

## AREA AND CIRCUMFERENCE OF CIRCLES

### Pearson Edexcel - Thursday 4 June 2020 - Paper 2 (Calculator) Foundation Tier

1.

27	35.3	P1	for starting the process to find length of third side of triangle, eg $9^2 - 6^2 (=45)$ <b>or</b> $6^2 + x^2 = 9^2$	[radius] is any value  If an answer in the range 35.2 to 35.4 is given in the working space then incorrectly rounded, award full marks No working, answer only no marks
		P1	for $\sqrt{9^2 - 6^2}$ or $\sqrt{81-36}$ or $\sqrt{45}$ or $3\sqrt{5}$ ( $= 6.7..$ ) <b>or</b> $r^2 = 45$	
		P1	for stating or using $\pi \times [\text{radius}]^2 \div 4$	
		A1	for answer in range 35.2 to 35.4	

### Pearson Edexcel - Thursday 24 May 2018 - Paper 1 (Non-Calculator) Foundation Tier

2.

9	(a)	Radius	B1	cao	Accept spelling mistakes
	(b)	Tangent	B1	cao	Accept spelling mistakes

### Pearson Edexcel - Thursday 7 June 2018 - Paper 2 (Calculator) Foundation Tier

3.

19		4378.2(0)	P1	for a process to find the circumference of the circle <b>or</b> the semi circle, eg $\pi \times 50$ ( $= 157.0796327$ ) <b>or</b> $0.5 \times \pi \times 50$ ( $= 78.53981634$ )	Figures may be truncated or rounded  May use circle at this point, figures imply method One cost is 1 length or labour Figures may be truncated or rounded  Two different aspects means arc and straight edge or arc and labour or straight edge and labour Condone circle and labour or circle and straight edge.  Finding the cost of the perimeter is two costs added and so implies the previous P1 The circle is not allowed to be counted as one of the two costs for this mark
			P1	for a complete process to find the perimeter of the field, eg $(0.5 \times \pi \times 50) + 50$ ( $= 128.5..$ ) <b>OR</b> for working with one cost eg "157.07..." $\times 29.86$ ( $= 4690.11..$ ) <b>or</b> "78.5..." $\times 29.86$ ( $= 2345.198..$ ) <b>or</b> $50 \times 29.86$ ( $=1493$ ) <b>or</b> $3 \times 180$ ( $= 540$ )	
			P1	For finding the costs of two different aspects eg 2 of "78.5..." $\times 29.86$ ( $= 2345.1..$ ) <b>or</b> $50 \times 29.86$ ( $= 1493$ ) <b>or</b> $3 \times 180$ ( $= 540$ )	
			P1	for a adding at least 2 costs eg "2345.1.." + "540" ( $=2885.1..$ ) <b>or</b> "1493" + "540" ( $=2033$ ) <b>or</b> "128.5..." $\times 29.86$ ( $= 3838.2..$ )	
			A1	for answer in the range 4377 – 4392	

**Pearson Edexcel - Thursday 2 November 2017 - Paper 1 (Non-Calculator) Foundation Tier**

4.

26		Daisy is wrong  (supported)	P1	for process to find area of any relevant circle ie $\pi \times 4^2 (=16\pi)$ , $\pi \times 7^2 (=49\pi)$ , $\pi \times 10^2 (=100\pi)$ <b>or</b> $7^2$ and $4^2$
			P1	for completed method to find shaded area eg " $\pi \times 7^2$ " – " $\pi \times 4^2$ " ( $=33\pi$ ) <b>or</b> use of radii eg $7^2 - 4^2 (=33)$
			A1	for 2 comparable figures, eg $33\pi$ and $100\pi$ <b>or</b> 33 and 100 <b>or</b> 103 to 103.7 and 314 to 314.2 <b>or</b> 103 to 103.7 and 104.6 to 104.8
			C1	statement eg No because it should be $\frac{33}{100}$ and their accurate figures Allow use of $\pi = 3$ or better

**Pearson Edexcel - Monday 6 November 2017 - Paper 2 (Calculator) Foundation Tier**

5.

18 (a)		31.4	P1	for working with circumference formula, eg $\pi \times 80 (=251.(\dots))$ oe
			A1	for answer in the range 31.4 to 31.5 accept $10\pi$
(b)		No (supported)	C1	Mean distance stays the same with reason, eg total distance remains unchanged or same number of points

**OCR – Tuesday 03 November 2020- Morning - Paper 1 (Calculator) Foundation Tier**

6.

25		142.2[0] with correct working	6	<p>M1 for <math>36^2</math> or 1296</p> <p>M1 for <math>k \times \pi \times 18^2</math> oe where <math>k = \frac{1}{2}, 1, 1\frac{1}{2}</math> or 3</p> <p>AND</p> <p>M1 for <i>their</i> area <math>\times 30</math></p> <p>M1 for <i>their</i> mass <math>\div 1000</math> and <math>\div 10</math> or counting up in 10 000s to <i>their</i> mass</p> <p>AND</p> <p>M1 for <i>their</i> <math>9 \times 15.8</math></p> <p>If 0, 1 or 2 scored instead award SC3 for answer of 142.2[0] with insufficient working</p> <p>If 0 or 1 scored instead award SC2 for 2822 to 2823.02</p> <p>If 0 scored award SC1 for 1526 to 1527.02, 1017 to 1018.008, 508 to 509.004, 3051 to 3054.024, <math>162\pi</math>, <math>324\pi</math>, <math>486\pi</math> rot to at least nearest integer</p>	<p>Correct working requires M1 AND M1 AND M1</p> <p>M2 implied by 2822 to 2823.02 or M1 implied by 1526 to 1527.02, 1017 to 1018.008, 508 to 509.004, 3051 to 3054.024, <math>162\pi</math>, <math>324\pi</math>, <math>486\pi</math> rot to at least nearest integer</p> <p><i>their</i> area cannot be 36 and M1 implied by 84660 to 84 690.6 or 84.66 to 84.7</p> <p><i>their</i> mass is attempt at (rectangle and circle(s)) <math>\times 30</math>, M1 implied by 8.46 to 8.47</p> <p><i>their</i> 9 dep. on fourth M1 scored with a rounding up to next integer</p>
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**OCR Thursday 05 November 2020- Morning (Non-Calculator) Foundation Tier**

7.

23		$\sqrt{\frac{24}{\pi}}$	4	M2 for $[r^2 =] \frac{360 \times 8}{120 \times \pi}$ or better or M1 for $\frac{120}{360} \times \pi r^2 [= 8]$ oe or better A1 for $[r^2 =] \frac{24}{\pi}$	For method condone use of 3.1, 3.14, etc used for $\pi$ M1 implied by $\pi r^2 = 24$ Implied by 7.6...
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**OCR Monday 11 November 2019 – Afternoon (Calculator) Foundation Tier**

8.

4	(a)	31.4 to 31.42	2	B1 for $2\pi r$ or $\pi d$ only seen or used	0 marks if $2\pi r$ or $\pi d$ and $\pi r^2$ seen and wrong one used
	(b)	78.5 to 78.55	2	B1 for $\pi r^2$ only seen or used	0 marks if $2\pi r$ or $\pi d$ and $\pi r^2$ seen and wrong one used

**OCR Tuesday 21 May 2019 – Morning (Calculator) Foundation Tier**

9.

13		615.7 to 615.832 or 616	2	Accept $196\pi$ as final answer for 2 marks M1 for $\pi \times 14^2$ oe
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**OCR Tuesday 6 November 2018 – Morning (Calculator) Foundation Tier**

10.

13		31.4[2] or 31.41...	2	M1 for $\pi \times 10$ oe	Method can be spoiled
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**OCR Thursday 8 November 2018 – Morning (Non-Calculator) Foundation Tier**

11.

21		$36\pi - \pi x^2$ oe final answer	2	M1 for $\pi x^2$ or $\pi \times 6^2$ oe	e.g. $\pi(36 - x^2)$ or $\pi \times 6^2 - \pi \times x^2$
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**OCR Monday 24 May 2018 – Morning (Calculator) Foundation Tier**

12.

12			37.7 cao	3	M1 for $12 \times \pi$ oe A1 37.68 to 37.70[4] If A0 scored B1 for rounding their answer to 1 dp	Their unrounded answer must be seen
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**OCR Thursday 7 June 2018 – Morning (Non Calculator) Foundation Tier**

13.

21			Radius C is $2x$ Or radius A or B is $x$	B1		A and B are the small semicircles C is the large semicircle  May be indicated on the diagram
			Area C = $\frac{\pi \times (2x)^2}{2}$ oe	M1		
			= $2\pi x^2$	A1		
			Area A or B = $\frac{\pi \times x^2}{2}$ oe	M1	or Area A + B = $\pi x^2$ oe	$\pi x^2$ must result from combining area A and area B
			Area = $2\pi x^2 + \frac{\pi x^2}{2} + \frac{\pi x^2}{2} = 3\pi x^2$	A1	or Area = $2\pi x^2 + \pi x^2 = 3\pi x^2$	Addition must be seen with no errors or omissions but condone equivalent expressions for $2\pi x^2$ , $\frac{\pi x^2}{2}$ , $\pi x^2$

**OCR Monday 6 November 2017– Morning (Calculator) Foundation Tier**

14.

15	a		tangent	1		Ignore spelling providing intention is clear
	b		segment	1		Ignore spelling providing intention is clear

AQA Tuesday 19 May 2020 – Morning (Non-Calculator) Foundation Tier

15.

Q	Answer	Mark	Comments
26(a)	$21 \div 7 \times 2 (= 6)$ or $21 \div 3 = 7$ and $6 \div 3 = 2$ or $21 \div 7 = 3$ and $6 \div 2 = 3$ or $7 \times 3 = 21$ and $2 \times 3 = 6$	B1	oe eg $6 \div 2 = 3$ and $7 \times 3 = 21$
	<b>Additional Guidance</b>		
	$3 \times 2 (= 6)$	B0	
	$7 : 2 (=) 21 : 6$ with no other working	B0	
	$7 : 2 (=) 21 : 6$ with multiplication by 3 shown by arrow(s)	B1	
	$7 : 2 (=) 14 : 4 (=) 21 : 6$	B1	
	Do not condone incorrect representation of a division eg $7 \div 21 = 3$	B0	
	Do not condone incorrect mathematical representation eg $21 \div 7 = 3 \times 2 = 6$	B0	
	$21 \div 6 = 3.5$ , $3.5 \times 2 = 7$	B1	
	$21 \times 2 = 42$ , $42 \div 7 = 6$	B1	

Q	Answer	Mark	Comments
<b>26(b)</b>	<b>Alternative method 1</b>		
	$2 \times \pi \times 21$ or $\pi \times 42$ or $42\pi$ or [131.88, 132]	M1	oe condone [3.14, 3.142] for $\pi$
	$2 \times \pi \times 6 \div 4$ or $\pi \times 12 \div 4$ or $3\pi$ or [9.4, 9.43]	M1	oe arc length of quarter circle condone [3.14, 3.142] for $\pi$
	$2 \times \pi \times 6 \div 4 + 2 \times 6$ or $3\pi + 12$ or [21.4, 21.43]	M1dep	oe dep on 2nd M1 this does not imply M1M1M1
	$45\pi + 12$	A1	
	<b>Alternative method 2</b>		
	$2 \times \pi \times 21$ or $\pi \times 42$ or $42\pi$ or [131.88, 132]	M1	oe condone [3.14, 3.142] for $\pi$
	$2 \times \pi \times 21$ and $2 \times \pi \times 6 \div 4$ or $42\pi$ and $3\pi$ or $2 \times \pi \times 21 + 2 \times 6$ or $42\pi + 12$ or [143.88, 144]	M1dep	oe eg $42\pi$ and [9.4, 9.43] or [131.88, 132] and $3\pi$
	$2 \times \pi \times 21 + 2 \times \pi \times 6 \div 4$ or $42\pi + 3\pi$ or $45\pi$ or [141, 141.43] or [153, 153.43]	M1dep	oe eg $42\pi + [9.4, 9.43]$ or [131.88, 132] + $3\pi$
	$45\pi + 12$	A1	

		Additional Guidance	
<b>26(b) cont</b>	Condone $3(15\pi + 4)$		M1M1M1A1
	Condone, for example, $\pi 42$ for up to M1M1M1		
	$21\pi + 3\pi + 12$		M0M1M1A0 on alt 1
	$441\pi + 3\pi + 12$		M0M1M1A0 on alt 1
	$42\pi + 36\pi + 12$		M1M1M0A0 on alt 2
	$441\pi + 36\pi + 12$		M0M0M0A0
	Using $\pi r^2$ instead of $2\pi r$ throughout		M0M0M0A0
	$45\pi + 12$ in working with incorrect further work, eg $45\pi + 12 = 57\pi$		M1M1M1A0

AQA Thursday 4 June 2020 – Morning (Calculator) Foundation Tier

16.

Q	Answer	Mark	Comments
<b>14</b>	True	B3	B2 three correct B1 two correct allow any unambiguous indication
	False		
	False		
	True		
<b>Additional Guidance</b>			
A tick and a cross in the same row – mark the tick			
Only a cross used in a row – regard cross as their selection for that row			

AQA Thursday 8 November 2018 – Morning (Calculator) Foundation Tier

17.

17	Pi or $\pi$	B1	accept a value in range [3.14, 3.142]
	<b>Additional Guidance</b>		
	Accept incorrect spelling if intention is clear eg accept pie		
	Answer ( $C =$ ) $\pi d$		B0
	Answer ( $C =$ ) $\pi d$ ( $k =$ ) $\pi$		B1

AQA Thursday 7 June 2018 – Morning (Calculator) Foundation Tier

18.

21(a)	$2 \times 4.2 \times \pi$ or $8.4\pi$	M1	oe allow [3.14, 3.142] for $\pi$
	[26.376, 26.393]	A1	may be implied by 26.4 as answer
	26.4	B1ft	ft their value to at least 2 dp rounded correctly to 1 dp
	<b>Additional Guidance</b>		
	26.4		M1A1B1ft
	26.3 only		M0A0B0ft
	55.4 only		M0A0B0ft

21(b)	Sector drawn correctly	B1	two radii joined at the centre of the circle
	<b>Additional Guidance</b>		
	Mark intention		
	Diameter drawn		B1
	Any number of sectors (eg diameter and radius drawn)		B1
	Ends of radii joined to form segment with whole sector shaded		B1
	Ends of radii joined to form segment without whole sector shaded		B0



AQA Thursday 2 November 2017 – Morning (Non-Calculator) Foundation Tier

19.

27	$\pi \times 6 \times 6$ or $36\pi$ or [113, 113.112] or $9 \times [3.14, 3.142]$ or [28.26, 28.3]	M1	oe accept [3.14, 3.142] for $\pi$
	$9\pi$ or $9 \times \pi$ or $\pi 9$ or $\pi \times 9$	A1	
	<b>Additional Guidance</b>		
	$36\pi$ followed by an incorrect method eg $36\pi \div 2 = 18\pi$ with answer $18\pi$		M1A0
	Answer of $9\pi$ from $\pi \times 3^2$		M0A0
	$9\pi$ and [28.26, 28.3] given on answer line		M1A0
	$\pi r^2$ stated but followed by 36 or 9		M0A0

AQA Thursday 25 May 2017– Morning (Non-Calculator) Foundation Tier

20.

20	$\sqrt{64}$ or 8 or $64 = 8 \times 8$	M1	Implied by a diameter or side length of 8 stated or shown on the diagram, or radius of 4 stated or used or shown on the diagram
	$\pi \times (\text{their } 8 \div 2)^2$ or $\pi \times 4^2$ or $\pi 4^2$ or [50.24, 50.272]	M1dep	oe Allow [3.14, 3.142] for $\pi$
	$16\pi$	A1	Condone $16 \times \pi$ or $\pi \times 16$ or $\pi 16$
	<b>Additional Guidance</b>		
	$64 - 16\pi$		M1M1A0
	Beware of incorrect methods which lead to the correct answer eg $r = 8, 2 \times \pi \times 8 = 16\pi$ $\sqrt{64} = 8, 8^2 = 16, 16\pi$		M0M0A0 M1M0A0

AQA Tuesday 13 June 2017 Morning– Morning (Calculator) Foundation Tier

21.

<b>13(a)</b>	Correct tangent drawn	B1	
	<b>Additional Guidance</b>		
	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		B0

<b>13(b)</b>	Valid reason for the area of the circle or the square around the circle	B1	
	<b>Additional Guidance</b>		
	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 cm <sup>2</sup> or 9 squares or 3 × 3 square		B1
	There aren't 9 squares in the circle		B1
	The circle fits into a 9 cm <sup>2</sup> 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 (cm <sup>2</sup> ) 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	

AQA Sample Paper 1– Morning (Non-Calculator) Foundation Tier

22.

<b>24</b>	$\pi \times 8^2 (\div 2)$	M1	oe
	$32\pi$	A1	