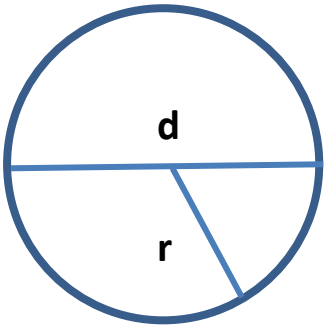
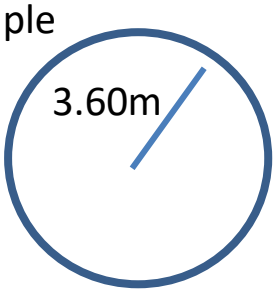
Circles



'πr² sounds like area to me, when I need the circumference I just use πd'

Example

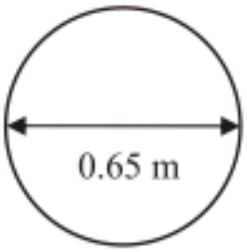


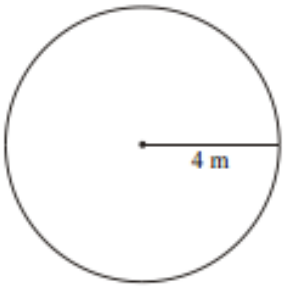
Area = πr²
= π x 3.60²
= π x 12.96
= 40.7cm²

Circumference = πd
= π x (2 x 3.60)
= π x 7.2
= 22.6cm

The diameter of a wheel on Harry's bicycle is 0.65 m.

Calculate the circumference of the wheel.
Give your answer correct to 2 decimal places.



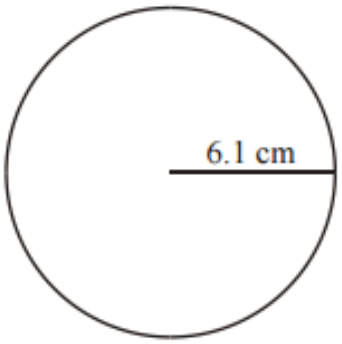


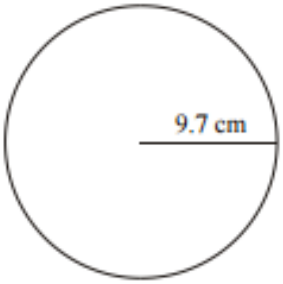
The radius of a circle is 4 m.

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

A circle has a radius of 6.1 cm.
Work out the circumference of the circle.

Give your answer correct to 3 significant figures.





The radius of the circle is 9.7 cm.
Work out the area of the circle.
Give your answer to 3 significant figures.

Here is a tile in the shape of a semicircle.

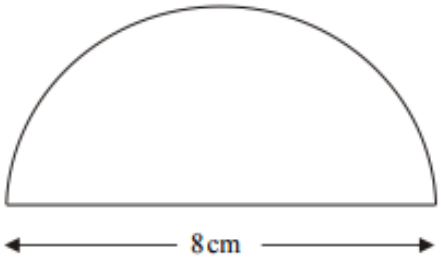


Diagram **NOT** accurately drawn

The diameter of the semicircle is 8 cm.

Work out the perimeter of the tile.
Give your answer correct to 2 decimal places.

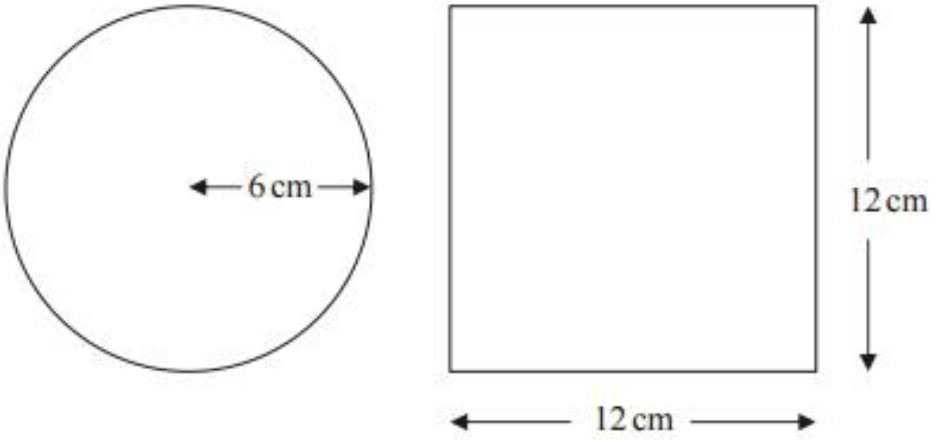


Diagram **NOT** accurately drawn

A circle has a radius of 6 cm.

A square has a side of length 12 cm.

Work out the difference between the area of the circle and the area of the square.
Give your answer correct to one decimal place.

The top of a table is a circle.
The radius of the top of the table is 50 cm.

(a) Work out the area of the top of the table.

…… cm^2

(2)

The base of the table is a circle.
The diameter of the base of the table is 40 cm.

(b) Work out the circumference of the base of the table.

…… cm

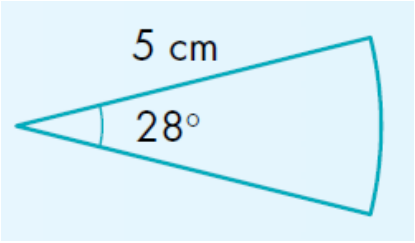
(2)

(4 marks)

Arc length and area of sectors

Harder questions involve parts of a circle

Example



This part of the circle is 28°, so we have 28° out of 360°, which we can write as a fraction as

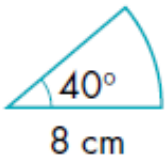
$$\frac{28}{360}$$

Arc length = fraction x πd
= 28/360 x π x (2 x 5)
= 2.4cm

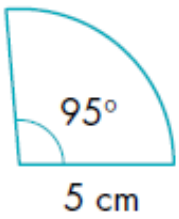
Area = fraction x πr^2
= 28/360 x π x 5^2
= 6.1cm²

1) Find the i) arc length ii) sector area

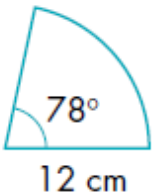
a



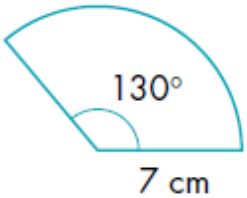
b



c

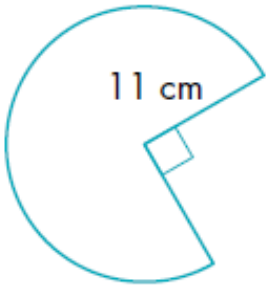


d

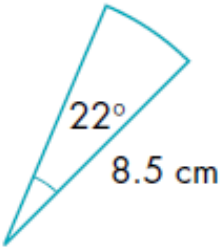


2) Calculate the total perimeter

a

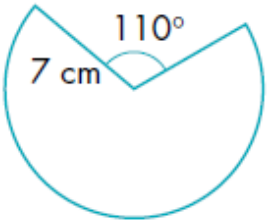


b

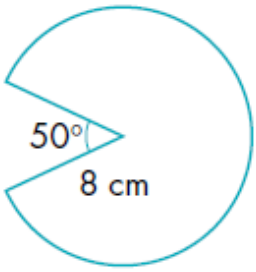


3) Calculate the area

a



b



Mixed Exam Questions

Q1. March 2013 paper 2

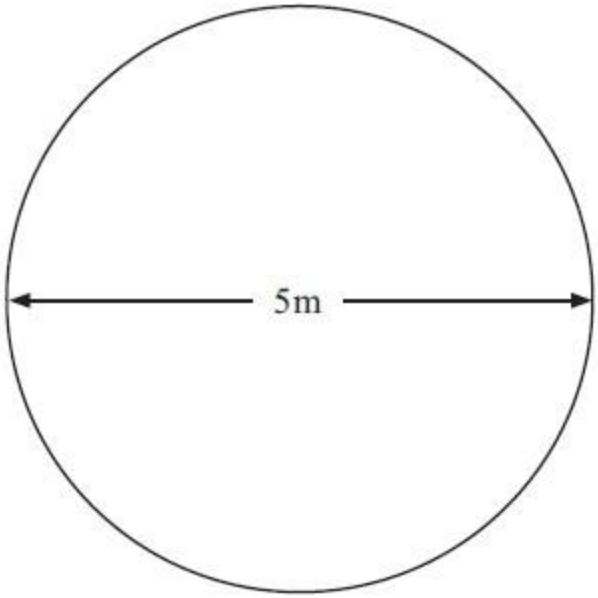


Diagram **NOT** accurately drawn

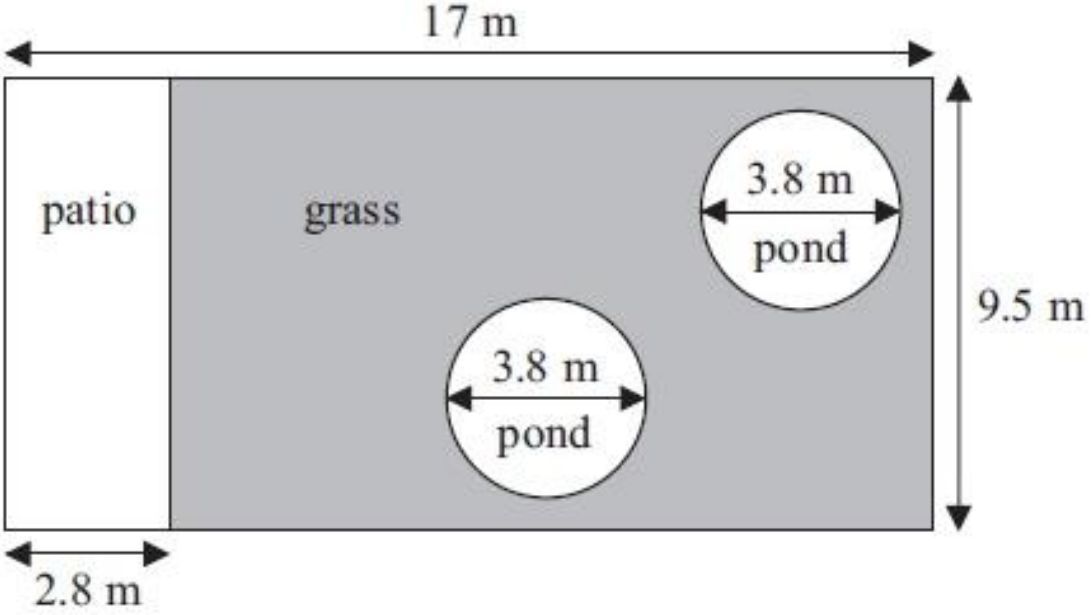
Jon has a flower garden in the shape of a circle.
The diameter of the garden is 5 metres.
Jon wants to put fencing around the edge of the garden.
The fencing costs £1.80 per metre.
Work out the total cost of the fencing.

£ . . . . . .

(Total for Question is 3 marks)

Q2. June 2012 paper 2

*Mr Weaver's garden is in the shape of a rectangle.
In the garden
there is a patio in the shape of a rectangle
and two ponds in the shape of circles with diameter 3.8 m.
The rest of the garden is grass.



Mr Weaver is going to spread fertiliser over all the grass.
One box of fertiliser will cover 25 m^2 of grass.
How many boxes of fertiliser does Mr Weaver need?
You must show your working.

(Total for Question is 5 marks)

Q3.Novemeber 2012 paper 1 (non-calculator)

The diagram shows a circle drawn inside a square.

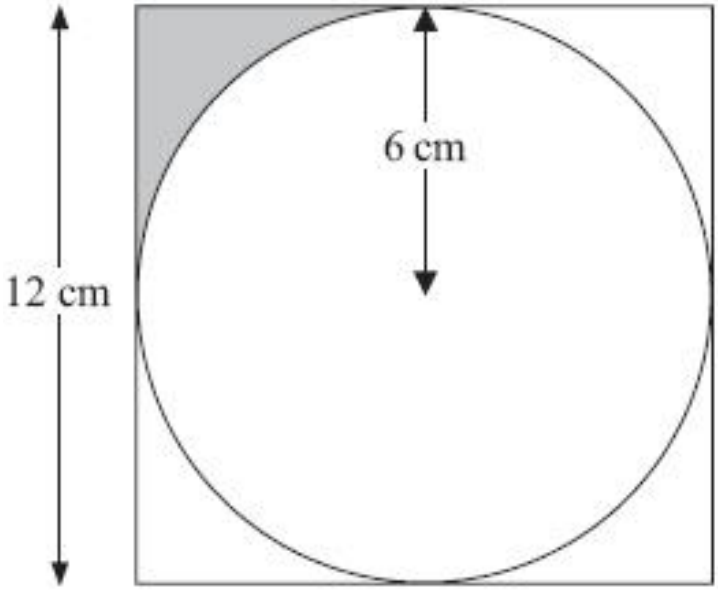


Diagram **NOT** accurately drawn

The circle has a radius of 6 cm.

The square has a side of length 12 cm.

Work out the shaded area.

Give your answer in terms of π.

.....cm^2

(Total for Question is 3 marks)

Q4.March 2013 paper 2

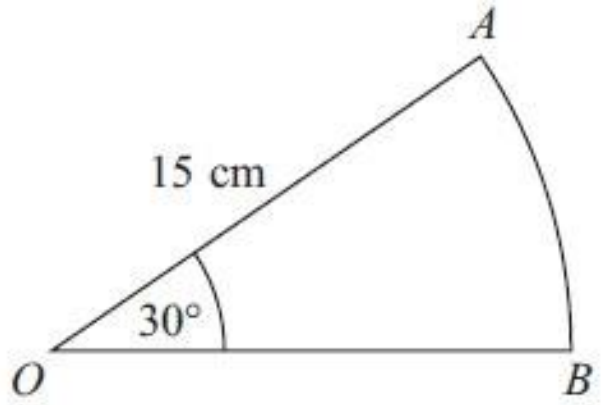


Diagram **NOT** accurately drawn

OAB is a sector of a circle, centre *O*.
The radius of the circle is 15 cm.
The angle of the sector is 30°.
Calculate the area of sector *OAB*.
Give your answer correct to 3 significant figures.

. . . . . cm^2
(Total for Question is 2 marks)

Q5. June 2013 unit 3

* The diagram shows a flower bed in the shape of a circle.

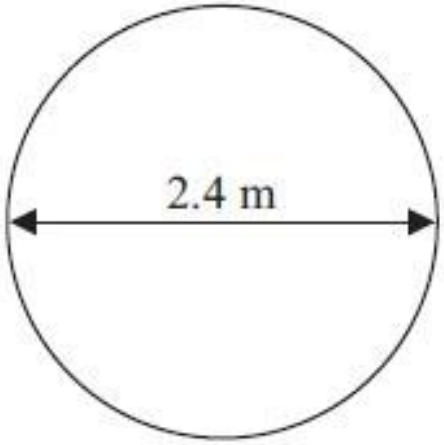


Diagram **NOT** accurately drawn

The flower bed has a diameter of 2.4 m.

Sue is going to put a plastic strip around the edge of the flower bed.

The plastic strip is sold in 2 metre rolls.

How many rolls of plastic strip does Sue need to buy?

You must show all your working.

(Total for Question is 4 marks)

Q6. June 2014 unit 3

The diagram shows a tile.

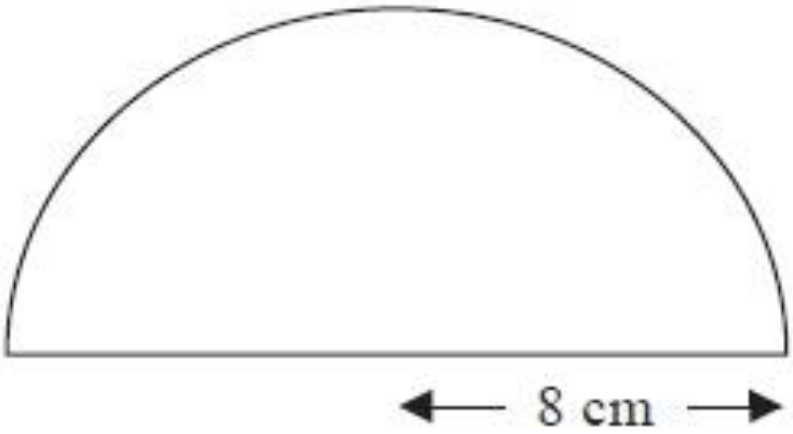


Diagram **NOT** accurately drawn

The tile is in the shape of a semicircle of radius 8 cm.
Work out the perimeter of the tile.
Give your answer correct to one decimal place.

..... cm

(Total for Question is 3 marks)

Q7. November 2014 paper 2

* Saphia is organising a conference.

People at the conference will sit at circular tables.

Diagram **NOT** accurately drawn

Each table has a diameter of 140 cm.

Each person needs 60 cm around the circumference of the table.

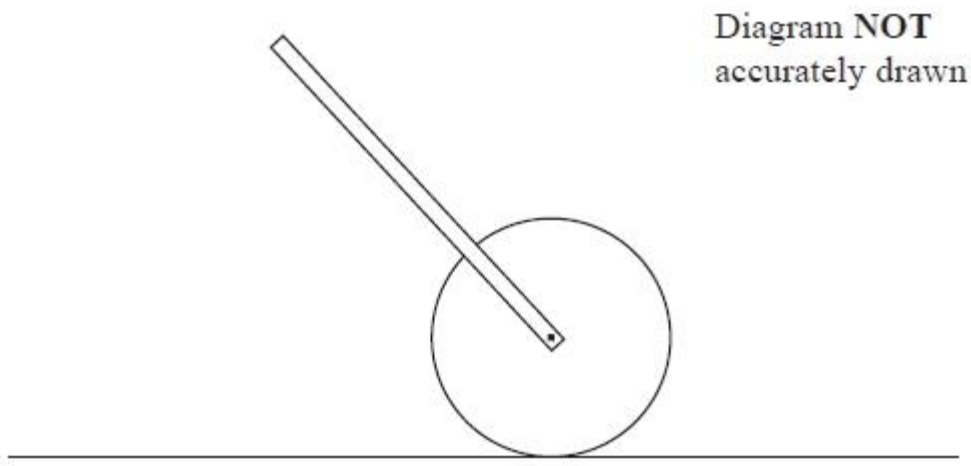
There are 12 of these tables in the conference room.

A total of 90 people will be at the conference.

Are there enough tables in the conference room?

(Total for question = 4 marks)

Q8.November 2014 unit 3
The diagram shows a trundle wheel.



Trundle wheels are used to measure distances along the ground.
The radius of the trundle wheel is 20 cm.
Jim wants to work out the distance between two junctions on a road.
He rolls the trundle wheel between the two junctions.
The trundle wheel rotates exactly 34 times.
Work out the distance between the two junctions.
Give your answer in metres correct to the nearest metre.

.....m
(Total for question = 3 marks)

Q9. June 2015 paper 2

* The diagram shows the top of Levi's birthday cake.

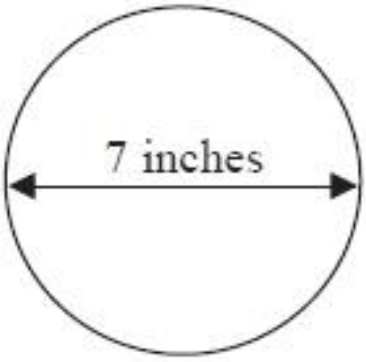


Diagram **NOT** accurately drawn

The top of the cake is in the shape of a circle.
The diameter of the circle is 7 inches.
A ribbon is going to be put around the side of the cake.
Ribbons are sold in 50 cm lengths.
1 inch is 2.54 cm.
Work out if one length of ribbon is long enough to go all the way around the cake.
You must show your working.

(Total for question = 4 marks)

Q10. June 2015 unit 3

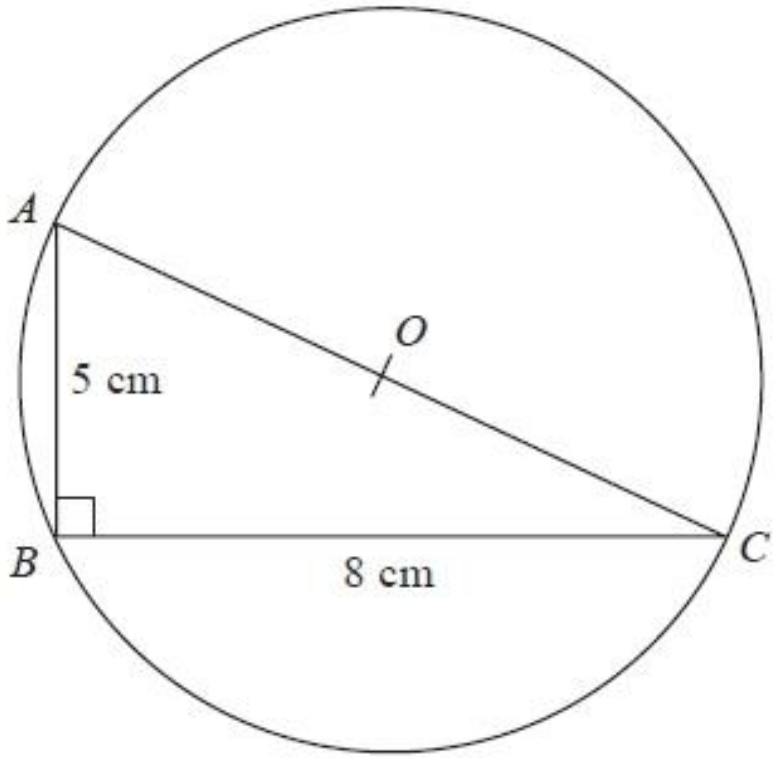


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
A, *B* and *C* are points on the circumference of a circle centre *O*.
AB = 5 cm
BC = 8 cm
AOC is a diameter of the circle.
Calculate the circumference of the circle.
Give your answer correct to 3 significant figures.

..... cm

(Total for question = 4 marks)

Examiner's Report Key points

- You need to remember which formula is which- in several question students have found the area instead of the circumference and vice versa.
- Set your working out clearly so that the examiner knows what you are trying to calculate

Answers

2.04m
50.3m²
38.3cm
296cm²
Circumference = 25.13 ÷ 2 = 12.567 Perimeter = 12.57 + 8 = 20.57cm
Area of circle = 113.1 Area of square = 144 144 – 113.1 = 30.9cm²
a) 7853.98cm² b) 125.66cm

Arc length and area of sectors

1a) i) 5.59cm ii) 22.3cm²
b) i) 8.29cm ii) 20.7cm²
a) i) 16.3cm ii) 96.0cm²
a) i) 15.9cm ii) 55.6cm²
2) a) 73.8cm b) 20.3cm
3) a) 107cm² b) 173cm²

Exam questions Mark Scheme

Q1.

Answer	Mark	Notes
28.27	3	M1 for use of π × *x* (with *x* = 5 or *x* = 2.5) **or** 2 × π × *x* (with *x* = 5 or *x* = 2.5) M1 for π × 5 × 1.8(0) **or** 2 × π × 2.5 × 1.8(0) A1 for 28.26 or 28.27 or 28.28 or 28.3(0) or 28.8(0)

Q2.

Answer	Mark	Notes
5	5	M1 for (17 – 2.8) × 9.5 (=134.9) or 17×9.5 – 2.8×9.5 (= 161.5 – 26.6 = 134.9) M1 for π × (3.8 ÷ 2)^2 (= 11.33 – 11.35) M1 (dep on M1) for '134.9' – 2 × '11.34' A1 for 112 - 113 C1(dep on at least M1) for 'He needs 5 boxes' ft from candidate's calculation rounded up to the next integer

Q3.

Answer	Mark	Notes
36 – 9π	3	M1 for π×6×6 or 36π seen value 113.03-113.2 M1 for (12×12 –'π×6×6')÷4 or value 7.7-7.8 A1 for 36 – 9π oe **OR** M1 for π×6×6÷4 or 9π seen or value 28.2-28.3 M1 for 6×6 – 'π×6×6÷4' or value 7.7-7.8 A1 for 36 – 9π oe NB: for M marks π may be given numerically.

Q4.

Working	Answer	Mark	Notes
$^{30}/_{360}$ × π × 15^2	58.8	2	M1 for a correct method to find the area of sector *OAB* A1 for answer in range 58.8 – 58.9125

Q5.

Answer	Mark	Notes
4 rolls	4	M1 for $\pi \times 2.4$ M1 for $(\pi \times 2.4) \div 2$ or 7.5 to 7.541 M1 for or 3.75 or 3.76... or 3.77... or (2, 4,) 6 , 8 C1 for a clear statement that 4 (rolls) are needed

Q6.

Answer	Mark	Notes
41.1 to 41.2	3	M1 for a method to find the circumference of the circle, eg. $\pi \times 16$ (= 50.265..) M1 for a method to find the length of the semicircle, eg. "50.265.." ÷ 2 (= 25.132..) A1 for answer in the range 41.1 to 41.2

Q7.

Answer	Mark	Notes
No + reason	4	M1 for intention to find the circumference eg $140 \times \pi$ (= 439.82...) A1 for circumference = 439 - 440 M1 (dep on M1) for a complete method shown that could arrive at two figures that are comparable eg "C"÷60×12 (=87.96..) , 90÷12×60 (=450) , 90×60÷"C" (=12.27), "C"÷90×12 (=58.64..) C1 (dep on both M marks) for No and explanation that shows a correct comparison eg only 84 people could sit around the tables or that 13 tables are needed or that 480 cm is needed.

Q8.

Answer	Mark	Notes
43	3	M1 for $\pi \times 40$ or $2 \times \pi \times 20$ M1 for $34 \times 2 \times \pi \times 20$ A1 for 42.7 – 43

Q9.

Answer	Mark	Notes
No supported by working	4	M1 for $\pi \times 7$ (= 21.9 to 22) or $\pi \times 7 \times 2.54$ = (55.5 to 56) M1 (dep) for a complete method that could lead to two figures that are comparable eg $\pi \times 7 \times 2.54$; $\pi \times 7$ and $50 \div 2.54$ A1 for correct comparable figures eg 55.5 to 56 (cm); 21.9 to 22 (in) and 19.6 to 19.7 (in) C1 (dep M2) for a correct conclusion based on their comparable figures

Q10.

Answer	Mark	Notes
29.6	4	M1 for $8^2 + 5^2$ or 64 + 25 or 89 M1 (dep) $\sqrt{"8^2"+"5^2"}$ (=9.4) M1 for "9.4..." $\times \pi$ A1 for 29.5 – 29.65