** for *their* **(a)(i)(a)** with no/wrong reason or for no/wrong angle with correct reason
(a)(ii)	8	**3**	**M2** for (180 –109) – 28 – 35 oe or **M1** for [angle *AED* =] 180 – 109 oe
(b)(i)	24	**3**	x = ext angle **B2** for [x =] 15 isw or **M1** for $x + 11x = 180$ oe or for $\frac{180(n-2)}{[n]} = \frac{360}{[n]} \times 11$
(b)(ii)	3960	**2**	**FT** (*their* 24 – 2) × 180 dep on **(b)(i)** an integer and > 6 **M1** for (*their* 24 – 2) × 180 oe or *their* 24 × 11 × *their* 15 oe or 11 × 360

30. 0580_w18_ms_41 Q: 1

	Answer	Mark	Partial Marks
(a)(i)	2.25 final answer	**2**	**M1** for $\frac{3}{5+3}$ or $\frac{6}{5+3}$ oe
(a)(ii)	37.5	**1**	**FT** *their* $\frac{\textbf{(a)(i)}}{6}\times 100$
(a)(iii)	5.5[0] or 5.499 to 5.500	**2**	**M1** for $6 \div 1.091$
(b)	21	**3**	**M2** for $15\times\sqrt{\frac{352.8}{15\times 12}}$ oe or **SC2** for answer 16.8 or **M1** for $\sqrt{\frac{352.8}{15\times 12}}$ or $\sqrt{\frac{15\times 12}{352.8}}$ seen or **M1** for a correct implicit statement for the length
(c)	525	**3**	**M2** for $\frac{483}{100-8}[\times 100]$ oe or **M1** for 483 associated with 92 [%]

31. 0580_w18_ms_42 Q: 7

	Answer	Mark	Partial Marks
(a)	29	**1**	
(b)	128	**2**	**FT** 180 – 2 (55 – *their* **(a)**) **M1** for angle *OCA* or angle *OAC* = 55 – *their* **(a)** soi

	Answer	Mark	Partial Marks
(c)	64	**1**	**FT** *their* **(b)** ÷ 2
(d)	116	**1**	**FT** 180 – *their* **(c)**

32. 0580_w18_ms_43 Q: 6

	Answer	Mark	Partial Marks
(a)	52[.0] or 52.02…	**4**	**M2** for [cos =] $\frac{13^2+4^2-11^2}{2\times13\times4}$ or **M1** for $11^2 = 13^2 + 4^2 - 2\times13\times4\cos(...)$ **A1** for [$\cos^{-1}$ =] $\frac{64}{104}$ oe or 0.615 or 0.6153 to 0.6154
(b)	62.7 or 62.69 to 62.70	**4**	**M3** for $180 - \sin^{-1}\left(\frac{8\sin80}{13}\right) - 80$ oe or **M2** for $\sin A = \frac{8\sin80}{13}$ or **M1** for $\frac{13}{\sin80} = \frac{8}{\sin A}$ oe **A1** for 37.3 or 37.30… If 0 scored, **M1** for 180 – 80 – *their A*
(c)	66.7 or 66.68 to 66.71	**3**	**M1** for $0.5\times13\times4\times\sin(theirACB)$ oe **M1** for $0.5\times8\times13\times\sin(their\ ACD)$ oe

33. 0580_w18_ms_43 Q: 8

	Answer	Mark	Partial Marks
(a)(i)	4	**2**	**M1** for correct method using similar triangles e.g. $\frac{10}{5}=\frac{8}{DX}$ oe
(a)(ii)	36.9 or 36.86 to 36.87	**2**	**M1** for tan = $\frac{6}{8}$ or sin = $\frac{6}{10}$ or cos = $\frac{8}{10}$ oe
(b)	[v =] 150	**B1**	
	[w =] 15	**B2**	**FT** (180 – *their v*) ÷ 2 **M1** for 180 – 2w = *their v* oe or angle POQ = 180 – *their v* oe
	[x =] 15	**B1**	**FT** *their w*
	[y =] 10	**B2**	**M1** for angle TPS = 5° or angle TXS = 20° or OXP = 20° or TXP = 160° (where X is where OT and PS intersect)
(c)	182 or 182.4…	**3**	**M2** for $\left(\frac{94}{226}\right)^{\frac{3}{2}}\left[=\frac{V}{680}\right]$ oe or **M1** for ratio of lengths = $\sqrt{\frac{226}{94}}$ or $\sqrt{\frac{94}{226}}$ or better or for $\frac{V^2}{680^2}=\frac{94^3}{226^3}$ oe

34. 0580_m17_ms_42 Q: 6

	ANSWER	MARK	PARTIAL MARKS
(a) (i)	27	**1**	
(ii)	3.89 or 3.888 to 3.889	**2**	**M1** for $\frac{7}{EZ}=\frac{9}{5}$ oe
(b)	76 cao	**3**	**B2** for ABC = 104 or AOC = 152 or COD = 28 or OBA = 52 **and** OBC = 52 or BCD = 128 **and** OCB = 52 or **B1** for any one of OBA,OBC, OCB = 52 or BCD = 128

	ANSWER	MARK	PARTIAL MARKS
(c) (i)	90	1	
	angle in semicircle	1	
(ii)	27	1	
	tangent [perpendicular to] radius	1	
(iii)	rectangle	1	

35. 0580_m17_ms_42 Q: 8

	ANSWER	MARK	PARTIAL MARKS
(a) (i)	5.14 or 5.135 to 5.142 nfww	4	**M2** for $[XY^2 =] 12.5^2 + 9.9^2 - 2 \times 12.5 \times 9.9 \times \cos 23$ or **M1** for implicit version **A1** for 26.4 to 26.5 OR **B1** for $[XYT =]$ 108 or $[TXY =]$ 49 **M2** for $\frac{12.5 \sin 23}{\sin(180-72)}$ oe or **M1** for $\frac{\sin(180-72)}{12.5} = \frac{\sin 23}{XY}$ oe

	ANSWER	MARK	PARTIAL MARKS
(ii)	15.6 or 15.7 or 15.64 to 15.68	3	**M2** for $[TZ=] \frac{9.9}{\sin 37} \times \sin(72)$ oe or **M1** for $\frac{9.9}{\sin 37} = \frac{TZ}{\sin 72}$ oe OR **M2** for $\frac{12.5 \times \sin(180-23-108)}{\sin 37}$ oe or **M1** for $\frac{\sin 37}{12.5} = \frac{\sin(180-23-108)}{TZ}$ oe
(b)	3.79 or 3.793 to 3.794	4	**M3** for $r = 20.5 \div \left(2 + \frac{3 \times 65 \times 2\pi}{360}\right)$ oe or **M2** for $20.5 = 2r + \frac{3 \times 65}{360} \times 2\pi r$ oe or **M1** for $[3 \times] \frac{65}{360} \times 2\pi r$ oe or 20.5 = 2*r* + expression involving π

36. 0580_s17_ms_43 Q: 2

	ANSWER	MARK	PARTIAL MARKS
(a)	38	**1**	
	118	**1**	
	62	**1FT**	**FT** 180 – *their y*
(b)	69	**3**	**B2** for *ACB* = 42 or **B1** for *ADB* = 42 If zero scored, **SC1** for *ACB* = *their ADB*
(c)	107	**2**	**B1** for *QPS* = 73 or [reflex] *QOS* = 214

37. 0580_w17_ms_41 Q: 2

	ANSWER	MARK	PARTIAL MARKS
(a)	122	**4**	**B3** for 238 or 61 or 58 correctly identified in working or on diagram or **B2** for 952 seen or 74 or 119 or 29 correctly identified in working or on diagram OR Method 1 using sum of interior angles **M1** for (8 – 2) × 180 or 1080 isw **M1** for *their* 1080 – 4 × 32 **M1** for 360 – *their* 952 ÷ 4 OR Method 2 using isosceles triangles and square **M1** for (180 – 32) ÷ 2 or for 90 **M1** for *their* 74 × 2 + 90 or 90 – *their* 74 **M1** for 360 – *their* 74 × 2 + 90 or 90 + 2(90 – *their* 74) OR Method 3 using four kites joined to centre **M1** for 360 ÷ 4 **M1** for (360 – (*their* 90 + 32)) ÷ 2 **M1** for 2(180 – *their* 119) OR Method 4 using square around outside **M1** for 90 – 32 **M1** for (90 – 32) ÷ 2 **M1** for 180 – 2(*their* 29)
(b)	105	**3**	**M2** for 360 = 2 × *y* + (2*y* – 60) oe or 2(180 – *y*) = 2*y* – 60 oe or **B1** identifying in working or on diagram a relevant angle in terms of *y*