Q1.

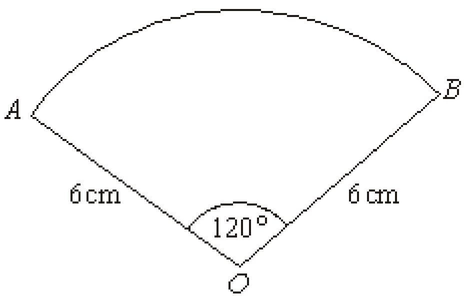


Diagram **NOT** accurately drawn

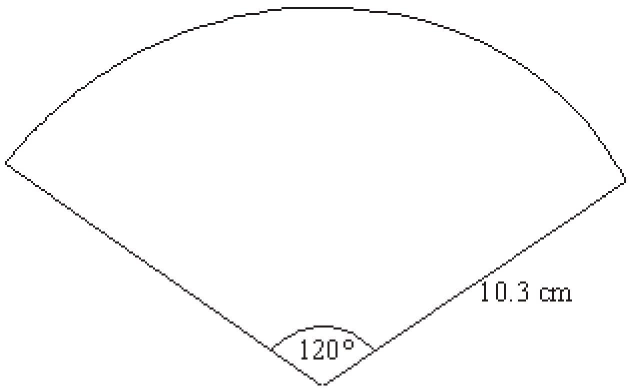
The diagram shows a sector of a circle, centre O.
The radius of the circle is 6 cm.
Angle AOB = 120°.

Work out the **perimeter** of the sector.
Give your answer in terms of π in its simplest form.

.... cm
(Total 3 marks)

Q2.

Diagram **NOT** accuartely drawn



The diagram shows a net.
The net is a sector of a circle.
The radius of the circle is 10.3 cm and the angle at the centre of the circle is 120º.

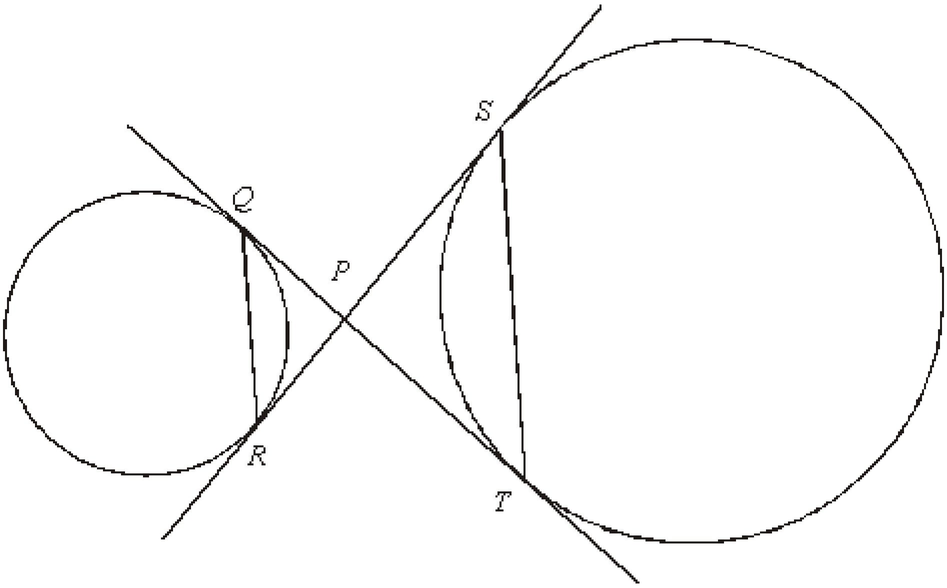
The net is used to make a cone.

Calculate the vertical height of the cone.
Give your answer correct to 3 significant figures.

.... cm

(Total 4 marks)

Q3.



Q and *R* are two points on the circumference of a circle.
S and *T* are two points on the circumference of another circle.

QT and *SR* are tangents to both circles.
P is the point of intersection of the two tangents.

Prove that *QR* is parallel to *ST*.

(Total 5 marks)

Q4.

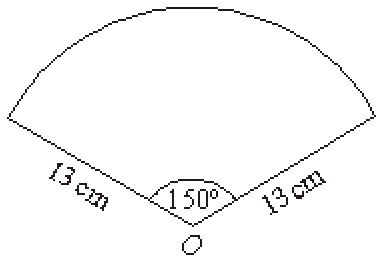


Diagram **NOT** accurately drawn

The diagram shows a sector of a circle, centre *O*.
The radius of the circle is 13 cm.
The angle of the sector is 150°.

Calculate the area of the sector.
Give your answer correct to 3 significant figures.

.... cm^2

(Total 2 marks)

Q5.

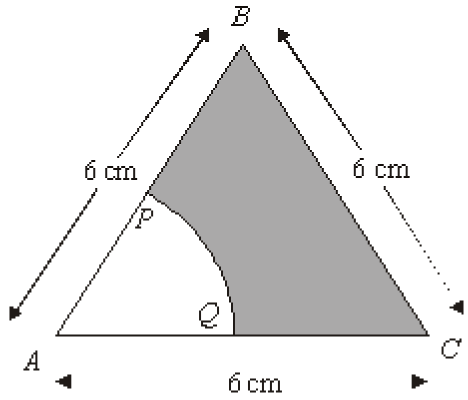


Diagram **NOT** accurately drawn

The diagram shows an equilateral triangle ABC with sides of length 6 cm.

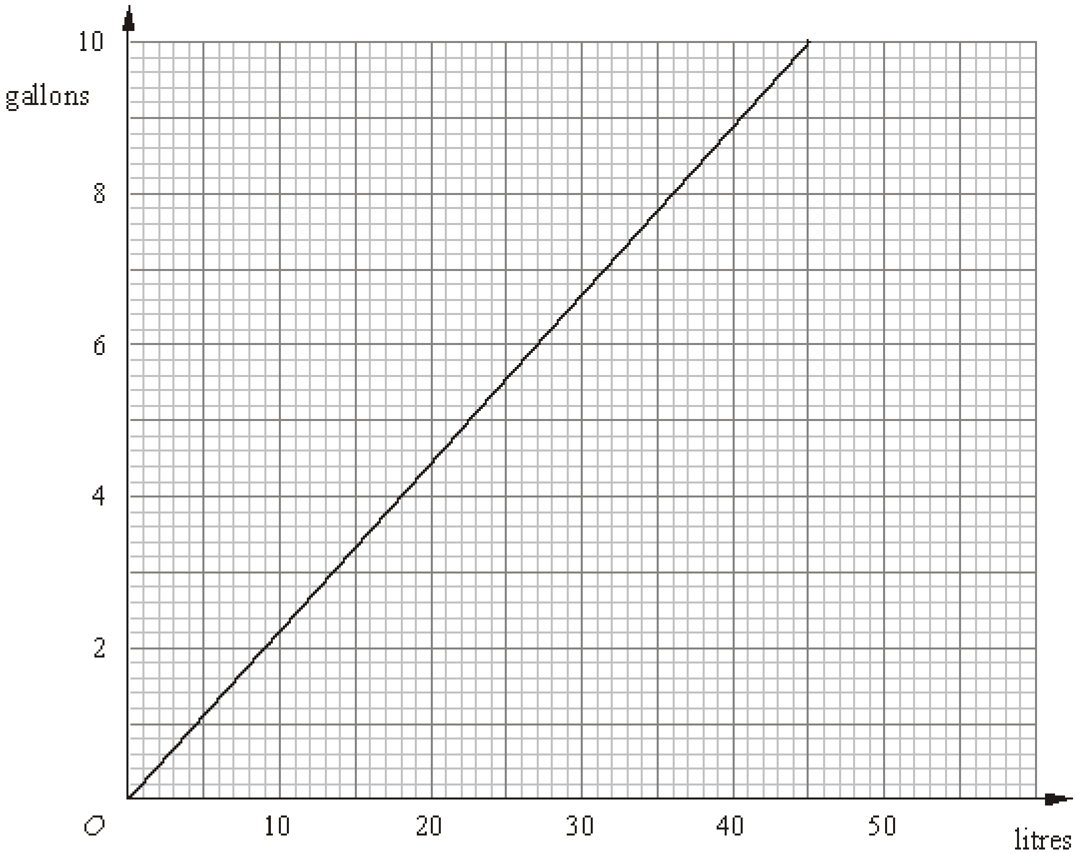
P is the midpoint of AB.
Q is the midpoint of AC.
APQ is a sector of a circle, centre A.

Calculate the area of the shaded region.
Give your answer correct to 3 significant figures.

.... cm^2

(Total 4 marks)

Q6. The graph can be used to convert between gallons and litres.



The diagram shows a central heating oil tank.

The oil tank is in the shape of a cylinder of length 180 cm and radius 60 cm.

The oil tank contains 200 gallons of oil.

(a) Is the oil tank more or less than $\frac{1}{2}$ full?

....

(5)

The oil has a density of 0.85 g/cm^3.

(b) Work out, in kg, the mass of the oil in the tank.

.... kg

(3)
(Total 8 marks)

M1.

Working	Answer	Mark	Additional Guidance
$\frac{120}{360} \times \pi \times 2 \times 6$	$4\pi + 12$	3	**M1** for $\frac{120}{360} \times \pi \times 2 \times 6$ oe allow 3.14, 3.142, $\frac{22}{7}$ for π **A1** for 4π or anything in the closed interval [12.56, 12.57], or $12\frac{4}{7}$ oe or $\frac{a\pi}{b}$ where a and b are integers with $a = 4b$ **A1** $4\pi + 12$ or $\pi 4 + 12$ oe SC (**B2** for a fully correct, but unsimplified expression for the perimeter, including $\left(\frac{2\pi r}{3}\right) + 12$ or $\left(\frac{2\pi r}{3}\right) + 2r$ Or for any value in the closed interval [24.56, 24.57])
			Total for Question: 3 marks

M2.

Working	Answer	Mark	Additional Guidance

$\frac{120}{360} \times 2\pi \times 10.3 = 21.572$ "21.572"$\div 2\pi = 3.4333$ $\sqrt{(10.3^2 - 3.433^2)}$	9.71	4	

	Total for Question: 4 marks

M3.

	Working	Answer	Mark	Additional Guidance
QWC (i, ii, iii)	PS = PT and PQ = PR (equal tgts from a point) Let angle SPT = x	Proof	5	**B1** for PS = PT or PQ = PR **B1** for equal tangents from a point

Total for Question: 5 marks

M4.

Working	Answer	Mark	Additional Guidance
$\frac{150}{360} \times \pi \times 13^2$ $= 0.41\dot{6} \times 530.9291585\ 360$ $= 221.22\ldots$	221	2	**M1** for $\frac{150}{360} \times \pi \times 13^2$ or $\pi \times 13^2 \div 2.4$ oe **A1** 220 – 222
Total for Question: 2 marks			

M5.

Working	Answer	Mark	Additional Guidance
$\frac{1}{2} \times 6 \times 6 \times \sin 60$ $- \frac{60}{360} \times \pi \times 3^2$ $= 15.588 - 4.712$	10.8 – 10.9	4	**M1** for $\frac{1}{2} \times 6 \times 6 \times \sin 60$ or for $0.5 \times 6 \times \sqrt{6^2 - 3^2}$ or 15.5 – 15.6 or 14.5 – 14.6 or ±5.48(65...) **M1** for $\frac{60}{360} \times \pi \times 3^2$ (= 4.712…) **M1** (dep on 1 previous M1) for ‘area of triangle’ – ‘area of sector’ **A1** for 10.8 – 10.9 SC: B3 for 10.1 – 10.2 or 9.84 – 9.85
Total for Question: 4 marks			

M6.

		Working	Answer	Mark	Additional Guidance
FE	(a)	1 gallon = 4.54 litres, 200 gallons = 908 litres = 908000 cm^3 Vol of tank $60^2 \times x\ \pi \times 180 =$ 2035752.04..cm^3 908000 < 1017876.02 **OR** Vol of tank $60^2 \times \pi \times 180 =$ 2035752.04..cm^3 Half vol of tank = 1017876.02 cm^3 = 1017.876…litres 1017.876 ÷ 4.54 = 224 gallons 224 > 200	No	5	Response may convert into gallons, litres, or cm^3 Calculations may be performed in different orders **M1** Using formulae to find volume of tank **B1** Converts between litres and cubic centimetres **M1** reads off graph for 1l, 2l , 4l, 5l or 10 litres within tolerance (4.4 – 4.6) **A1** Answer in cm^3, litres or gallons **C1** Decision and reason **QWC: Decision should be stated, with appropriate supporting statement**
	(b)	"908000" cm^3 × 0.85 g/cm^3 = 771800 g	771.8	3	**M1** "908000" × 0.85 **M1**(dep) 771800 ÷ 1000 **A1** 770 – 772
Total for Question: 8 marks					

E1. The sector is, of course, in this case one third of its circle so the fraction demand was reasonable for a higher tier paper, although some candidates assumed it was a quarter of a circle.. Many candidates used the area formula and thus scored no marks. Of those that used the correct formula many could not simplify completely the expression for the arc length. Those that did get the arc length, did, however often go on to add 12 to get an expression for the perimeter although a few spoiled things at the end by writing $12 + 4\pi = 16\pi$.

E4. The most common successful approach was to multiply πR^2 by 150/360, although a few candidates did the equivalent by dividing by 2.4. Common errors included assuming the sector was one third of a circle or just working out the area of a circle. Some candidates halved the given 13 and thought that the radius was 6.5 cm.

E5. This question was reported by many as being a good discriminator.

The most efficient way to tackle the question was to realise that the angle of the sector was 60.This enabled the candidates to use the $\frac{1}{2}ab\sin C$ formula for the triangle. However many candidates resorted to the cosine rule to find it or decided because it was a sixth of the circle they needed to use sin 6. A number of candidates were able to calculate one of the areas correctly; more frequently the sector, and then the subtraction carried out. The most common error was to use half base × height for the triangle area, using 6 as the height. Some did use Pythagoras to find the height but often made errors. Quite a few found one or other of the two areas and offered this as their answer.