Name ANSWERS	Class

MATHS TEACHER HUB

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Circles

(9 – 1) Topic booklet

Foundation

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1F** question you are not allowed to use a calculator.
- If the question is a **2F** or a **3F** question, you may use a calculator to help you answer.

Information

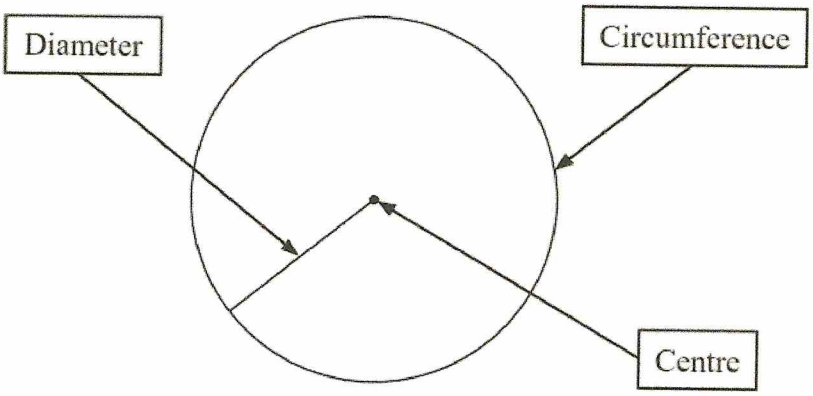
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

6 Freddie adds labels to this diagram of a circle.

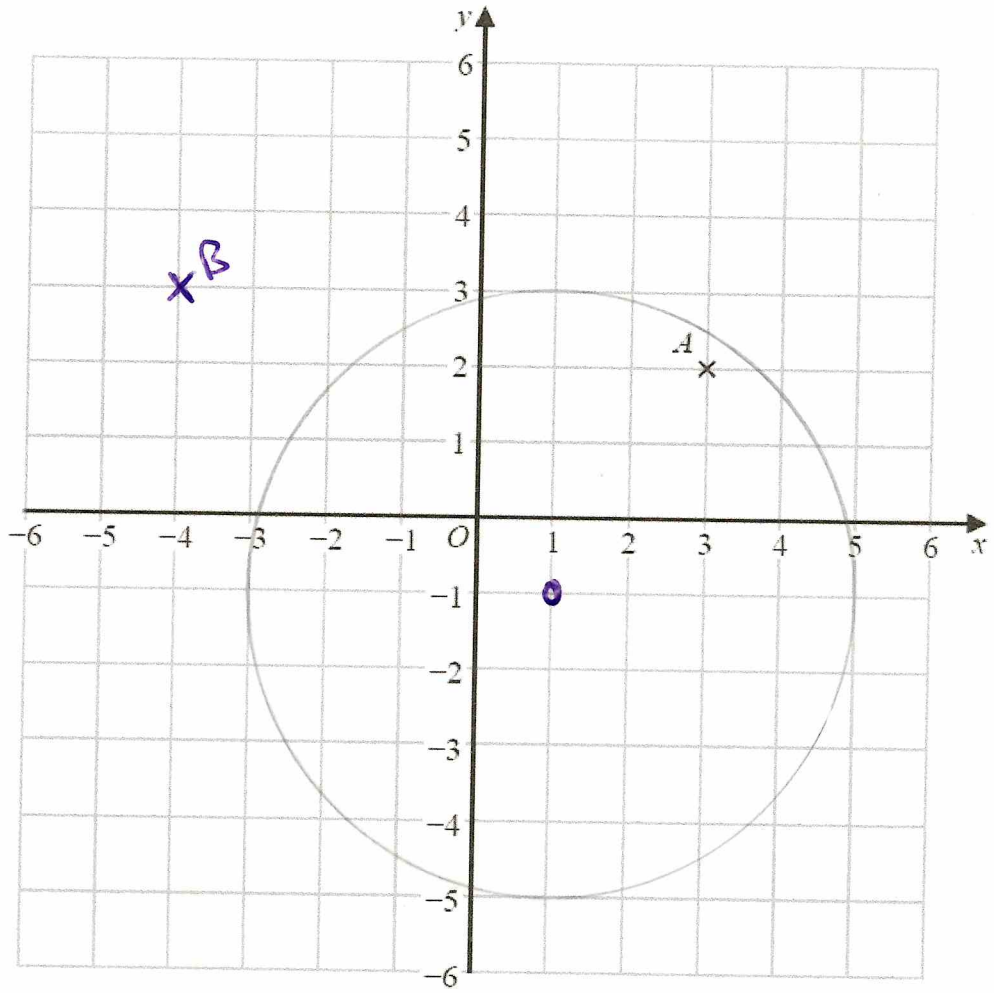


Explain why one of the labels is wrong.

The Diameter should be the radius

(Total for Question 6 is 1 mark)

8 Here is a centimetre grid.



(a) Write down the coordinates of point A.

(3 , 2)

(1)

(b) On the grid, mark with a cross (×) the point with coordinates (−4, 3)
Label this point B.

(1)

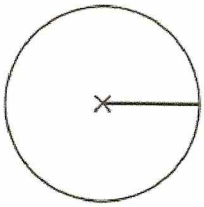
(c) On the grid, draw the circle with

centre (1, −1)
and radius 4 cm.

(2)

(Total for Question 8 is 4 marks)

9 The centre of this circle is marked with a cross (×).

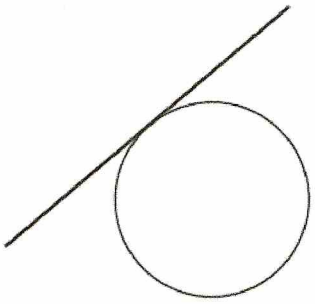


(a) Write down the mathematical name of the straight line shown in the circle.

Radius

(1)

(b) Write down the mathematical name of the straight line that is touching the circle.

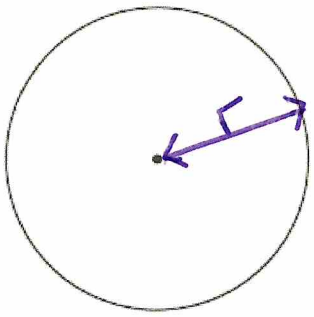


Tangent

(1)

(Total for Question 9 is 2 marks)

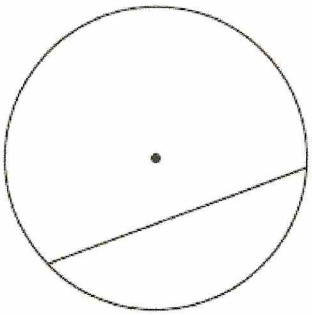
10 Here is a circle.



(a) On the diagram above, draw a radius of the circle.

(1)

Here is another circle.



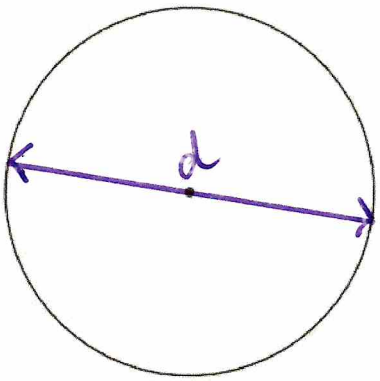
(b) Write down the mathematical name for the straight line inside this circle.

Chord

(1)

(Total for Question 10 is 2 marks)

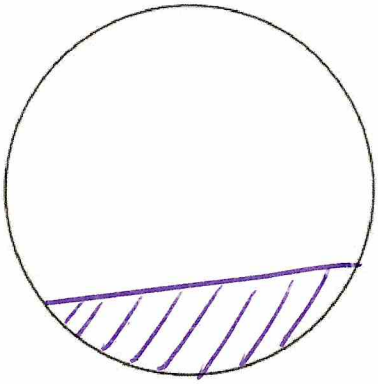
10



(a) On the diagram above, draw a diameter of the circle.

(1)

(b) On the diagram below, draw a segment of the circle.
Shade the segment.



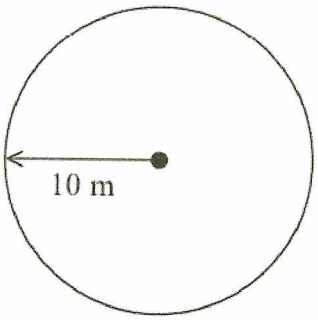
(1)

(Total for Question 10 is 2 marks)

18 Balena has a garden in the shape of a circle of radius 10 m.
He is going to cover the garden with grass seed to make a lawn.

Grass seed is sold in boxes. → $50m^2$
Each box of grass seed will cover 46 m^2 of garden.

Balena wants to cover all the garden with grass seed.



(a) Work out an estimate for the number of boxes of grass seed Balena needs.
You must show your working.

Area = $\pi \times 10^2$

$= 3 \times 100$

$= 300m^2$

$\frac{300}{50} = 6$ boxes

6

(4)

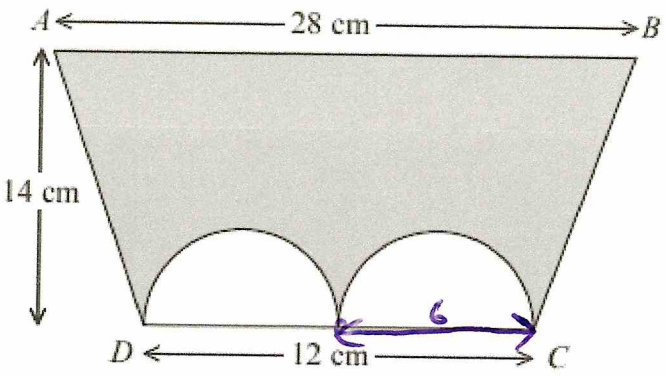
(b) Is your estimate for part (a) an underestimate or an overestimate?
Give a reason for your answer.

Underestimate, the seed can only cover $46m^2$ not $50m^2$

(1)

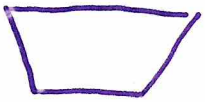
(Total for Question 18 is 5 marks)

18 The diagram shows a trapezium $ABCD$ and two identical semicircles.



The centre of each semicircle is on DC.

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



$\frac{1}{2}(12+28)\times 14$

$= 280\text{cm}^2$

$\frac{1}{2}(\pi \times 3^2)$

$= 14.13716$

$\frac{1}{2}(\pi \times 3^2)$

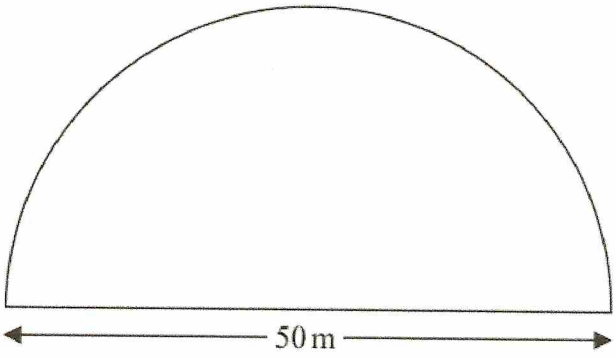
$= 14.13716$

$280 - 14.137 - 14.137 = 251.725$

252 cm^2

(Total for Question 18 is 4 marks)

19 A farmer has a field in the shape of a semicircle of diameter 50 m.



The farmer asks Jim to build a fence around the edge of the field.
Jim tells him how much it will cost.

Total cost = £29.86 per metre of fence plus £180 for each day's work

Jim takes three days to build the fence.

Work out the total cost.

$\frac{1}{2}(\pi \times 50) = 25\pi$

$+ 50m = 128.53981\,m$

$128.53981 \times £29.86 = £3838.1987$

£3838.20
+ 540

3 days = 180 × 3
= £540

£ 4378.20

May 2018 – Paper 2F

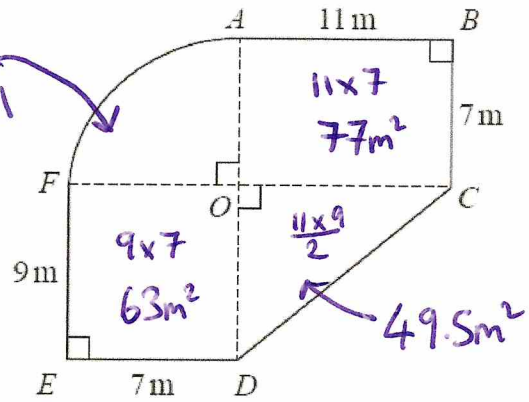
(Total for Question 19 is 5 marks)

21 The diagram shows a plan of Jason's garden.

ABCO and *DEFO* are rectangles.
CDO is a right-angled triangle.
AFO is a sector of a circle with centre *O* and angle $AOF = 90°$

$\frac{1}{4}(\pi \times 7^2)$

38.48451



11×7
77m²

9×7
63m²

$\frac{11 \times 9}{2}$

49.5m²

Jason is going to cover his garden with grass seed.
Each bag of grass seed covers 14 m² of garden.
Each bag of grass seed costs £10.95

Work out how much it will cost Jason to buy all the bags of grass seed he needs.

Total area = 38.48451 + 77 + 63 + 49.5

= 227.98451m²

$\frac{227.98451}{14} = 16.2846$

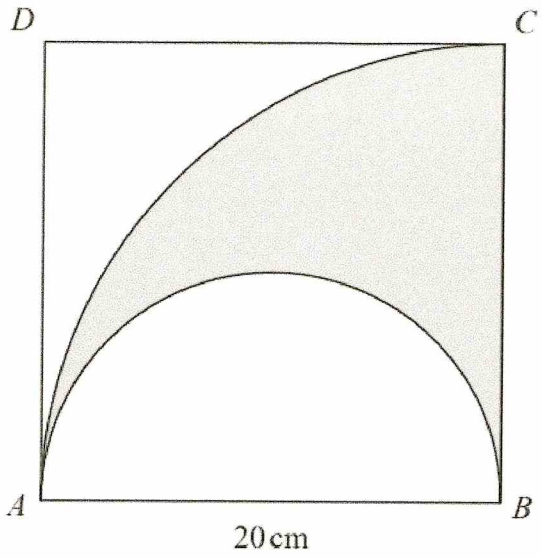
= 17 bags

17 × £10.95 = £186.15

£ 186.15

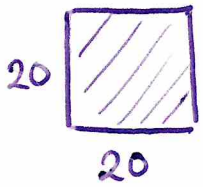
(Total for Question 21 is 5 marks)

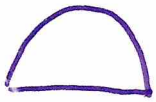
26 The diagram shows a square $ABCD$ with sides of length 20 cm.
It also shows a semicircle and an arc of a circle.



AB is the diameter of the semicircle.
AC is an arc of a circle with centre B.

Show that $\dfrac{\text{area of shaded region}}{\text{area of square}} = \dfrac{\pi}{8}$





20×20

$= 400\text{cm}^2$

$\frac{1}{4}(\pi \times 20^2)$

$\frac{1}{4}(400\pi)$

$= 100\pi$

$\frac{1}{2}(\pi \times 10^2)$

$\frac{1}{2}(100\pi)$

$= 50\pi$

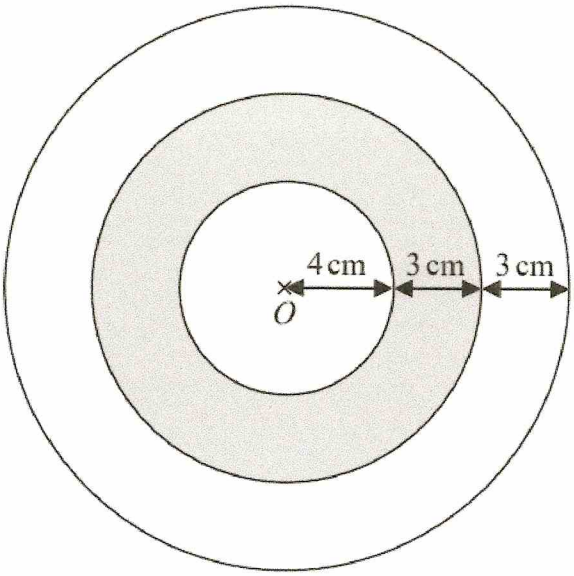
$100\pi - 50\pi$

$= 50\pi$

$$\frac{\text{Area shaded region}}{\text{Area of square}} = \frac{50\pi}{400} = \frac{\pi}{8}$$

(Total for Question 26 is 4 marks)

26 The diagram shows a logo made from three circles.



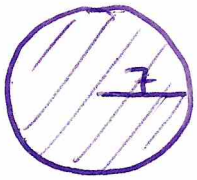
Each circle has centre O.

Daisy says that exactly $\frac{1}{3}$ of the logo is shaded.

Is Daisy correct?
You must show all your working.

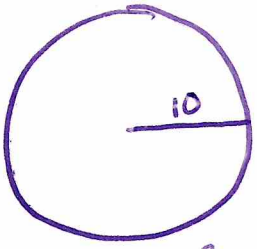
$\pi \times 4^2$

$= 16\pi$



$\pi \times 7^2$

$= 49\pi$



$\pi \times 10^2$

$= 100\pi$

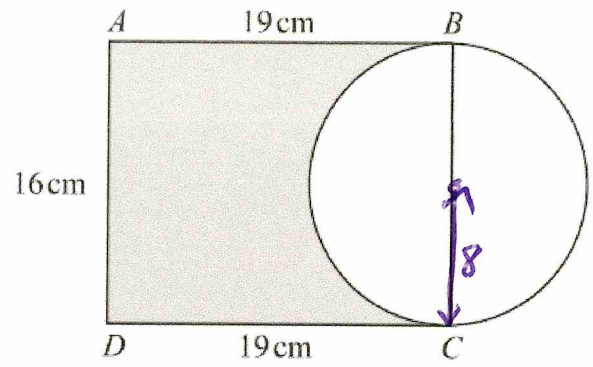
Shaded region $= 49\pi - 16\pi$

$= 33\pi$

$\frac{33\pi}{100\pi}$ is not equal to $\frac{1}{3}$, so Daisy is wrong

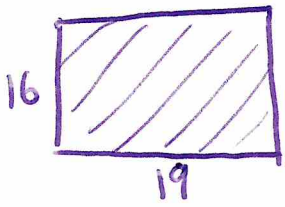
(Total for Question 26 is 4 marks)

27 Here is a diagram showing a rectangle, *ABCD*, and a circle.



BC is a diameter of the circle.

Calculate the percentage of the area of the rectangle that is shaded.
Give your answer correct to 1 decimal place.



$16 \times 19 = 304 cm^2$

$\frac{1}{2}(\pi \times 8^2)$

$= 32\pi$

$304 - 32\pi = 203.469 cm^2$ shaded.

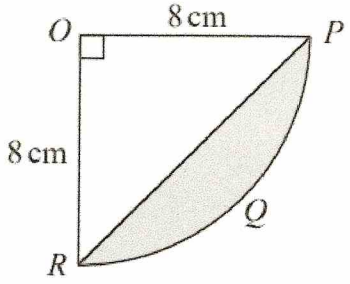
$\% = \frac{203.469}{304} = 0.66930$

$= 66.930\%$

66.9 %

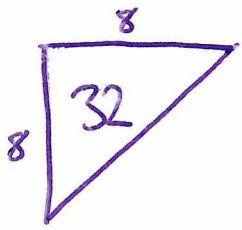
Specimen 1 – Paper 2F **(Total for Question 27 is 4 marks)**

27 The diagram shows a sector $OPQR$ of a circle, centre O and radius 8 cm.

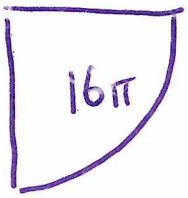


OPR is a triangle.

Work out the area of the shaded segment PQR.
Give your answer correct to 3 significant figures.



$\frac{8 \times 8}{2} = 32\text{cm}^2$



$\frac{1}{4}(\pi \times 8^2)$

$= 16\pi$

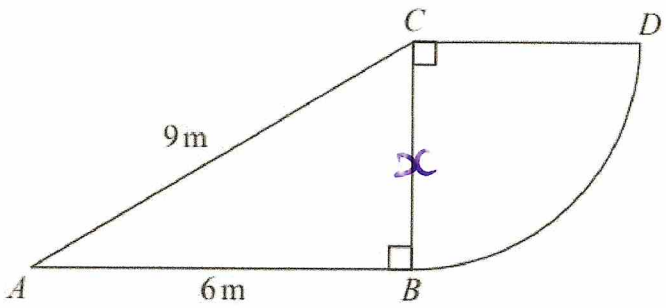
shaded segment $= 16\pi - 32$

$= 18.26548$

18.3 ..... cm^2

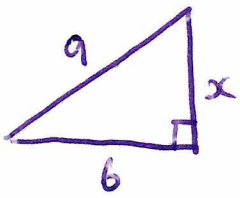
(Total for Question 27 is 4 marks)

27 The diagram shows a right-angled triangle and a quarter circle.



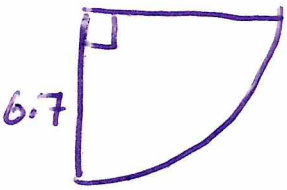
The right-angled triangle ABC has angle $ABC = 90°$
The quarter circle has centre C and radius CB.

Work out the area of the quarter circle.
Give your answer correct to 3 significant figures.
You must show all your working.



$\sqrt{9^2 - 6^2} = x$

$6.708\text{cm} = x$



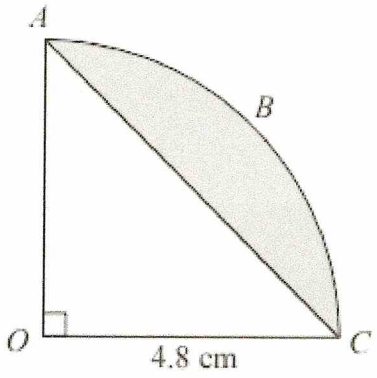
$\frac{1}{4} \times (\pi \times 6.7^2)$

$= 35.342917$

35.3 ..... m^2

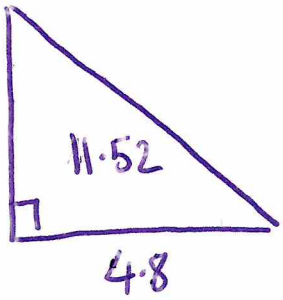
(Total for Question 27 is 4 marks)

28

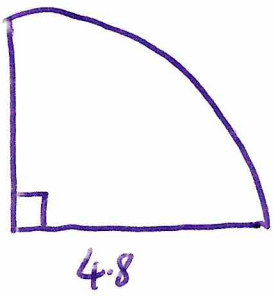


The arc ABC is a quarter of a circle with centre O and radius 4.8 cm.
AC is a chord of the circle.

Work out the area of the shaded segment.
Give your answer correct to 3 significant figures.



$\frac{4.8 \times 4.8}{2} = 11.52$



$\frac{1}{4}(\pi \times 4.8^2)$

$= 18.09557$

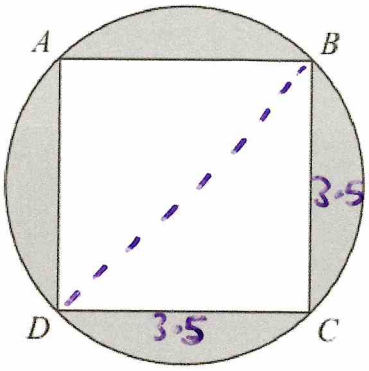
Shaded segment $= 18.095 - 11.52$

$= 6.575573$

6.58 cm^2

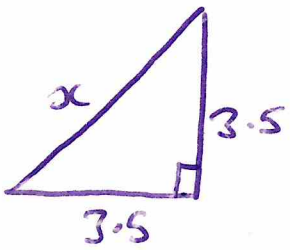
(Total for Question 28 is 3 marks)

29 A, B, C and D are points on a circle such that $ABCD$ is a square.



The square $ABCD$ has sides of length 3.5 cm.

Calculate the circumference of the circle.
Give your answer correct to 1 decimal place.
You must show all your working.



$x = \sqrt{3.5^2 + 3.5^2} = \frac{7\sqrt{2}}{2}$ or 4.949747cm

$C = \pi \times d$

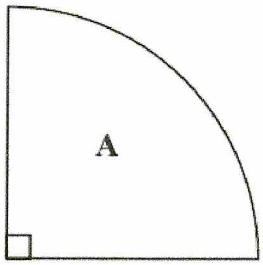
$C = \pi \times \frac{7\sqrt{2}}{2}$

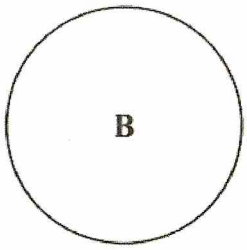
$C = 15.550090 28$

15.6 .....cm

(Total for Question 29 is 4 marks)

30 **A** is in the shape of a quarter circle of radius 15 cm.
B is in the shape of a circle.





The area of **A** is 9 times the area of **B**.

Show that the radius of **B** is 2.5 cm.

A

$\frac{1}{4}(\pi \times 15^2)$

$= \frac{225}{4}\pi$ or $176.71458 \longrightarrow \div 9 = \frac{25}{4}\pi$

Area of B $= \frac{25}{4}\pi$

$\pi \times r^2 = \frac{25}{4}\pi$

$r^2 = \frac{25}{4}$

$r = \sqrt{\frac{25}{4}} = \frac{\sqrt{25}}{\sqrt{4}} = \frac{5}{2} = 2.5$

(Total for Question 30 is 3 marks)