

Mark schemes

Q1.

A point that lies on the circumference, eg (4, 5), (10, 5), (7, 2), (7, 8)

B1 (4, y) or (10, y) or (x, 2) or (x, 8)

*B1 for 4 or 10 **clearly** shown as min or max horizontal value*

*B1 for 2 or 8 **clearly** shown as min or max vertical value*

B2

Additional Guidance

Circle measurement is 2.6 cm so if subtracted or added then rounded can lead to correct answer, but allow as 2.6 rounds to 3, so mark answer line, ignore any other working

[2]

Q2.

$$\pi \times 6 \times 6 \div 2$$

oe accept a numerical value for π

M1

18 π or a numerical value

[55.8, 56.57]

Accept $\pi \times 18$ or $\pi 18$

A1

[2]

Q3.

$$\pi \times 6 \times 6$$

or 36π or [113, 113.112]

or $9 \times [3.14, 3.142]$ or [28.26, 28.3]

oe

accept [3.14, 3.142] for π

M1

9π or $9 \times \pi$ or $\pi 9$ or $\pi \times 9$

A1

Additional Guidance

36π followed by an incorrect method

eg $36\pi \div 2 = 18\pi$ with answer 18π

M1A0

Answer of 9π from $\pi \times 3^2$

M0A0

9π and [28.26, 28.3] given on answer line

M1A0

πr^2 stated but followed by 36 or 9

M0A0

[2]

Q4.

(a) radius

B1

(b) chord

B1

(c) tangent

B1

[3]

Q5.

$$\frac{150}{360} \times 2 \times \pi \times 6$$

or 5π or [15.5, 15.71]

oe

M1

2 × their 5π

$$\text{or } \frac{300}{360} \times 2 \times \pi \times 6$$

oe

$$\text{NB } \frac{300}{360} \times 2 \times \pi \times 6 \text{ is M2}$$

M1dep

10π or [31, 31.42]

A1

their $10\pi + 18$ or [49, 49.42]

SC1 18 or 6 + 6 + 3 + 3 seen

A1ft

[4]

Q6.

(a) Fully correct constructed circle drawn with radius [5.9, 6.1]

B1 for any circle centre P (must be constructed and not freehand)

B2

(b) Sector drawn [58°, 62°] degrees

B1 for any sector

B2

[4]

Q7.

chord

B1

[1]

Q8.

$2 \times \pi \times 37$ or $\pi \times 74$

or 8×37 or 296

Accept [3.14, 3.142] for π

M1

[232, 233] or 74π

May be implied by e.g. $74\pi + \dots$

A1

[528, 529] or $74\pi + 296$

A1

Additional Guidance

$360 - 37 \times 8$

M1A0A0

37×8 or 296 seen and then e.g. halved or doubled

M1

[3]

Q9.

(Diameter or side of square =) $\sqrt{36}$ or 6 or (radius =) 3

$6 \times 6 (= 36)$

M1

$\pi \times 6$

or $2 \times \pi \times 3$

M1dep

[18.8, 18.9] or 6π

Accept 19 with working shown

A1

Additional Guidance

Accept [3.14, 3.142] for π

Ignore further working after 6π , that is if they incorrectly work 6π out award full marks

Do not accept $\pi 6$ for the A mark

6 or 3 may be on diagram but must be correct, e.g. radius must be 3, not 6

[3]

Q10.

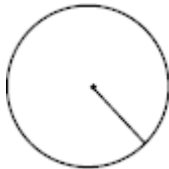
(a) [2.7, 2.9]

*If answer in mm, accept [27mm, 29mm]**Ignore further working if answer seen, e.g calculating area or circumference***B1**

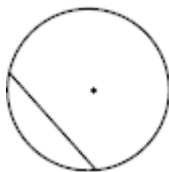
(b) [5.4, 5.8]

*ft their (a) × 2**Ignore further working if answer seen, e.g calculating area or circumference***B1ft**(c) *d equals 2r**oe**or r equals $\frac{1}{2} d$* *Accept $d = 2r$* *Do not accept $d = r^2$* *diameter equals twice radius**radius is half the diameter***B1****[3]****Q11.**

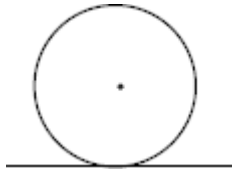
(a)

**B1**

(b)

*Allow diameter as special case of chord***B1**

(c)



Allow radius to be drawn in too as long as it touches the tangent

B1

[3]

Q12.

$$2 \times \pi \times 7 \text{ oe}$$

or [43.9, 44]

$$14\pi$$

M1

$$2 \times \pi \times 7 \div 4 \text{ oe}$$

or [10.9, 11]

$$7\pi / 2$$

$$\text{or } 2 \times \pi \times 7 \times 3 \text{ oe}$$

or [131.9, 132]

$$42\pi$$

M1dep

$$2 \times \pi \times 7 \div 4 \times 3 \text{ oe}$$

or [32.9, 33]

$$21\pi / 2$$

M1dep

[46.9, 47]

$$10.5\pi + 14 \text{ oe}$$

SC2 for [23.4, 23.5] or [30.4, 30.5]

SC1 for [16.4, 16.5]

A1

[4]

Q13.

$$\pi \times 6^2$$

M1

113.(...) or 36π

A1

[2]

Q14.

$$8 \div 2 (= 4) \text{ oe}$$

M1

$\pi \times$ their 4 \times their 4 oe

Allow 3.14 or better for π

M1dep

[50.2, 50.3] or 16π

Condone [13.7, 13.8] or $64 - 16\pi$ as fw

A1

[3]

Q15.

(a) $\pi r + 2r$

B1

(b) their $(\pi r + 2r) = 11.6$

ft their formula from (a) or for an incorrect formula that is given in (a)

Allow $\pi = 3.14$ or better throughout

B1ft

$$r(\pi + 2) = 11.6$$

$$\text{or } (r =) 11.6 \div (\pi + 2)$$

M1

2.256... or 2.2559...

A1

2.26 or 2.3

Accept 1.8 or 1.85 if $2\pi r$ used

2.7 or 2.72 if $\frac{1}{2} \pi r^2$ used

3.7 or 3.69 if πr used

B1ft

[5]

Q16.

(a) $2 \times \pi \times 9.4$ oe

or $18.8 \times \pi$

M1

[59, 59.1] or 18.8π or $\frac{94\pi}{5}$

A1

(b) their $59 \div 2 + 9.4 + 9.4$ oe

M1

48.3 or $9.4 \pi + 18.8$

[48.3, 48.4]

$$\frac{47\pi}{5} + 18.8$$

A1 ft
[4]

Q17.

Circumference

B1
[1]

Q18.

(a) Radius

B1

(b) Sector

B1

(c) Diameter passes through the centre.

Chord is smaller

Diameter cuts into equal (half) sections, Chord cuts into unequal sections

Ignore irrelevant statements, correct or otherwise.

Any reference to diameter and/or chord must be correct or B0

B1
[3]

Q19.

Side of square = 14 cm seen or implied

eg 14 × 14 or 196

B1

$$\begin{aligned} &\pi \times 7^2 \\ &\text{or } 49\pi \\ &\text{or } [153.8, 154] \end{aligned}$$

oe

M1

$$\begin{aligned} &14 \times 14 - \pi \times 7^2 \\ &\text{or } 196 - [153.8, 154] \end{aligned}$$

oe

M1dep

$$[42, 42.2] \text{ or } 196 - 49\pi$$

A1
[4]

Q20.

$$\frac{120}{360} \times 2 \times \pi \times 4$$

$$\text{or } \frac{120}{360} \times 2 \times \pi \times 5$$

oe

M1

$$\frac{120}{360} \times 2 \times \pi \times 4$$

and $\frac{120}{360} \times 2 \times \pi \times 5$

oe

M1

$$\frac{120}{360} \times 2 \times \pi \times 5 - \frac{120}{360} \times 2 \times \pi \times 4$$

or
[8.37, 8.38] or 8.4
and [10.46, 10.48] or 10.5

oe

M1dep

2.1

A1

[4]

Q21.

tangent

B1

sector

B1

arc

B1

chord

B1

[4]

Q22.

$$\pi \times 8 \times 8 \text{ oe}$$

M1

$$\frac{130}{360} \times \pi \times 8 \times 8 \text{ oe}$$

M1dep

72.5... or 72.6...

A1

73 or 72.6

B1ft

[4]

Q23.

$2 \times \pi \times 12$ or [75.3, 75.4]

oe
 24π

M1

$\frac{135}{360} \times 2 \times \pi \times 12$ (+ 24)

or [28.2, 28.3]

oe
 9π (+24)

M1dep

[52.2, 52.3]

Do not award if $\pi = 3$ used

A1

[3]**Q24.**

diameter

B1

circumference

B1

tangent

B1

chord

B1

[4]**Q25.**

(a) Correct tangent drawn

B1

Additional Guidance

Accept unruled line if intention is clear

Tangent must be drawn without clear space between line and circle

Ignore square drawn on grid lines from part (b)

Tangent may be drawn as part of a square

B1

Accept tangent which does not extend to both sides of circle

B1

Accept tangent drawn and ignore any radius or diameter drawn

B1

Do not accept tangent and chord drawn together

(b) Valid reason for the area of the circle or the square around the circle

B0

B1

Additional Guidance

The area of the circle stated to be [4.5, 6.2] without incorrect working

B1

Area of circle of radius 1.5 (cm) is 7(.06...) or 7.07 or 7.1

B1

The square around it is only 9 cm² or 9 squares or 3 × 3 square

B1

There aren't 9 squares in the circle

B1

The circle fits into a 9 cm² square or 9 squares or 3 × 3 square

B1

It only covers about [4.5, 6.2] squares

B1

Circle does not (completely) cover nine separate boxes

B1

There is one whole square and 8 part squares in the circle

B1

Because all of the space for 9 is not used up

B1

Calculate radius = 1.6(9...) (cm) or 1.7 (cm) from area of circle 9 (cm²) and states radius of circle drawn is smaller

B1

She uses 9 squares that are half in and half out of the circle, she needed to work it out only using the squares inside the circle

B0

Does not fill up the whole square (no reference to 9)

B0

Because the radius is not big enough for it to be 9

B0

[2]