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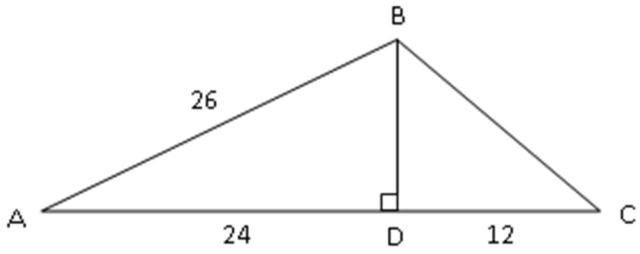
Revision Booklet

Unit 1

Unit 1 Revision Pack

1.1a PYTHAGORAS

1. Answer these questions about the framework opposite.

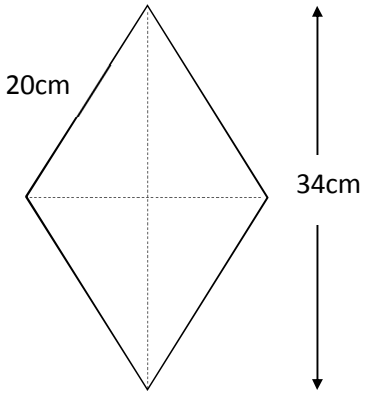


(a) Calculate the length of BD.

(b) Hence calculate the length of BC.

(c) Calculate the area of triangle ABC.

2. A rhombus has sides of 20cm and its longest diagonal measuring 34cm.



(a) Calculate the length of the shorter diagonal.

(b) Calculate the area of the rhombus

3. Calculate the distance between each pair of points below.

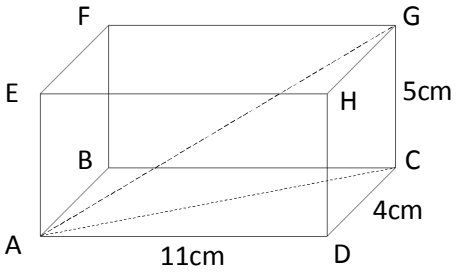
(a) A(2, 5) and B(7, 10)

(b) P(1, 8) and Q(12, 2)

(c) $E(-2,3)$ and $F(2,-4)$

(d) $R(-7,-3)$ and $F(3,-1)$

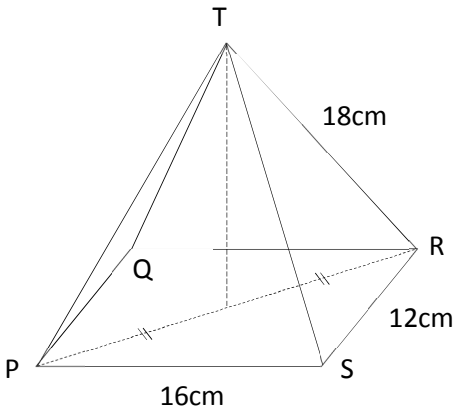
4. Answer the following about the cuboid opposite.



(a) Calculate the length of the face diagonal AC.

(b) Hence calculate the length of the space diagonal AG.

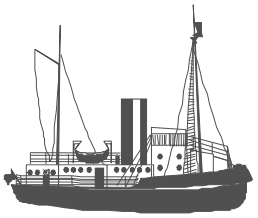
5. The pyramid opposite has a rectangular base.



(a) Calculate the length of the base diagonal PR.

(b) Given that edge TR = 18cm, calculate the vertical height of the pyramid.

Start each of the following questions by drawing a diagram.



6. A ship sails 9km due North and then a further 17km due East.

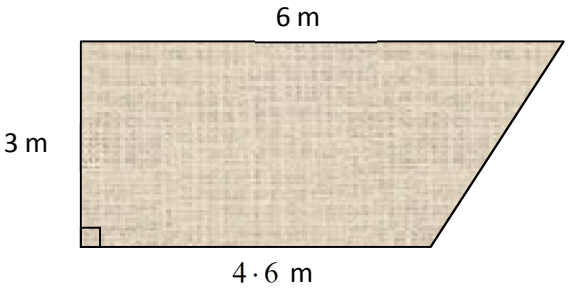
How far is the ship from its starting point?

7. An aircraft flies 400km due West and then a further 150km due South.

How far is the aircraft from its starting point?

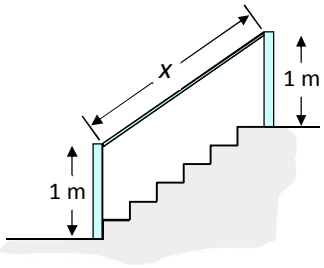
8. The room shown opposite has two parallel sides.

Using the given dimensions calculate the perimeter of the room.



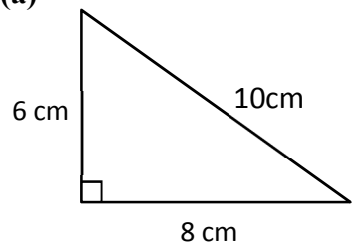
9. Calculate the length of the banister rail shown in the diagram if there are 6 stairs, and if each tread measures 25cm and each riser 20cm.

Give your answer in metres.

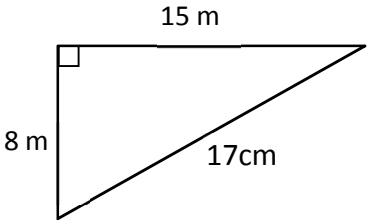


10. Use the converse of Pythagoras Theorem to prove that these triangles are right angled.

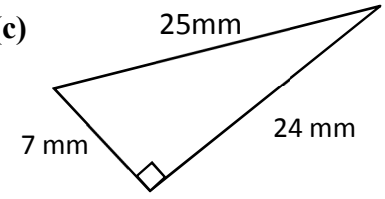
(a)



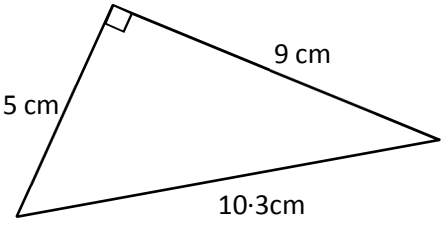
(b)



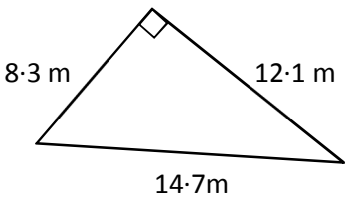
(c)



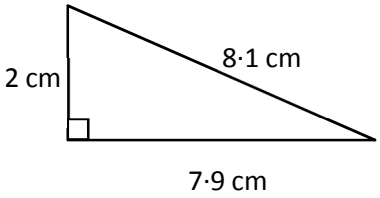
(d)



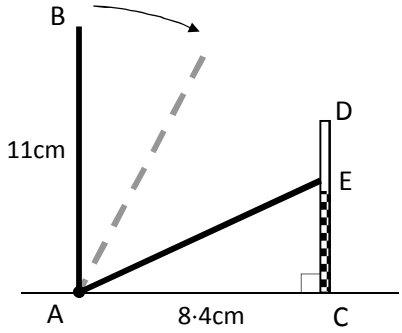
(e)



(f)



1. In a switch mechanism lever AB rotates around A until it rests against the rod CD.



Point B touches rod CD at E.

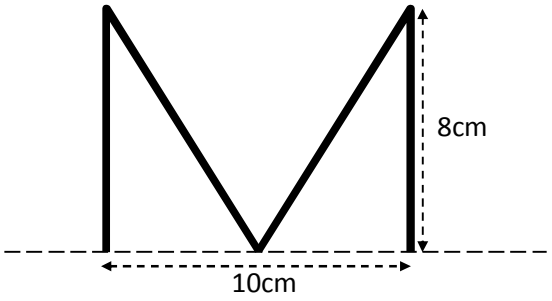
AB = 11cm and AC = 8·4cm as shown.

For the switch to work the distance from C to E must be **more than** 7cm.

Will this switch mechanism work?

Your answer must be accompanied by appropriate working and explanation.

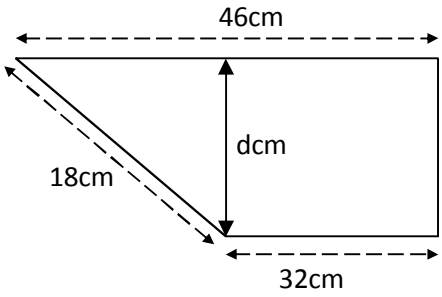
2. The capital letter 'M' can be formed using straight lines as shown below.



Calculate the total length of the lines forming the letter.

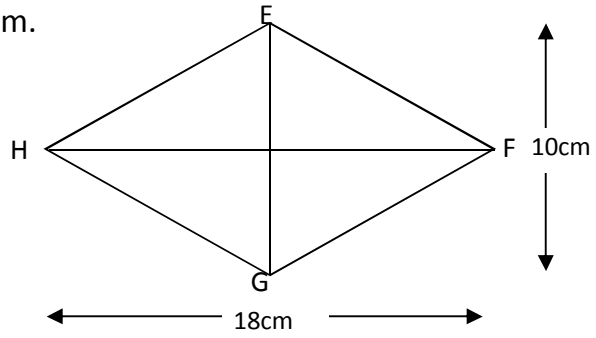
3. The side view of a water trough is as shown in the diagram. The depth of it must by at least 11cm.

Is this container acceptable? Show working and give a reason for your answer.

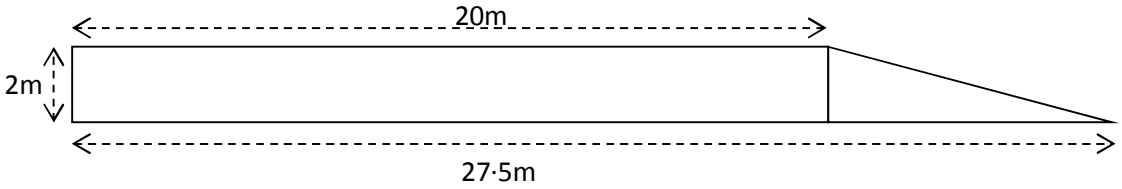


4. EFGH is a rhombus. EG is 10cm and HF is 18cm.

Calculate the perimeter of the rhombus.



5. A special stage is being built for an outdoor concert. It has to be 20 metre wide, 2 metres high and has a ramp on one side.



Special non-slip matting has to be laid along the stage and down the ramp.

The cost of the matting is £34 a metre and it is sold in complete metres.

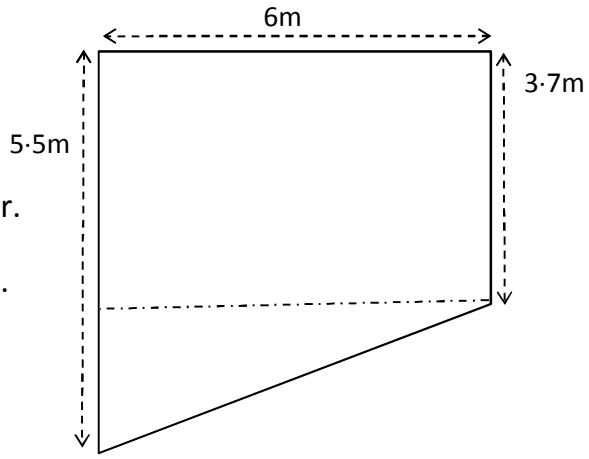
Calculate the cost of the matting.

6. I have just built a new patio area in my garden.

The diagram shows the measurements of it.

I am going to put a low fence round its perimeter.

Calculate the length of fencing that I will require.



1.2a EXPRESSIONS with BRACKETS

1. Multiply out the brackets:

(a) $4\,(2a + 5)$ **(b)** $7\,(3y - 4)$ **(c)** $2\,(12x + 11)$ **(d)** $9\,(4c - 7)$

2. Expand and simplify:

(a) $3(3a - 1) + 2a$ **(b)** $2(5x + 3) - 3x$ **(c)** $8(b + 2) - 9$

(d) $4(2h - 1) + 7$ **(e)** $5(3 - 4x) + 11x$ **(f)** $3(2c + 1) - 8$

(g) $2(4t + 3) - 10t$ **(h)** $p(p + q) - 3pq$ **(i)** $7(1 - 3c) - 10$

3. Multiply out the brackets:

(a) $(x + 2)(x + 3)$ **(b)** $(y + 5)(y + 2)$ **(c)** $(a + 4)(a + 6)$

(d) $(b + 3)(b + 4)$ **(e)** $(x + 9)(x + 5)$ **(f)** $(s + 3)(s + 8)$

4. Multiply out the brackets:

(a) $(x - 1)(x - 5)$ **(b)** $(c - 4)(c - 2)$ **(c)** $(y - 3)(y - 7)$

(d) $(b - 6)(b - 8)$ **(e)** $(x - 5)(x - 2)$ **(f)** $(s - 8)(s - 5)$

5. Multiply out the brackets:

(a) $(x - 1)(x + 5)$ **(b)** $(a + 3)(a - 7)$ **(c)** $(t - 5)(t + 4)$

(d) $(y + 8)(y - 4)$ **(e)** $(c + 2)(c - 7)$ **(f)** $(x - 6)(x + 1)$

6. Multiply out the brackets:

(a) $(x + 3)^2$ **(b)** $(w - 2)^2$ **(c)** $(a - 5)^2$ **(d)** $(c + 8)^2$

(e) $(y - 4)^2$ **(f)** $(a + 6)^2$ **(g)** $(b + 1)^2$ **(h)** $(s + 7)^2$

7. Multiply out the brackets:

(a) $(a + b)(c + d)$ **(b)** $(2 + x)(3 + y)$ **(c)** $(a + 4)(b + 5)$

(d) $(p - q)(r - s)$ **(e)** $(1 - a)(7 - b)$ **(f)** $(c - 6)(d + 8)$

8. Multiply out the brackets:

(a) $x(x^2 + x - 1)$ **(b)** $3(2x^2 - 3x + 5)$ **(c)** $x(3x^2 - 5x + 8)$

(d) $2x(x^2 + 2x + 3)$ **(e)** $-5(x^2 - 8x + 2)$ **(f)** $x(x^2 - 4x - 7)$

9. Multiply out the brackets and simplify:

(a) $(x + 2)(x^2 + 3x + 1)$ **(b)** $(x + 5)(x^2 + 4x + 2)$

(c) $(x + 1)(x^2 + 5x + 4)$ **(d)** $(x + 3)(x^2 + x + 5)$

(e) $(x - 3)(x^2 - 2x + 5)$ **(f)** $(x - 6)(x^2 - 5x + 2)$

10. Multiply out the brackets and simplify:

(a) $(x + 5)(2x^2 + 4x + 9)$ **(b)** $(x - 3)(5x^2 + x + 6)$

(c) $(x - 2)(6x^2 - 5x + 7)$ **(d)** $(x + 7)(3x^2 + 9x - 2)$

(e) $(x - 4)(5x^2 - x - 8)$ **(f)** $(x + 1)(7x^2 - 2x + 11)$

(g) $(2x + 1)(3x^2 + 4x + 1)$ **(h)** $(3x + 4)(x^2 - 11x + 2)$

1.2b FACTORISING

1. Factorise by finding the common factor:

(a) $2a + 4b$ **(b)** $10x - 12y$ **(c)** $18m + 24n$ **(d)** $10c + 15d$

(e) $6a - 9x$ **(f)** $18s - 12t$ **(g)** $12x + 15y$ **(h)** $14a - 7b$

2. Factorise by finding the common factor

(a) $ax + ay$ **(b)** $xy^2 + xa^2$ **(c)** $pqr + pst$

(d) $xay - bac$ **(e)** $pq + p$ **(f)** $y^2 + y$

3. Factorise by finding the highest common factor:

(a) $2ax + 6a$ **(b)** $3y + 9y^2$ **(c)** $24a - 16ab$

(d) $pq^2 - pq$ **(e)** $12xy - 9xz$ **(f)** $6b^2 - 4b$

(g) $3a^2 + 27ah$ **(h)** $15abc + 20abd$ **(i)** $3s^3 - 9s^2$

4. Factorise the following expressions, which contain a difference of squares:

(a) $a^2 - b^2$ **(b)** $x^2 - y^2$ **(c)** $p^2 - q^2$ **(d)** $s^2 - t^2$

(e) $a^2 - 3^2$ **(f)** $x^2 - 2^2$ **(g)** $p^2 - 9^2$ **(h)** $c^2 - 5^2$

(i) $b^2 - 1$ **(j)** $y^2 - 16$ **(k)** $m^2 - 25$ **(l)** $a^2 - 9$

5. Factorise the following expressions, which contain a difference of squares:

(a) $a^2 - 4b^2$ **(b)** $x^2 - 25y^2$ **(c)** $p^2 - 64q^2$ **(d)** $16c^2 - d^2$

(e) $81 - 4g^2$ **(f)** $36w^2 - y^2$ **(g)** $4a^2 - 1$ **(h)** $g^2 - 81h^2$

(i) $49x^2 - y^2$ **(j)** $9c^2 - 16d^2$ **(k)** $4p^2 - 9q^2$ **(l)** $b^2 - 100c^2$

6. Factorise the following expressions which contain a common factor and a difference of two squares:

(a) $2a^2 - 2b^2$ **(b)** $5p^2 - 5$ **(c)** $45 - 5x^2$ **(d)** $4d^2 - 36$

(e) $2y^2 - 50$ **(f)** $4b^2 - 100$ **(g)** $3q^2 - 27$ **(h)** $8a^2 - 32b^2$

(i) $ab^2 - 64a$ **(j)** $xy^2 - 25x$ **(k)** $abc^2 - ab$ **(l)** $8p^2 - 50q^2$

7. Factorise the following quadratic expressions:

(a) $x^2 + 3x + 2$ **(b)** $a^2 + 2a + 1$ **(c)** $y^2 + 5y + 4$

(d) $x^2 + 8x + 7$ **(e)** $x^2 + 6x + 9$ **(f)** $b^2 + 8b + 12$

8. Factorise the following quadratic expressions:

(a) $a^2 - 8a + 15$ **(b)** $x^2 - 9x + 8$ **(c)** $c^2 - 9c + 18$

(d) $y^2 - 4y + 4$ **(e)** $b^2 - 6b + 5$ **(f)** $x^2 - 15x + 14$

9. Factorise the following quadratic expressions:

(a) $b^2 + 3b - 10$ **(b)** $x^2 + 6x - 7$ **(c)** $y^2 - y - 6$

(d) $a^2 - a - 20$ **(e)** $q^2 + 2q - 8$ **(f)** $x^2 - 8x - 20$

10. Factorise the following quadratic expressions:

(a)	$2x^2 - 7x + 3$	**(b)**	$2a^2 - 5a + 3$	**(c)**	$5p^2 - 17p + 6$
(d)	$5b^2 - 7b + 2$	**(e)**	$6x^2 - 7x + 2$	**(f)**	$4y^2 - 11y + 6$
(g)	$7c^2 - 29c + 4$	**(h)**	$4m^2 - 9m + 2$	**(i)**	$16a^2 - 10a + 1$

11. Factorise the following quadratic expressions:

(a)	$3x^2 - 2x - 1$	**(b)**	$2a^2 - a - 3$	**(c)**	$4p^2 - p - 3$
(d)	$2c^2 + 7c - 4$	**(e)**	$6y^2 - 11y - 2$	**(f)**	$3w^2 + 10w - 8$
(g)	$3m^2 + 2m - 5$	**(h)**	$4q^2 + 5q - 6$	**(i)**	$6b^2 + 7b - 20$

12. **Fully** factorise these expressions:

(a)	$3x^2 - 3$	**(b)**	$2p^2 + 12p + 10$	**(c)**	$9x^2 - 36$
(d)	$5x^2 + 25x + 30$	**(e)**	$ax^2 + 5ax + 6a$	**(f)**	$3y^2 - 12y - 15$
(g)	$15c^2 + 27c + 12$	**(h)**	$16b^2 + 28b + 6$	**(i)**	$9q^2 + 33q + 18$
(j)	$10s^2 - 35s + 15$	**(k)**	$8m^2 - 20m + 12$	**(l)**	$8a^2 - 36a + 36$
(m)	$4t^2 + 2t - 56$	**(n)**	$90d^2 - 60d - 80$	**(o)**	$400x^2 - 4$

1.2c SOLVING EQUATIONS and INEQUATIONS

1. Solve :

(a)	$2x - 3 = 5$	**(b)**	$4x + 5 = 9$	**(c)**	$3x + 3 = -12$	**(d)**	$5x + 2 = 7$
(e)	$2a - 2 = -14$	**(f)**	$5y + 3 = 18$	**(g)**	$2p + 7 = 21$	**(h)**	$3c - 4 = 17$
(i)	$8b - 7 = 57$	**(j)**	$10q - 8 = 72$	**(k)**	$3d - 5 = 31$	**(l)**	$9x - 1 = 80$
(m)	$4c - 9 = 15$	**(n)**	$6p - 2 = 40$	**(o)**	$5a - 2 = 73$	**(p)**	$3y - 14 = 40$

2. Multiply out the brackets and solve :

(a)	$2\,(x + 5) = 12$	**(b)**	$5\,(y + 7) = 45$	**(c)**	$3\,(a + 6) = 36$
(d)	$6\,(x + 4) = 54$	**(e)**	$4\,(x + 9) = 48$	**(f)**	$3\,(c + 8) = 30$

3. Solve :

(a) $6y + 3 = y + 18$ **(b)** $5a + 7 = a + 15$

(c) $9c + 5 = c + 21$ **(d)** $10x + 1 = 4x + 19$

(e) $5b + 3 = 2b + 9$ **(f)** $7n + 6 = 3n + 18$

(g) $7x - 14 = 3x + 2$ **(h)** $6c - 13 = 3c + 59$

4. Solve :

(a) $2x + 1 < 5$ **(b)** $4x + 1 > 9$ **(c)** $3x + 3 > 12$ **(d)** $5x + 2 > 12$

(e) $7a - 1 < 13$ **(f)** $5y - 2 < 23$ **(g)** $6p - 5 > 31$ **(h)** $4c - 7 > 25$

(i) $8b - 3 > 61$ **(j)** $10q - 7 < 73$ **(k)** $3d - 2 < 34$ **(l)** $9x - 8 > 73$

(m) $4c - 5 < 19$ **(n)** $6p - 1 < 41$ **(o)** $5a - 4 < 71$ **(p)** $3y - 24 < 30$

5. Solve each of the following inequations where x can only take values from the set of numbers ….. $\{-2, -1, 0, 1, 2, 3, 4, 5\}$.

(a) $6x + 2 \leq 3x + 5$ **(b)** $7x \geq 13x + 3$

(c) $3(2x + 1) \geq 5x + 8$ **(d)** $2(6 + 5x) < 8x + 12$

6. Solve each of the following inequations.

(a) $3a + 2 \leq 17 - 2a$ **(b)** $7(2x + 3) > 8x + 27$

(c) $2(5p - 12) \geq 7p - 18$ **(d)** $40 + 3k < 28 - k$

(e) $7(2 - d) \leq 2(d - 12)$ **(f)** $2(2y - 1) - 8 > 10(1 + y)$

(g) $4(3 - 4h) < 12 + h$ **(h)** $3(2 - y) > 2(1 + 3y) - 7$

7. I think of a <u>whole</u> number, treble it and subtract 3. The answer must be less than or equal to 12. Form an inequation and solve it to find the possible starting whole numbers.

8. I subtract a whole number from 8 and double the answer. The result must be greater than 10. Form an inequation and solve it to find the possible starting whole numbers.

9. Fred and Jane are brother and sister. Fred is 3 years older than twice Jane's age.

The sum of their ages is less than 36 years.

Taking Jane's age to be x years form an inequation. What can you say about Jane's age?

1.2d Changing the Subject of the Formula

1. Change the subject of each formula to c.

(a) $b = {}^1/_2\, c$ **(b)** $x = {}^1/_5\, c$ **(c)** $y = {}^1/_4\, c$

(d) $a = {}^1/_2\, c + 2$ **(e)** $h = {}^1/_3\, c - 5$ **(f)** $p = {}^1/_4\, c + q$

2. Change the subject of each formula to x.

(a) $y = \dfrac{3}{x}$ **(b)** $d = \dfrac{c}{x}$ **(c)** $m = \dfrac{y}{x}$

(d) $s = \dfrac{a+2}{x}$ **(e)** $a = \dfrac{x+8}{9}$ **(f)** $k = \dfrac{x-5}{2}$

(g) $y = \dfrac{2}{x} + 1$ **(h)** $z = \dfrac{6}{x} - 7$ **(i)** $h = \dfrac{m}{x} + k$

3. Change the subject of each formula to k.

(a) $y = \sqrt{k}$ **(b)** $x = \sqrt{k}$ **(c)** $c = \sqrt{\dfrac{k}{d}}$

(d) $h = \sqrt{\dfrac{k}{g}}$ **(e)** $s = \sqrt{\dfrac{t}{k}}$ **(f)** $r = k^2$

(g) $ab = k^2$ **(h)** $\dfrac{p}{q} = k^2$ **(i)** $y = x + k^2$

4. Change the subject of each formula to the letter shown in brackets.

(a) $v^2 = u^2 + 2as$ (s) **(b)** $v^2 = u^2 + 2as$ (u)

(c) $V = \pi r^2 h$ (h) **(d)** $V = \pi r^2 h$ (r)

(e) $r = \sqrt{\frac{A}{\pi}}$ (A) **(f)** $L = 3 + \sqrt{6a}$ (a)

(g) $2k = \sqrt{(p+4)}$ (p) **(h)** $x^2 = \frac{4yz}{t}$ (y)

1.2e CHANGING the SUBJECT of a FORMULA EXAM QUESTIONS

1. Change the subject of the formula to c.

$$ab = \frac{1}{2}\sqrt{\frac{x}{c^2}}$$

2. The formula for the velocity that a body must have to escape the gravitational pull of Earth is

$$V = \sqrt{2gR}$$

Change the subject of the formula to g.

3. For the formula given below, change the subject to x

$$A^2 = \sqrt{x} + 5$$

4. The formula for kinetic energy is

$$E = \tfrac{1}{2}mv^2$$

Change the subject of the formula to v.

5. Change the subject of the formula to a:

$$V = 3a^2b$$

6. Change the subject of the formula to k.

$$T = 2\pi\sqrt{\frac{m}{k}}$$

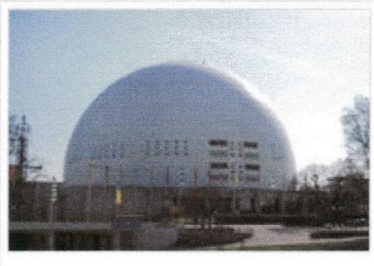
7. A formula to convert temperature from degrees Celsius to degrees Farenheit is

$$F = \frac{9}{5}C + 32$$

Change the subject of the formula to C.

1.3a VOLUME OF SOLIDS

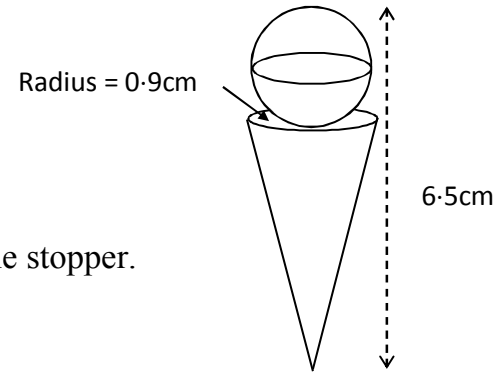
1. The Stockholm Globe Arena is the largest hemispherical building in the world.



The radius of the building is 110 m.

Calculate the volume of the building in cubic metres, giving your answer in scientific notation correct to 3 significant figures.

2. A metal bottle stopper is made up from a cone topped with a sphere.



The sphere has diameter 1·5cm.

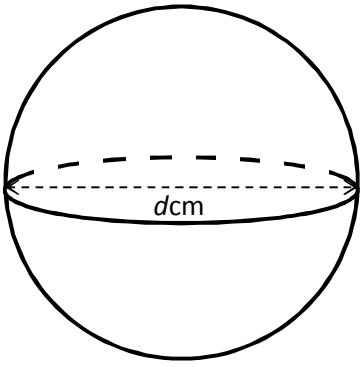
The cone has radius 0·9cm.

The overall length of the stopper is 6·5cm.

Calculate the volume of metal required to make the stopper.
Give your answer correct to 3 significant figures.

3. The volume of this sphere is 524cm^3.

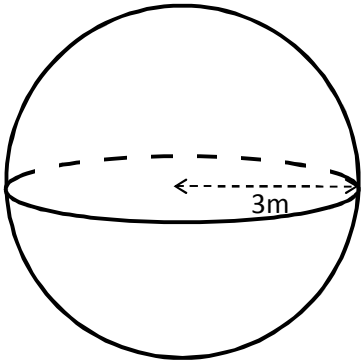
Calculate the diameter, d cm.



4. Non Calculator!

Calculate the volume of this sphere which has radius 3m.

[Take $\pi = 3 \cdot 14$]



5. Sherbet in a sweet shop is stored in a cylindrical container like the one shown in *diagram 1*.

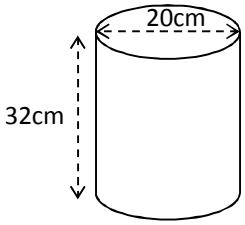


Diagram 1

The volume of the cylinder, correct to the nearest 1000cm^3, is $10\,000\ \text{cm}^3$.

The sherbet is sold in conical containers with diameter 5 cm as shown in *diagram 2*.

250 of these cones can be filled from the contents of the cylinder.

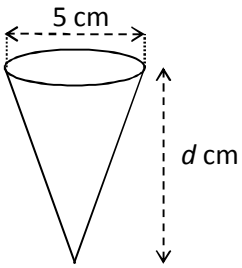


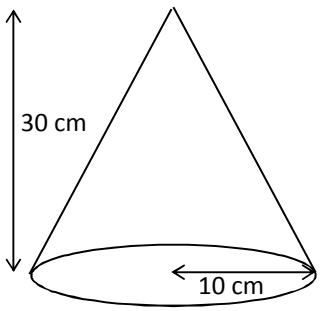
Diagram 2

Calculate the depth, *d* cm, of a sherbet cone.

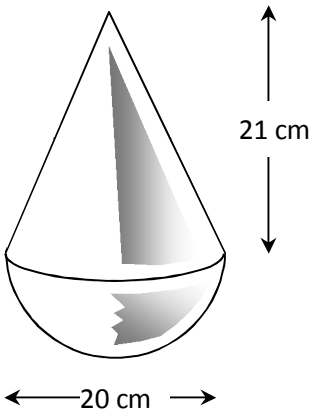
6. Non Calculator!

The diagram shows a cone with radius 10 centimetres and height 30 centimetres.

Taking $\pi = 3 \cdot 14$, calculate the volume of the cone.



7.

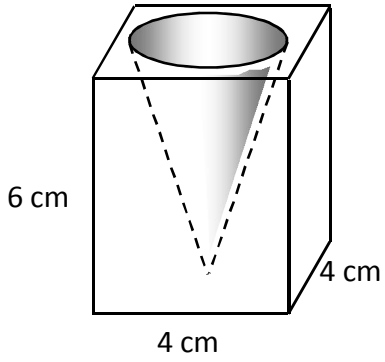


A children's wobbly toy is made from a cone, 21 cm high, on top of a hemispherical base of diameter 20 cm.

The toy has to be filled with liquid foam.

Calculate the volume of foam which will be required.

8.



A glass candle holder is in the shape of a cuboid with a cone removed. The cuboid measures 4cm by 4cm by 6cm.

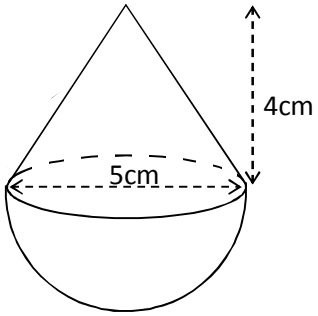
The cone has a diameter of 3cm and a height of 5cm.

Calculate the volume of glass in the candle holder.

9. For the Christmas market a confectioner has created a chocolate Santa.

It consists of a solid hemisphere topped by a solid cone.

Both have diameter 5cm and the height of the cone is 4cm as shown in the diagram.



Calculate the volume of chocolate required to make one chocolate

Santa, giving your answer correct to 3 significant figures.

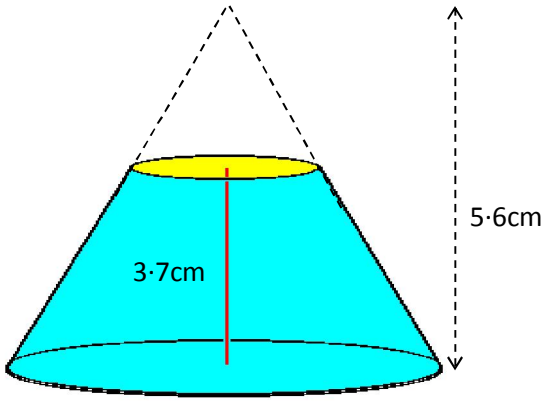
10. The diameter of an ordinary snooker ball is 5·25cm.

Calculate the volume of a snooker ball giving your answer correct to 3 significant figures.

11. A dessert is in the shape of a truncated cone [a cone with a 'slice' taken from the top].

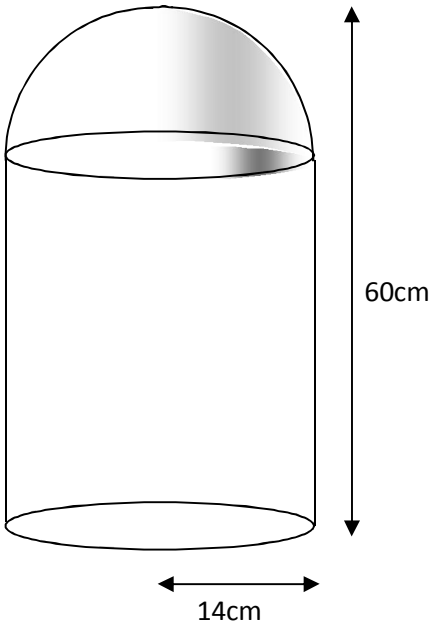
The radius of the base is 4·1cm and is 1·6 cm at the top.

The other dimensions are shown in the diagram.



Calculate the volume of the dessert.

12. A company that produces bins uses the design of a cylindrical base with a hemispherical lid.



If the total height of the bin is 60cm and the radius of the bin is 14cm, calculate the total volume of the bin in litres correct to 3 significant figures.

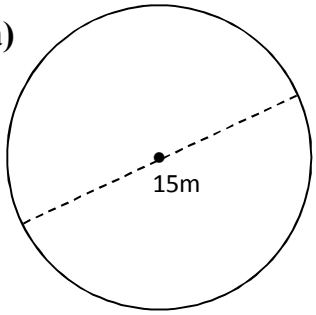
(Volume of cylinder = $\pi r^2 h$;

Volume of sphere = $^4/_3\pi r^3$)

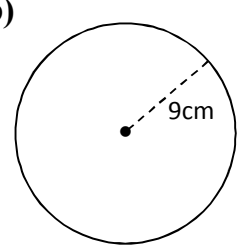
1.4a The Circle – Area and Circumference Revision

1. Calculate the CIRCUMFERENCES of these circles:

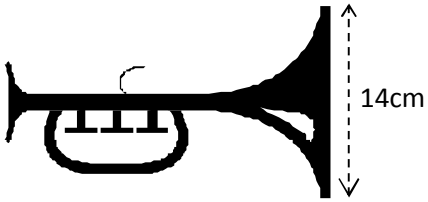
(a)



(b)



2.



The diameter of the 'bell' on the end of a trumpet measures 14 cm. Calculate its circumference.

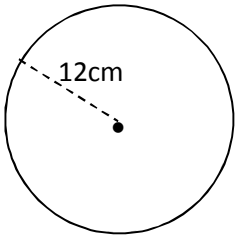
3. Calculate the circumference of the circle drawn with these compasses.

4. Linzi's Mum buys a frill of length 38cm to fit round her birthday cake.

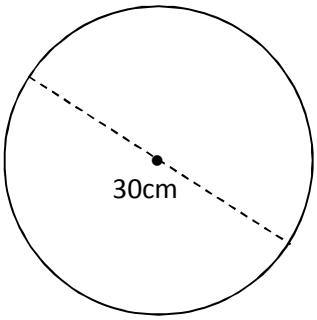
Find out the biggest diameter that the cake can have so that the frill fits.

5. Calculate the area of these circles:

(a)

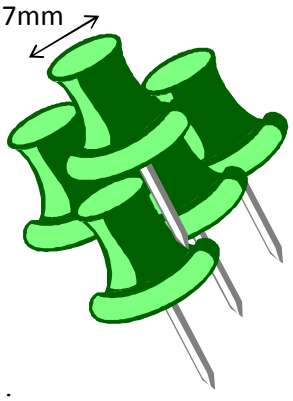


(b)

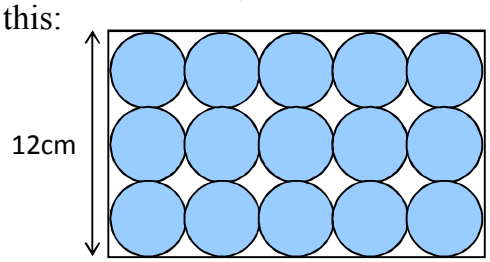


6. The diameter of the top of a pin is 7mm.

Calculate the total area of the tops of 5 of them.



7. Tea-light candles have to be packed into a box like this:



(a) What is the area of 1 tea light?

(b) Calculate the total area taken up by the 15 tea lights on the tray.

(c) What is the area of the top of the tray?

(d) What percentage of space on the tray is **NOT** taken up by the tea lights?

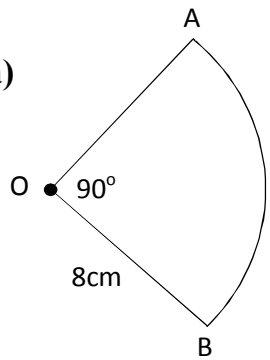
8. The weights at the end of these balloons each have an area of $20cm^2$.

Calculate their radius and then the circumference.

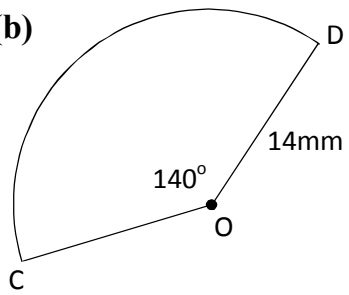
1.4b The Circle – Length of Arcs and Area of Sectors

1. Calculate the length of the arc in each diagram below, giving your answer to 1d.p.

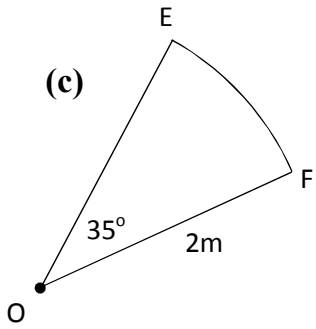
(a)



(b)

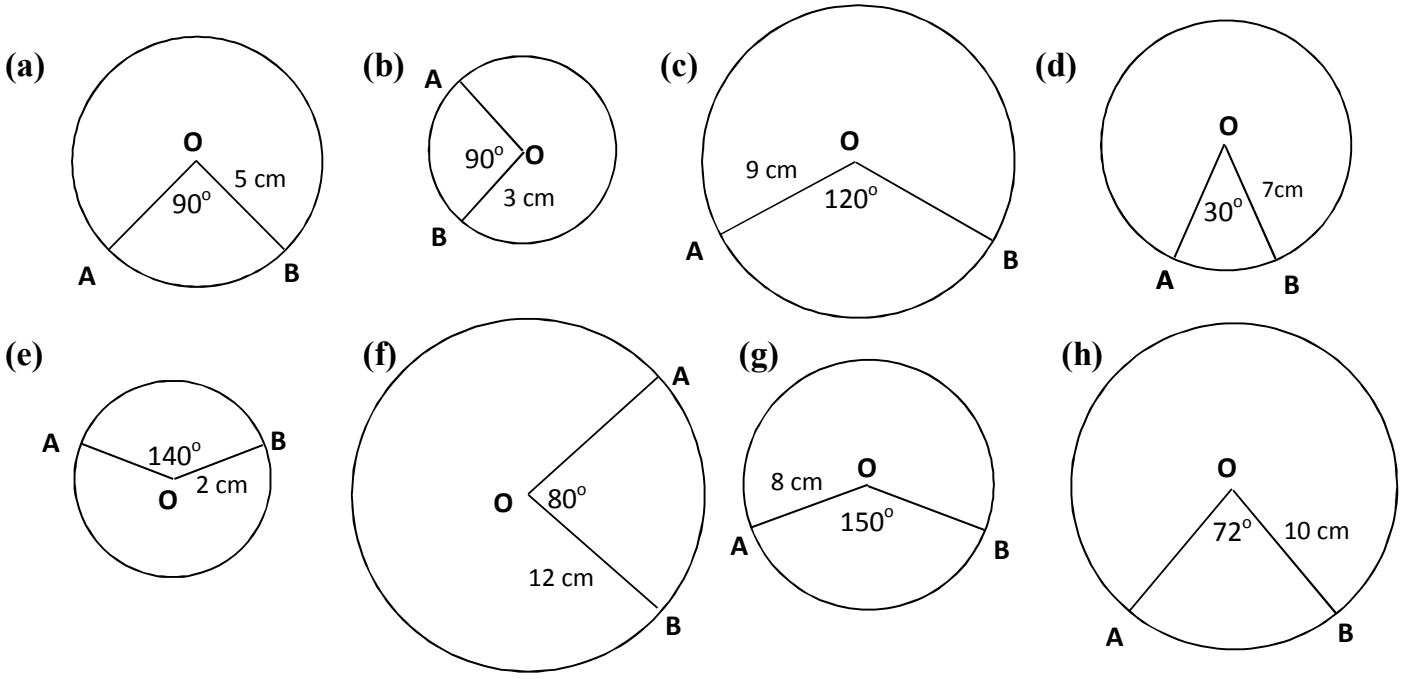


(c)



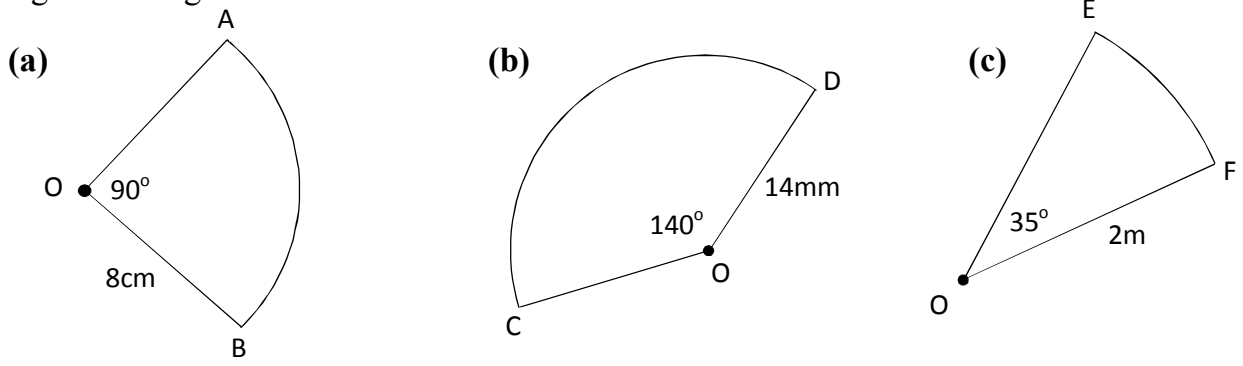
2. Calculate the perimeter of each sector in Question 1. Giving your answers to 1 d.p.

3. Find the length of the minor arc AB in each of the following circles, giving your answers correct to 1 d.p.



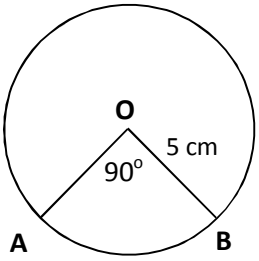
4. Calculate the length of the major arc in the circles shown in Question 3, giving your answers correct to 1 d.p.

5. Calculate the area of the sector in each diagram below, giving your answer correct to 3 significant figures.

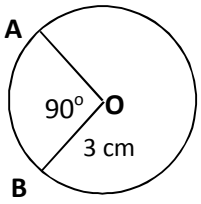


6. Calculate the area of minor sector OAB in the circles shown below, giving your answers correct to **3 significant figures**.

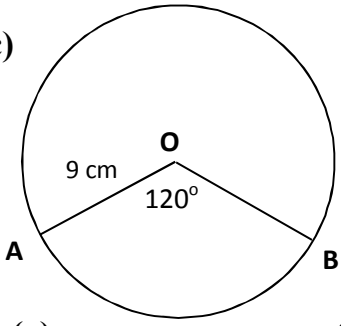
(a)



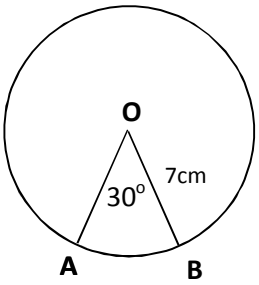
(b)



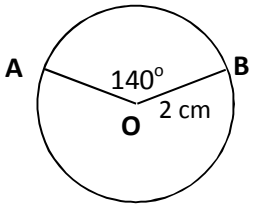
(c)



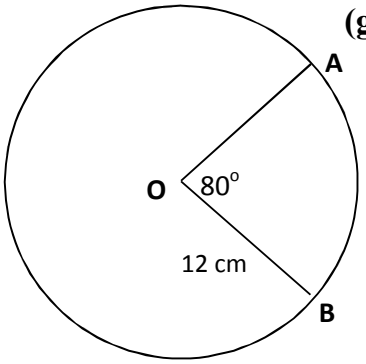
(d)



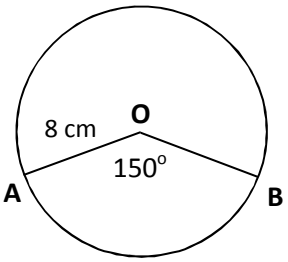
(e)



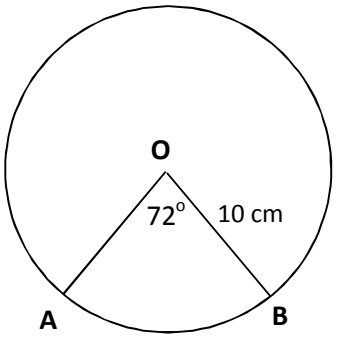
(f)



(g)



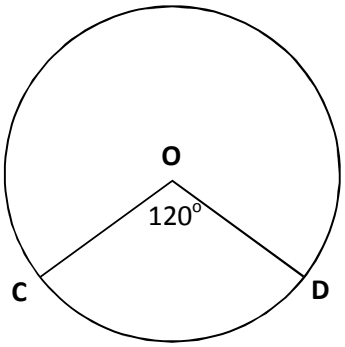
(h)



7. Calculate the area of the major sector for the circles in Question 2, giving your answers correct to 3 significant figures.

8. The length of minor arc CD is 7·33 cm.

Calculate the area of the circle.

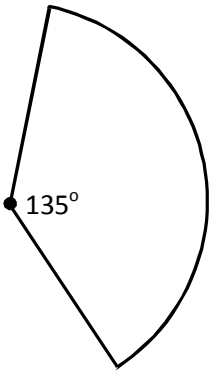


1.4c ARCS and SECTORS of a CIRCLE EXAM QUESTIONS

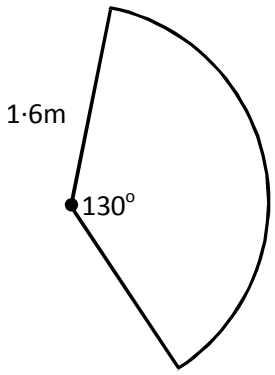
Give your answers correct to 3 significant figures unless otherwise stated.

1. Calculate the area of the sector shown in the diagram,

given that it has radius 6·8cm.



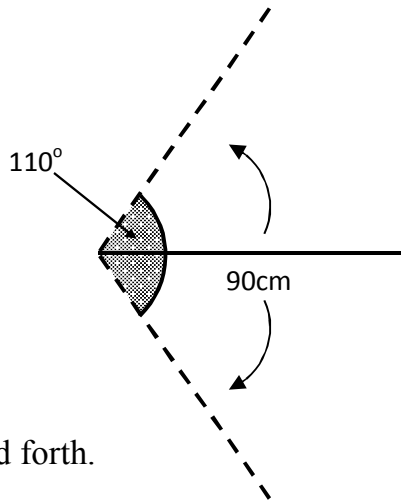
2. A table is in the shape of a sector of a circle with radius 1·6m.



The angle at the centre is 130° as shown in the diagram.

Calculate the perimeter of the table.

3. The door into a restaurant kitchen swings backwards and forwards th



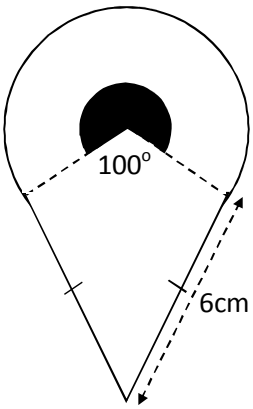
The width of the door is 90cm.

Calculate the area swept out by the door as it swings back and forth.

4. The YUMMY ICE CREAM Co uses this logo.

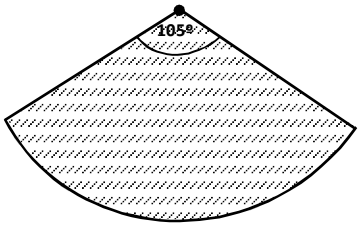
It is made up from an isosceles triangle and a sector of a circle as shown in the diagram.

- The equal sides of the triangle are 6cm
- The radius of the sector is 3·3cm.



Calculate the perimeter of the logo.

5. A sensor on a security system covers a horizontal area in the shape of a sector of a circle of radius 3·5m.



The sensor detects movement in an area with an angle of 105º.

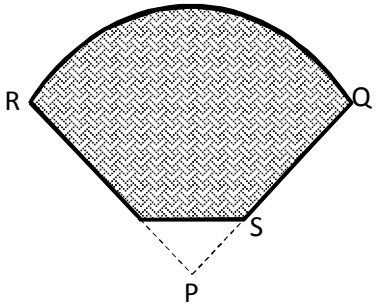
Calculate the area covered by the sensor.

6. A biscuit is in the shape of a sector of a circle with triangular part removed as shown in the diagram.

The radius of the circle, PQ, is 7 cm and PS = 1·5 cm.

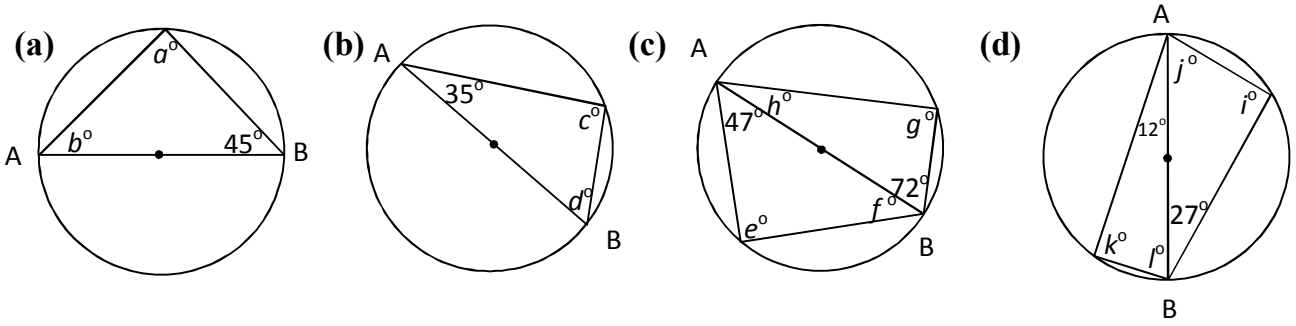
Angle QPR = 80º.

Calculate the area of the biscuit.

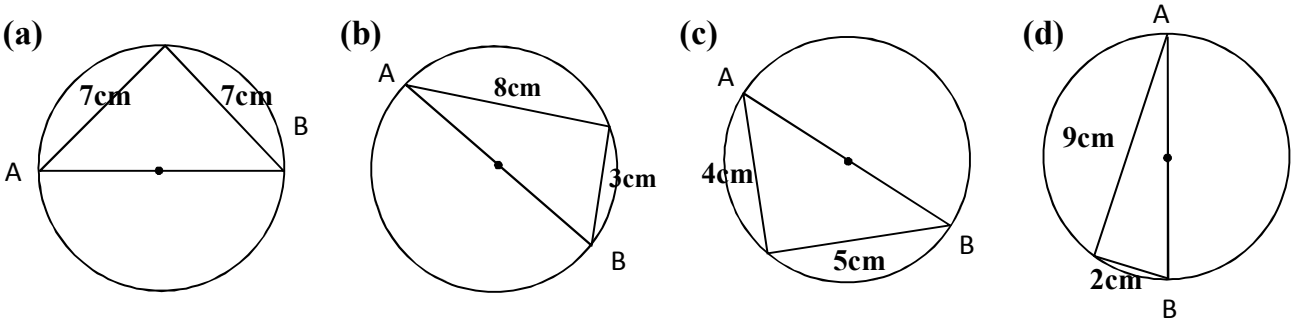


1.4d Angles in a Circle

1. In each of the diagrams below AB is a diameter. Find the missing angles in each diagram.

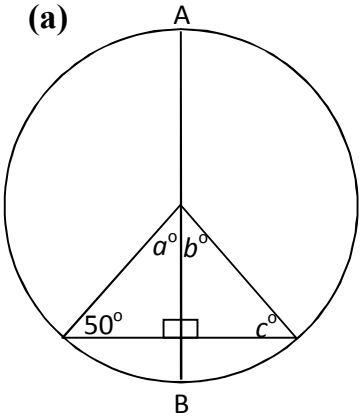


2. Find the length of the diameter AB in each of the circles below, given the other 2 sides of the triangle.

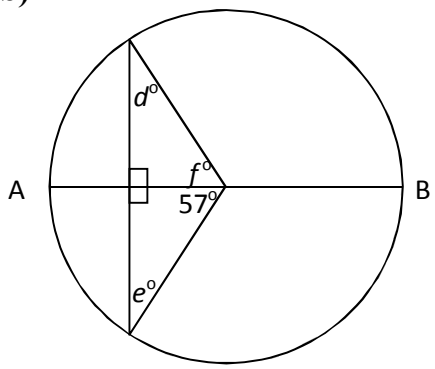


3. Use the symmetry properties of the circle to find the missing angles in the diagrams below. In each diagram AB is a diameter.

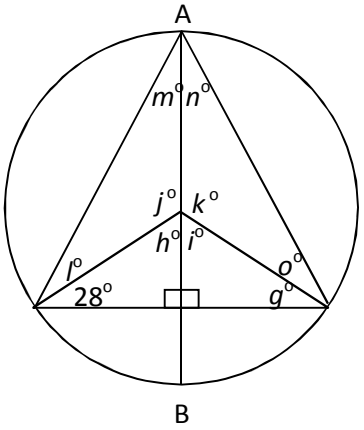
(a)



(b)

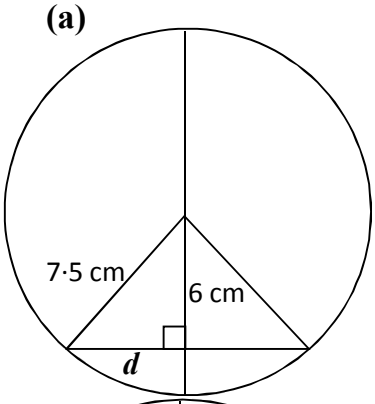


(c)

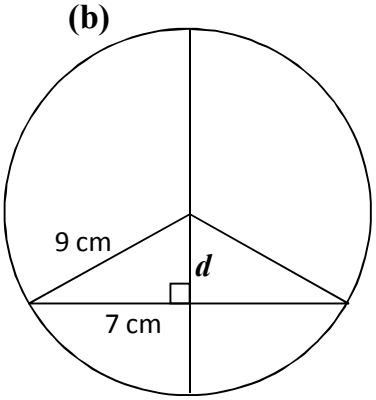


4. Calculate the length of ***d*** in each diagram.

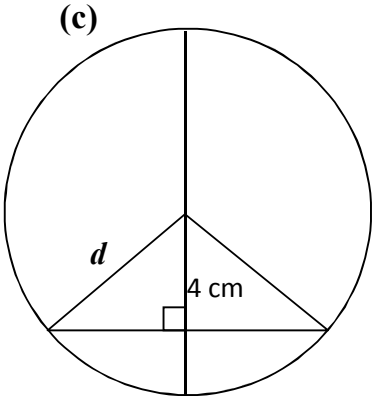
(a)



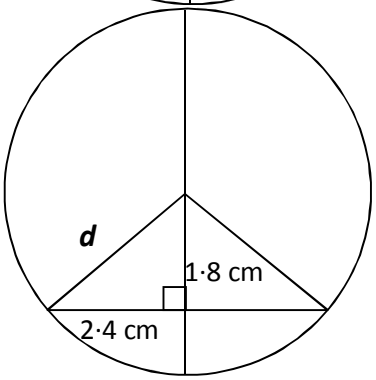
(b)



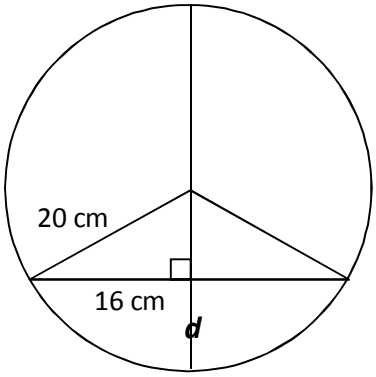
(c)



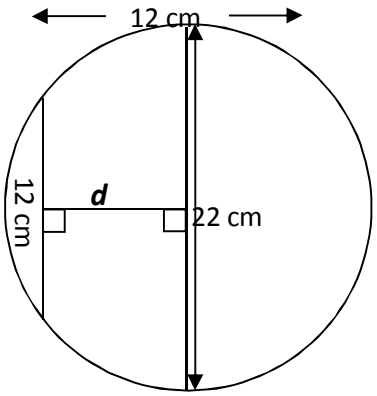
(d)



(e)

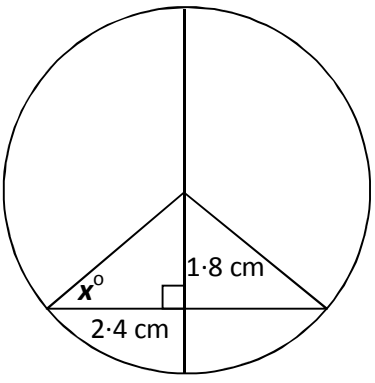


(f)

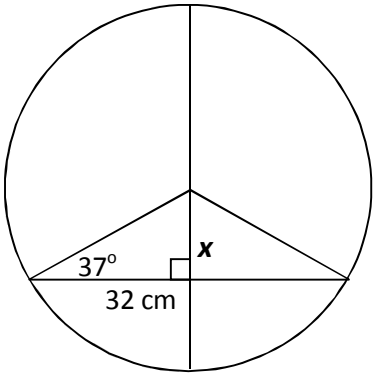


5. Find ***x*** in each of the triangles below.

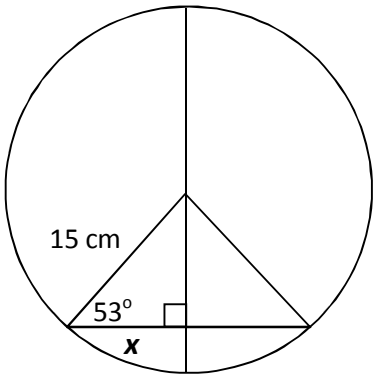
(a)



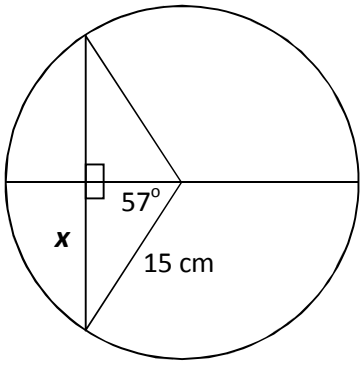
(b)



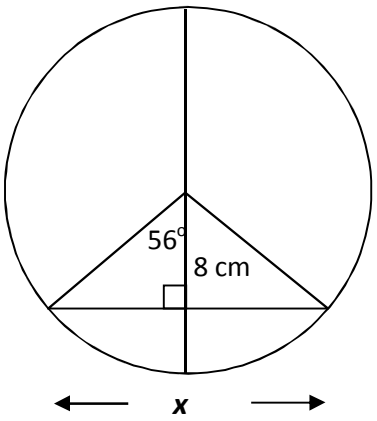
(c)



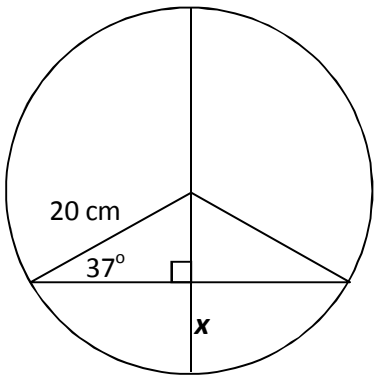
(d)



(e)

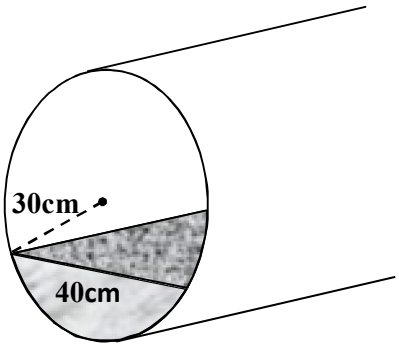


(f)



6. A cylindrical pipe is used to transport water underground.
The radius of the pipe is 30 cm and the width of the water surface is 40 cm.

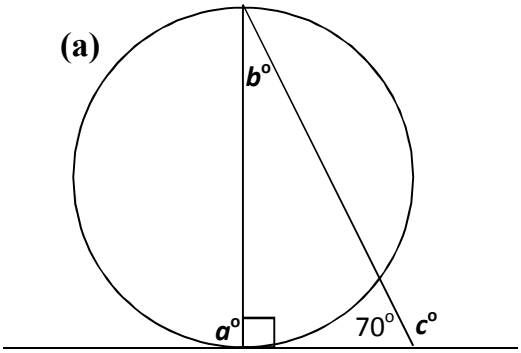
Calculate the height of the pipe above the water.



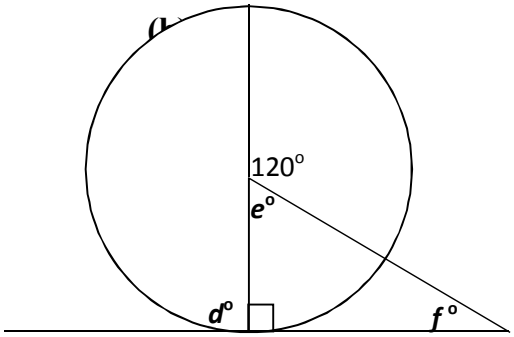
1.4e TANGENTS TO A CIRCLE

1. Calculate the sizes of the angles marked ***a***, ***b***, ... ***r***, in the diagrams below.

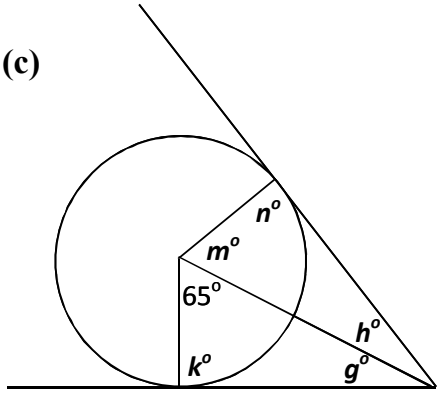
(a)



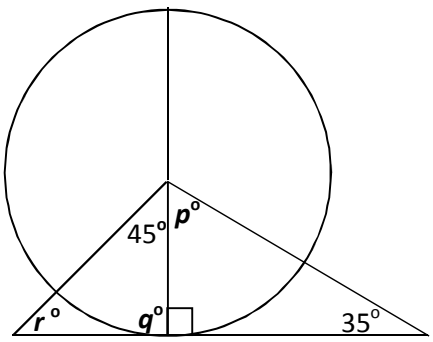
(b)



(c)



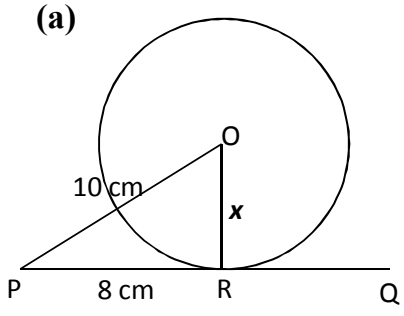
(d)



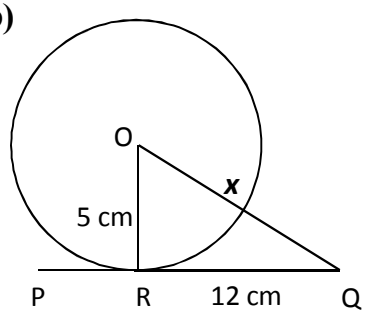
2. In each of the diagrams below, PQ is a tangent which touches the circle at R.

Calculate the lengths of the lines marked ***x***.

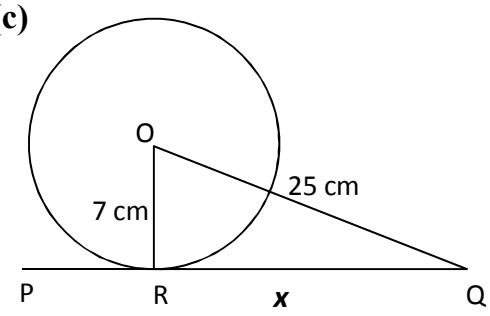
(a)



(b)



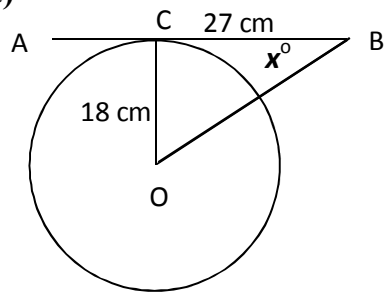
(c)



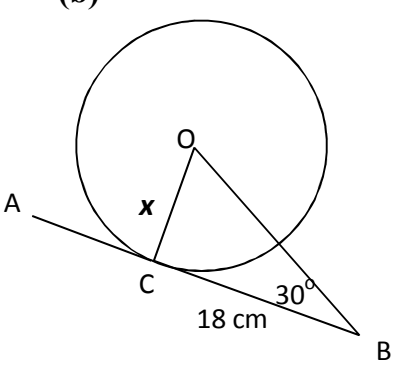
3. In each of the diagrams below, AB is a tangent which touches the circle at C.

Calculate ***x*** for each diagram.

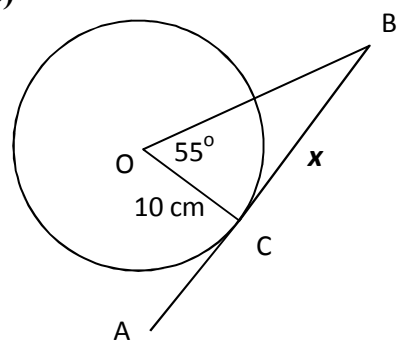
(a)



(b)

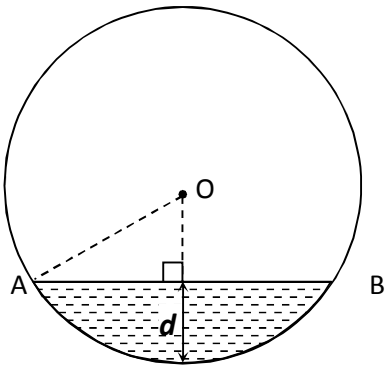


(c)



1.4f THE CIRCLE — EXAM QUESTIONS

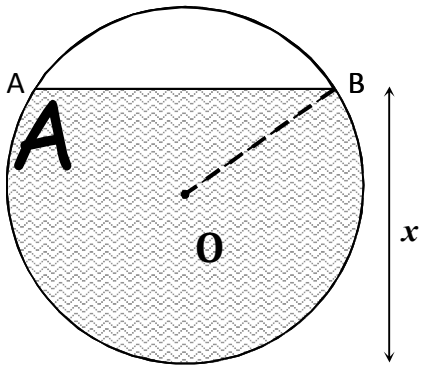
1. The diagram shows a section of a cylindrical drain whose **diameter** is 1 metre. The surface of the water in the drain AB is 70 cm.



(a) Write down the length of OA.

(b) Calculate the depth of water in the pipe, ***d***. (Give your answer to the nearest cm.)

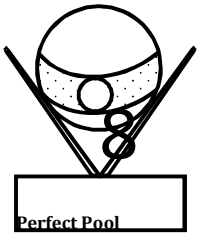
2. The diagram shows a section of a disused mineshaft whose diameter is 2 metres. The surface of the water in the shaft, AB, is 140 cm.

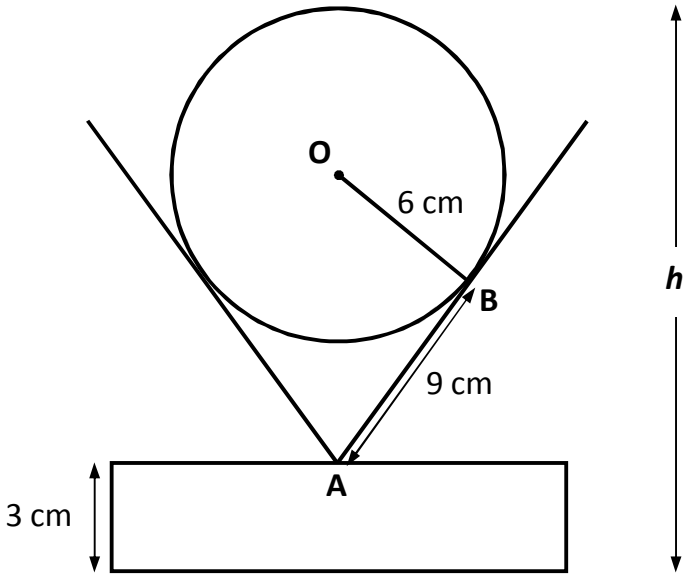


(a) Write down the length of OB.

(b) Calculate the depth of water in the pipe, ***x***. (Give your answer to the nearest cm.)

3. A pool trophy is in the shape of a circular disc with two pool cues as tangents to the circle.

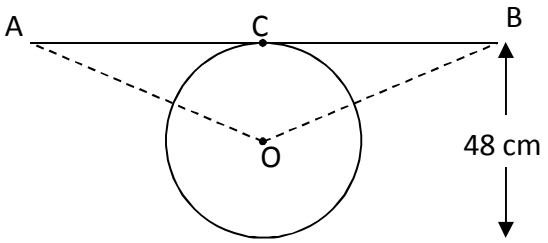




The radius of the circle is 6 cm and the length of the tangent to the point of contact (AB) is 9 cm.
The base of the trophy is 3 cm.

Calculate the total height of the trophy, ***h***, to the nearest centimetre.

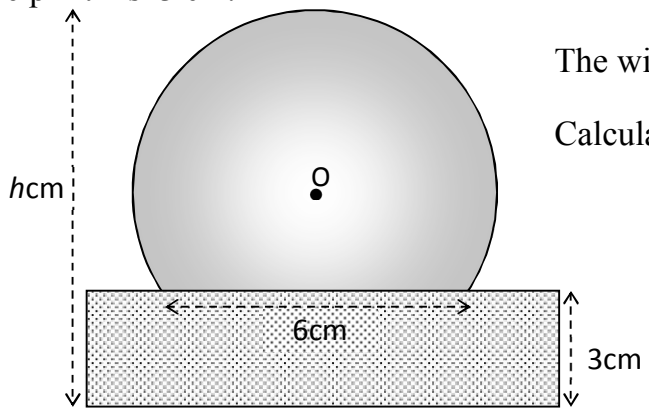
4. A circular bathroom mirror, diameter 48 cm, is suspended from the ceiling by **two** equal wires from the centre of the mirror, O.



The ceiling, AB, is a tangent to the circle at C. AC is 45 cm.

Calculate the total length of wire used to hang the mirror.

5. A bowling trophy consists of a glass circle set into a rectangular wooden plinth as shown in the diagram. The diameter of the circle, centre O, is 8cm and the height of the plinth is 3 cm.

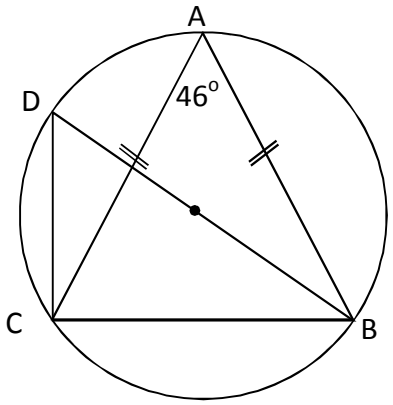


The width of the glass at the plinth is 6cm.

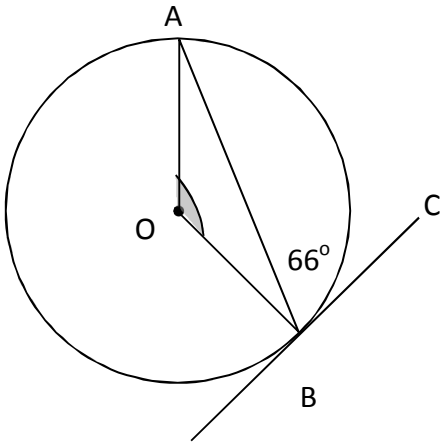
Calculate the height, h cm, of the trophy.

6. In the diagram triangle ABC is isosceles and BD is a diameter of the circle.

Calculate the size of angle ACD.



7.

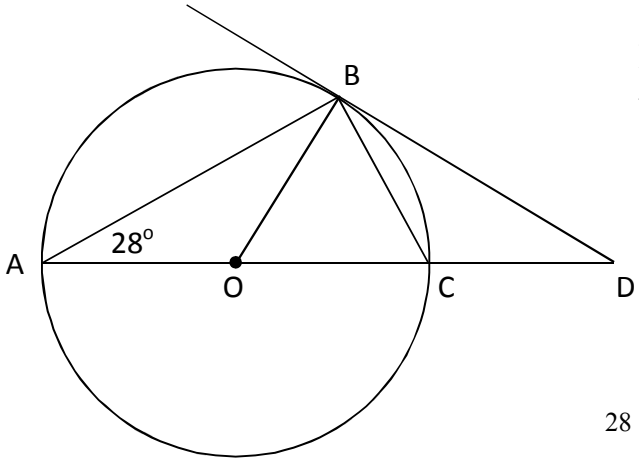


A and B are points on the circumference of a circle centre O. BC is a tangent to the circle.

Angle ABC = 66°.

Calculate the size of angle AOB.

8.

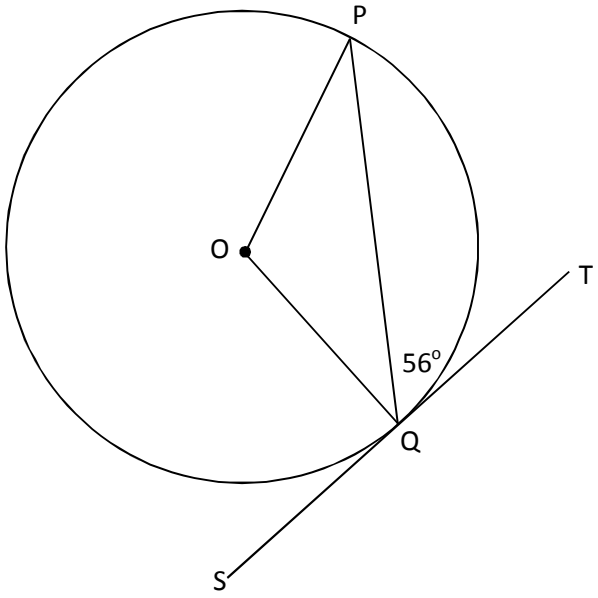


In the diagram shown, BD is a tangent to the circle centre O.

Angle BAC = 28°.

Calculate the size of angle CBD.

9. The diagram shows a circle with centre O. ST is a tangent to the circle with point of contact Q. $\angle PQT = 56^o$.

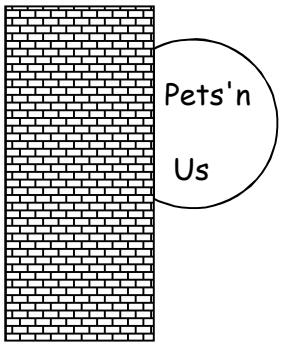


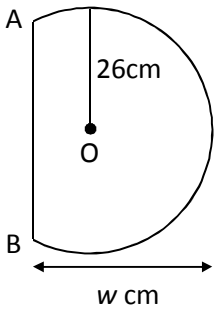
(a) Calculate the size of $\angle POQ$.

(b) Hence calculate the length of the major arc PQ given that the radius of the circle is 14cm.

10. The sign outside a pet shop is formed from part of a circle.

The circle has centre O and radius 26cm.





Given that the line AB = 48cm, calculate the width, *w* cm, of the sign.

1.5 STATISTICS

1. For each of the data sets below find the median, lower quartile, upper quartile and interquartile range. Construct a box plot to display this information.

(a)	2	4	4	6	7	8	10	14	15			
(b)	29	30	32	33	34	37	40					
(c)	17	19	20	22	23	25	26					
(d)	0	0	0	1	1	2	2	2	3	3	4	
(e)	1·8	1·8	2·8	2·9	4·0	4·0	4·0	4·7	5·1	5·2	5·3	
(f)	0·13	0·18	0·18	0·19	0·25	0·26	0·29	0·29	0·30	0·31	0·33	0·39
(g)	133	136	136	138	140	141	143	145				
(h)	371	375	376	379	380	384	385	387	389	390		
(i)	57	58	58	60	63	67	67	69	82	85	86	90
(j)	11	11	11	12	13	14	15	15	16	18	20	

2. For each of the data sets below find the median, lower quartile, upper quartile and interquartile range.

(a)	47	56	58	48	60	65	50	52	61	53	63	
(b)	12	20	27	15	35	16	26	34	38	24	26	
(c)	149	165	154	167	170	179	151	168	158			
(d)	1	8	3	1	2	5	3	1	4	3	2	
(e)	108	114	132	95	144	120	116	125	172	188	155	160
(f)	65	74	59	43	63	52	48	63	67	85	92	48
(g)	190	165	174	187	166	172	184	190	166	183	180	
(h)	325	363	347	359	314	329	364	372	301	317	346	
(i)	0·5	1·3	0·4	1·0	0·9	1·4	0·8	0·9	1·1	0·6		
(j)	10	13	11	11	20	10	10	14	50	10	11	10