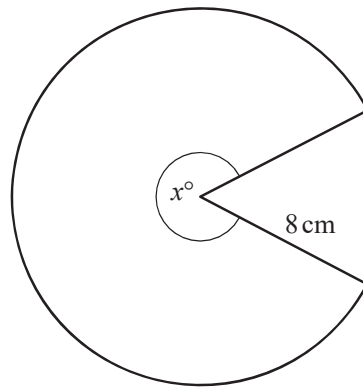# EXAM PAPERS PRACTICE

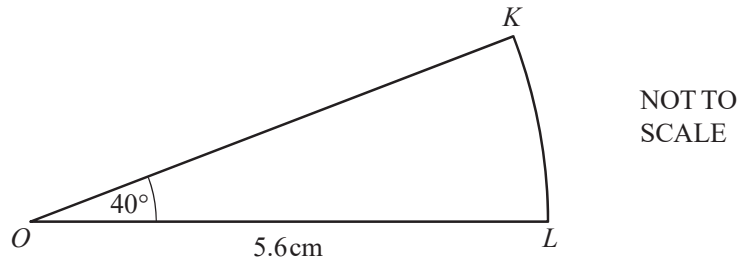## Circle Problems

Model Answer

Question 1

NOT TO
SCALE

The diagram shows a sector of a circle of radius 8 cm.
The angle of the sector is $x°$.
The perimeter of the sector is $(16 + 14\pi)$ cm.

Find the value of x. [3]

The perimeter of the sector is $(x°/360°) * 2\pi*8 \text{ cm} + 8 \text{ cm} + 8 \text{ cm}$. Setting this equal to *Setting this equal to* $(16 + 14\pi)$cm and solving for x, we get $x = 73 /(2\pi)$ degrees.

Question 2

NOT TO
SCALE

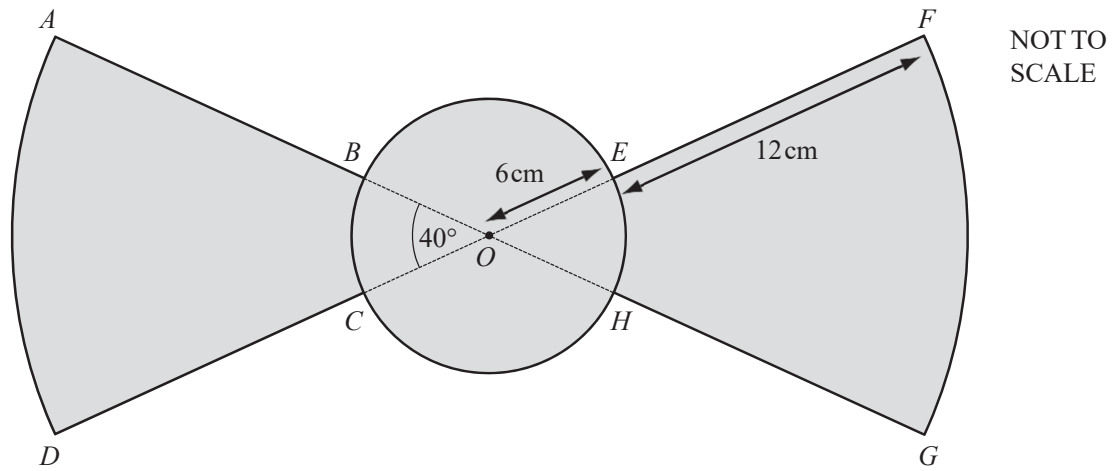*OKL* is a sector of a circle, centre *O*, radius 5.6 cm.
Angle *KOL* = 40°.

Calculate

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

Area of the sector: 56 cm^2

(b) the perimeter of the sector. [2]

Perimeter of the sector: 37.6 cm

Question 3

NOT TO SCALE

The diagram shows part of a fan.
OFG and *OAD* are sectors, centre *O*, with radius 18 cm and sector angle 40°.
B, *C*, *H* and *E* lie on a circle, centre *O* and radius 6 cm.
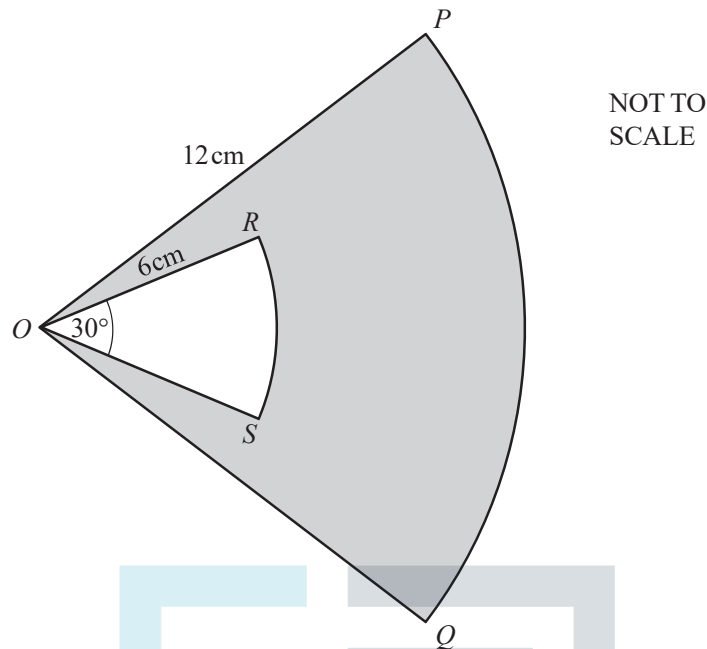Calculate the shaded area.   [4]

Area of triangle OEH = 1/2*OH*EH
Area of triangle OEH = 1/2*18$\sqrt{2}$*6
Area of triangle OEH = 54$\sqrt{2}$ cm^2
Therefore, the shaded area is equal to:
Area of sector OFG - Area of triangle OEH = 12πcm^2 − 54$\sqrt{2}$ cm^2

Question 4

NOT TO SCALE

OPQ is a sector of a circle, radius 12 cm, centre *O*. Angle *POQ* = 50°.

ORS is a sector of a circle, radius 6 cm, also centre *O*. Angle *ROS* = 30°.

(a) Calculate the shaded area. [3]
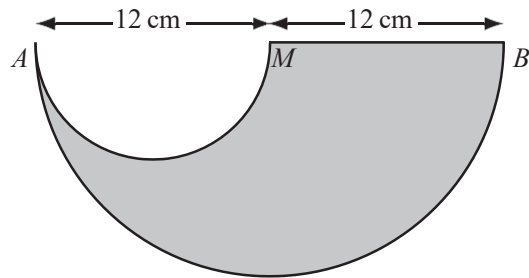
The shaded area is 72.252 square cm.

(b) Calculate the perimeter of the shaded area, *PORSOQP*. [3]

Circumfirence of big sector $= \frac{2\pi r\theta}{360}$

$= \frac{2\pi \cdot 12 \times 30}{360} = 2\pi$

Circumference of small sector $= \frac{2\pi \cdot 6 \times 30}{360}$

$= \pi$

$\therefore$ Perimeter of shaded region $= 2\pi - \pi$

$= \pi = 3.14$ cm

Question 5

The shape above is made by removing a small semi-circle from a large semi-circle.
AM = *MB* = 12 cm
Calculate the area of the shape. [3]

Let's first find the area of the large semi-circle :
$\frac{\pi*12^2}{2}$ or 72π
Now the area of the small semi-circle:
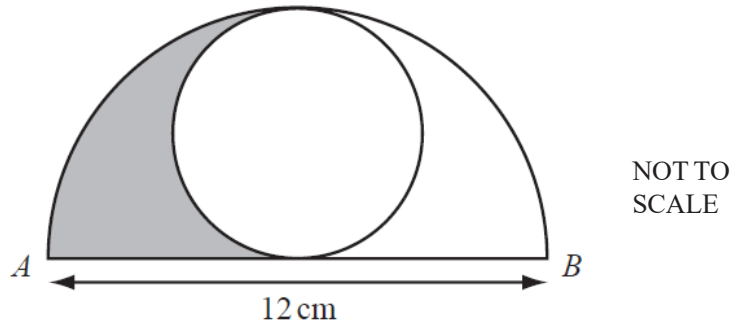$\frac{\pi*6^2}{2}$ or 18π
So the area of the shape after the small circle is removed is :
$72\pi - 18\pi$
which as written above is 169.6 or 170

Question 6

NOT TO
SCALE

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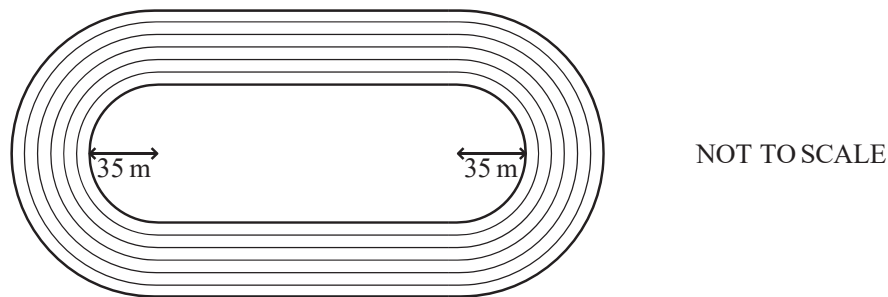The distance *AB* is 12 centimetres.

(a) Find the shaded area. [4]

$$\frac{1}{4}\pi \times 12^2 = 36\pi$$

(b) Find the perimeter of the shaded area. [2]

The perimeter of the shaded area is 12 centimeters.

Question 7

NOT TO SCALE

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

(a) Calculate the total length of the two straight sections at the inside of the inner lane. [3]

$$400 = 2\pi r + 2L$$
$$= 2 \times 3.14 \times 35 + 2L \quad \{\pi = 3.14\}$$
$$\Leftrightarrow 2L = 400 - 3.14 \times 2 \times 35 = 219.8$$

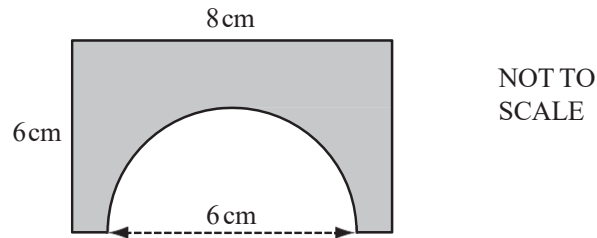Therefore, the total length of the two straight sectwons is 219.8 metres.

(b) Each lane is one metre wide.
Calculate the difference in the distances around the outside of the outer lane and the inside of the inner lane. [2]

$$6 \times 1 = 6 \text{ metres}$$

So, the difference is 6 metres

Question 8

8 cm

6 cm

6 cm

NOT TO
SCALE

A semicircle of diameter 6 cm is cut from a rectangle with sides 6 cm and 8 cm.

Calculate the perimeter of the shaded shape, correct to 1 decimal place.

[3]

The perimeter of the shaded shape is 39 cm to 1 decimal place.
The semicircle has diameter 6 cm, so radius 3 cm. Its perimeter is $\pi r + 2r = \pi(3) + 2(3) = 3\pi + 6$
The rectangle has sides 6 cm and 8 cm, so perimeter $2(6) + 2(8) = 28$ cm.
The total perimeter of the shaded shape is $28 \text{ cm} + (3\pi + 6)\text{cm} = 39$cm to 1 decimal place.
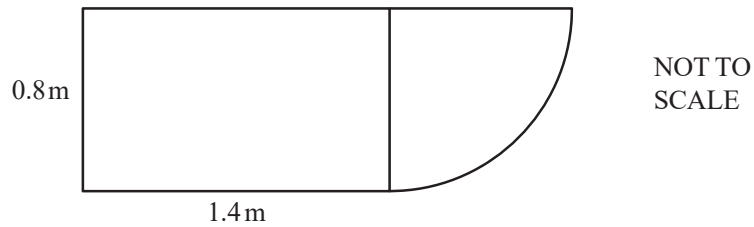
Question 9

NOT TO
SCALE

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

Calculate the shaded area.

[3]

The shaded area is 125 cm2.

Question 10

0.8 m

1.4 m

NOT TO
SCALE

The top of a desk is made from a rectangle and a quarter circle.
The rectangle measures 0.8m by 1.4m.

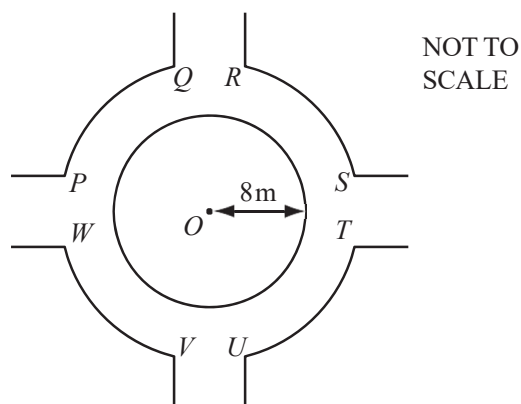Calculate the surface area of the top of the desk. [3]

The surface area of the top of the desk is 1.72 square meters.
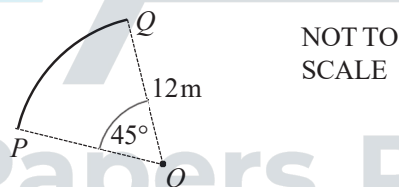
Exam Papers Practice

Question 11

NOT TO SCALE

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

(a) Calculate the area of grass. [2]

the area is πr^2

$= 8 \times 8 \times \pi \mathrm{m}^2$

$= 64\pi \mathrm{m}^2$

(b)

NOT TO SCALE

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

$$PQ + RS + TU + MV = \frac{45 + 45 + 45 + 45}{360} \times \text{ perimeter}$$

$$= \frac{1}{2} \times 2\pi r$$

$$= \pi r$$

$$= 12\pi \mathrm{m}$$

[4]

the circumference is $2\pi r$

$= 2\pi \times 8 \text{ m}$

$= 16\pi \mathrm{m}$

so the sum is $12\pi + 16\pi$ m

$= 28\pi \mathrm{m}$

Question 12

A spacecraft made 58 376 orbits of the Earth and travelled a distance of 2.656×10^{9} kilometres.

(a) Calculate the distance travelled in 1 orbit correct to the nearest kilometre. [2]

To calculate the distance travelled in 1 orbit, we divide the total distance by the number of orbits:

Distance per orbit $= \frac{2.656 \times 10^9 \text{ kilometres}}{58376 \text{ orbits}}$

Rounding to the nearest kilometer, we get:

Distance per orbit ≈ 45500 kilometres

(b) The orbit of the spacecraft is a circle.

Calculate the radius of the orbit. [2]

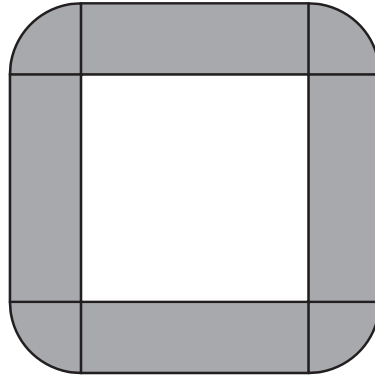The radius of the orbit is 724.5 km.

Question 13

A large conference table is made from four rectangular sections and four corner sections.
Each rectangular section is 4 m long and 1.2 m wide.
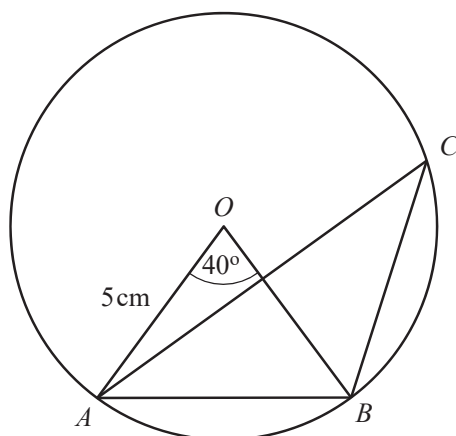Each corner section is a quarter circle, radius 1.2 m.

NOT TO
SCALE

Each person sitting at the conference table requires one metre of its outside perimeter.
Calculate the greatest number of people who can sit around the **outside** of the table.
Show all your working. [3]

The greatest number of people who can sit around the outside of the conference table is 12 .

Question 14

NOT TO
SCALE

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

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

Angle ACB is 40 degrees.

(ii) Find the size of angle *OAB*. [1]

angle $OAB = 360$ degrees - angle ACB - angle $AOB = 360$ degrees -140 degrees -180 degrees $= 40$ degrees

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

(i) Calculate the length of the minor arc *AB*. [2]

The length of the minor arc *AB* is 4 cm.

(ii) Calculate the area of the minor sector *OAB*. [2]

The area of the minor sector OAB is $5^2 \cdot \dfrac{40}{360}\pi = 5$ cm2.

Question 15

The radius of the Earth at the equator is approximately 6.4×10^6 metres.
Calculate the circumference of the Earth at the equator. Give your answer in standard form, correct to
2 significant figures. [3]

$c = 2\pi r$

where c is the circumference and r is the radius.
Steps to solve:
1. Evaluate the exponent:
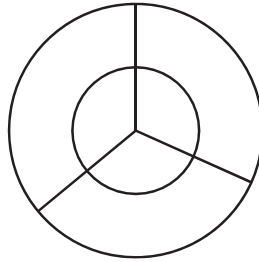$6.4 \times 10^6 \pi = 6.4 \times 1000000\pi$
2. Multiply the numbers:
$6.4 \times 1000000\pi = 6400000\pi$
Answer:
The circumference of the Earth at the equator is approximately 6400000π metres, or 6400 km, correct to 2 significant figures.
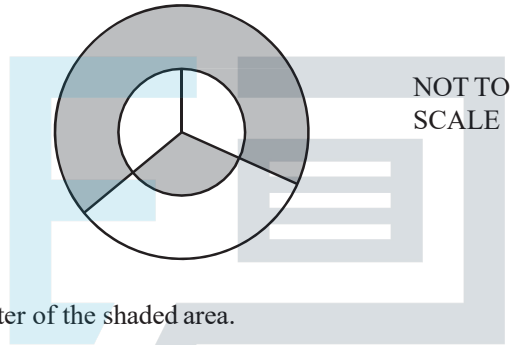
Question 16

NOT TO
SCALE

The diagram shows two concentric circles and three radii.
The diagram has rotational symmetry of order 3.

A club uses the diagram for its badge with some sections shaded.
The radius of the large circle is 6 cm and the radius of the small circle is 4 cm.

NOT TO
SCALE

Calculate the total perimeter of the shaded area. [5]

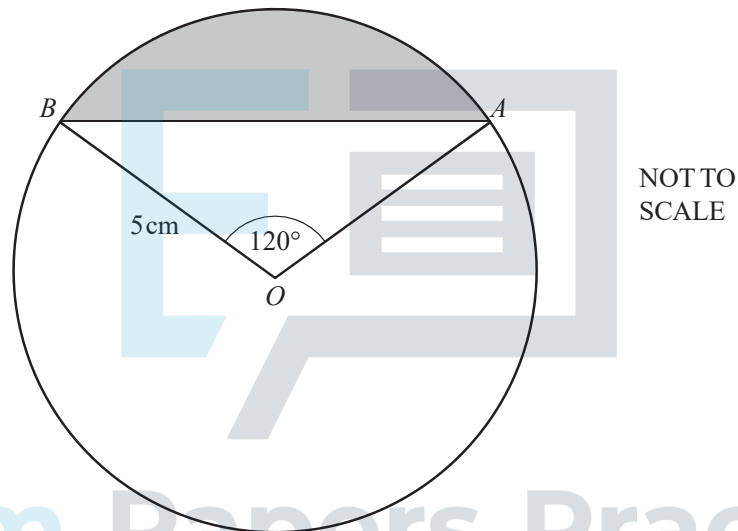The total perimeter of the shaded area is $24 + 12\pi$ cm.

Question 17

Find the circumference of a circle of radius 2.5 cm. [2]

$$c = 2\pi(2.5 \text{ cm})$$
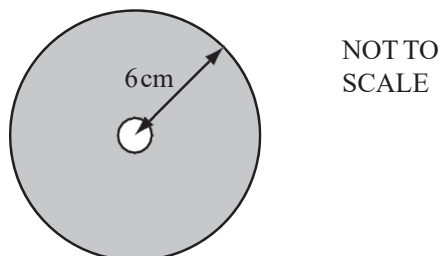$$c = 5\pi\text{cm}$$

Question 18

NOT TO SCALE

A and *B* lie on a circle centre *O*, radius 5cm.
Angle *AOB* = 120°.

Find the area of the shaded segment. [4]

The area of the shaded segment is 5 square cm.
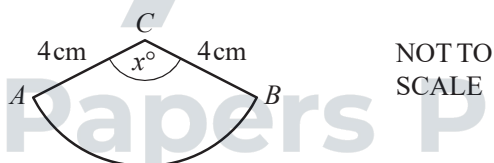
Question 19

NOT TO
SCALE

6cm

The diagram shows a circular disc with radius 6 cm.
In the centre of the disc there is a circular hole with radius 0.5 cm.

Calculate the area of the shaded section. [3]

The area of the shaded region is $\pi \left(6^2 - 0.5^2\right) = 35.4\ \text{cm}^2$.
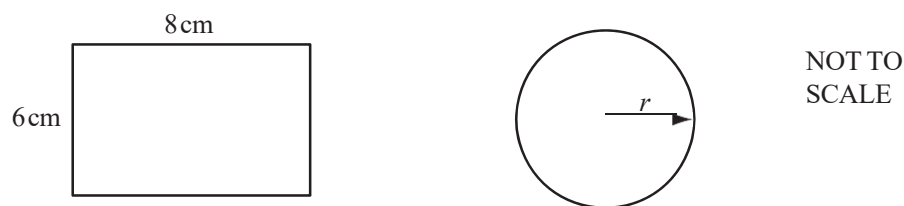
Question 20

C

4cm $x°$ 4cm NOT TO
SCALE

A B

ABC is a sector of a circle, radius 4 cm and centre *C*. [3]
The length of the arc *AB* is 8 cm and angle *ACB* =*x*°.

Calculate the value of *x* .

The value of x is 4 cm.

Question 21

8 cm

6 cm

NOT TO SCALE

r

The perimeter of the rectangle is the same length as the circumference of the circle.

Calculate the radius, *r*, of the circle. [3]

The radius of the circle is equal to half the perimeter of the rectangle, or 7 cm.

Question 22

A circle has a radius of 50 cm.

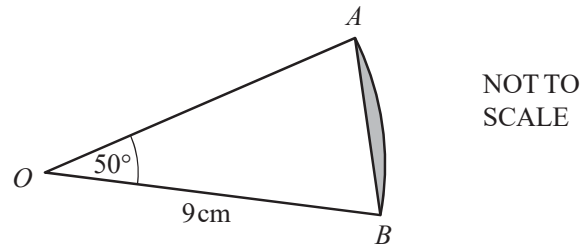(a) Calculate the area of the circle in cm^2. [2]

The area of a circle with radius r is given by πr^2. In this case, $r = 50$ cm, so the area of the circle is $\pi(50 \text{ cm})^2 = 7854 \text{ cm}^2$.

(b) Write your answer to part (a) in m^2.

$$\text{Area} = \pi(0.5)^2 = 0.785 \text{ m}^2$$

[1]

Question 23

NOT TO
SCALE

The diagram shows a sector *AOB* of a circle, centre *O*, radius 9 cm with angle *AOB* = 50°.
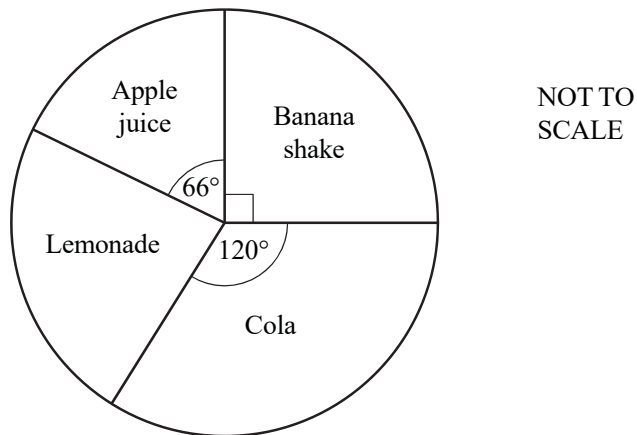
Calculate the area of the segment shaded in the diagram. [4]

The area of the shaded segment in the diagram is 9 cm^2.

Question 24

60 students recorded their favourite drink.
The results are shown in the pie chart.

NOT TO SCALE

(a) **Calculate** the angle for the sector labelled Lemonade. [1]

The angle for the sector labelled Lemonade in the pie chart is 120 degrees.

(b) Calculate the number of students who chose Banana shake. [1]

The number of students who chose Banana shake is 20 students.

(c) The pie chart has a radius of 3 cm.
   Calculate the arc length of the sector representing Cola. [2]

The angle of the sector representing Cola is 120 degrees.