AREA OF ANY TRIANGLE

Pearson Edexcel - Thursday 8 November 2018 - Paper 2 (Calculator) Higher Tier

1.

13	84.9	P1	shows a process to find the radius or diameter eg $44 = 2 \times \pi \times r$ **or** $r = \frac{22}{\pi}$ **or** $d = \frac{44}{\pi}$ **or** $r = 7.0028$ **or** $d = 14.0056..$	Allow r in the range 7 to 7.1 and d in the range 14 to 14.1 Could be shown on the diagram.
		P1	(dep on P1) complete method to find the area eg ½ × "d" ^{2} × Sin60 oe, ½ × 14 × Tan60 oe, ½ × 14 × $\sqrt{14^2 - 7^2}$ oe	
		A1	for answer in the range 84.8 to 85	If the correct answer in the range is given in working and then rounded incorrectly award full marks.

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2.

8	216	P1	for process to work with ratio eg 72 ÷ (3 + 4 + 5) (= 6) **or** 72 ÷ 12 (= 6)	
		P1	for process to find length of base or height of triangle eg 3 × "6" (= 18) **or** 4 × "6" (= 24) **OR** process to find area scale factor eg "6" × "6" (= 36)	
		P1	complete process to find the area of the triangle eg ½ × "18" × "24" **or** ½ × 3 × 4 × "6"^{2}	
		A1	cao	

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3.

15		2.63	P1	for setting up the expression $\frac{1}{2}(x+3)(2x-1)\sin 45$ (may be seen in an equation)
			P1	(dep) for expanding the brackets in the expression or for the equation $\frac{1}{2}(x+3)(2x-1)\sin 45 = 6\sqrt{2}$ oe
			P1	(dep) for the process to set up the equation and rearrange to the form $ax^2 + bx + c = d$ e.g. to $2x^2 + 5x - 27 = 0$ or $24 = 2x^2 + 5x - 3$
			P1	(dep) for substitution into the quadratic formula e.g. $\frac{-5 \pm \sqrt{5^2 - 4 \times 2 \times -27}}{4}$
			A1	for 2.63(10436…)

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4.

18		48	P1	Identifies that $16 \div 8 = 2$ so $PL = 2NP$
			P1	Process to find area of LMN $8 \times (2+1)^2$ (=72)
			P1	Completes process to find area of LQM '72'−16 − 8
			A1	48 cao

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5.

22		60	P1 P1 P1 P1 A1	process to start problem eg draw diagram and find gradient of OA (= 3) process to find equation of tangent with $m = -1/\text{'3'}$ process to find x-axis intercept of tangent process to find area of triangle cao

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6.

21		10.4	P1 P1 P1 P1 A1	starts process by using cosine rule to find CD eg $(CD)^2 = 4.9^2+3.8^2-2\times4.9\times3.8\times\cos80$ (= 31.98..) uses sine rule to find angle ACD or angle ADC eg $\frac{\sin C}{3.8}=\frac{\sin 80}{\text{'5.655'}}$ or $\frac{\sin D}{4.9}=\frac{\sin 80}{\text{'5.655'}}$ uses sine rule to find BC or BD eg $\frac{BD}{\sin 25}=\frac{\text{'5.655'}}{\sin\text{'33.6'}}$ process to find area eg 1/2 $ab\sin C$ for 10.4 to 10.43

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7.

21 (a)		130	P1 P1 P1 A1	start to process eg draw a labelled triangle or use of sine rule $\frac{\sin Q}{8.7}=\frac{\sin 32}{5.2}$ process to find of Q eg $Q=\sin^{-1}\left[\frac{\sin 32}{5.2}\times8.7\right]$ process to find area of triangle PRQ. 22.5 – 22.6
(b)			C1	angle PRQ is obtuse so need to find area of two triangles.

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8.

18		49.5	4	M1 for $\tan 54 = \frac{\text{height}}{6}$ M1 for (height =) $6 \times \tan 54$ (=8.2-8.3) M1 for $\frac{1}{2} \times$ '8.258..' $\times 12$ A1 for 49.2 - 50 **OR** M1 for $\cos 54 = \frac{6}{AC}$ M1 for $(AC =) \frac{6}{\cos 54}$ (=10.2(07...)) M1 for $\frac{1}{2} \times 12 \times$ '10.207' $\times \sin 54$ A1 for 49.2 - 50 **OR** M1 for $\frac{AC}{\sin 54} = \frac{12}{\sin 72}$ M1 for $(AC =) \frac{12}{\sin 72} \times \sin 54$ (=10.2(07...)) M1 for $\frac{1}{2} \times 12 \times$ '10.207' $\times \sin 54$ A1 for 49.2 – 50

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9.

20			$5x^2$	4	M1 for $4x \times 4x$ M1 for $(2x \times 4x)/2$ or $(2x \times x)/2$ or $(3x \times 4x)/2$ M1(dep M2) for "$16x^2$" – "$4x^2$" – "x^2" – "$6x^2$" A1 for $5x^2$ **OR** M1 for $\sqrt{(2x)^2 + (4x)^2}$ $(= \sqrt{20x^2} = \sqrt{20}\,x)$ M1 for $\sqrt{(x)^2 + (2x)^2}$ $(= \sqrt{5x^2} = \sqrt{5}\,x)$ M1(dep M2) for $\frac{\text{"}\sqrt{5}\,x\text{"} \times \text{"}\sqrt{20}\,x\text{"}}{2}$ $(= \frac{\sqrt{100}}{2}\,x^2)$ A1 for $5x^2$

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10.

24	(a)		18.2	2	M1 for $\frac{1}{2} \times 6 \times 7 \times \sin 60$ A1 for answer in range 18.1 to 18.2
	(b)		6.56	3	M1 for $6^2 + 7^2 - 2 \times 6 \times 7 \times \cos 60$ M1 for correct order of operation eg $36 + 49 - 42$ (=43) A1 for answer in range 6.55 to 6.56

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11.

16			84	4	M1 for $x - 1 + 3x + 1 + 3x$ (= 56) or $7x = 56+1-1$ or $\frac{3x(x-1)}{2}$ oe M1 for $7x = 56$ or 8 seen M1 for $0.5\times('8' - 1)\times(3\times'8')$ A1 cao Ignore any statement of units. SC B2 for 8 as the answer or 7 identified as the height and 24 identified as the base of the triangle.

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12.

18		$\frac{1}{2} \times 4 \times 3 = 6$ $\left(\frac{1}{2}\right)^2 \times 6 =$	1.5	3	M1 for $\frac{1}{2} \times 4 \times 3$ oe M1 for $\left(\frac{1}{2}\right)^2 \times$ "6" A1 cao **OR** M2 for $\frac{1}{2} \times 2 \times 1.5$ oe (M1 for triangle with all lengths $\frac{1}{2}$ corresponding lengths of triangle ABC seen in any position **or** vertices seen at (1, 1) (3,1) and (2.5, 2.5) or stated) A1 cao

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13.

24		$\frac{AC}{\sin 49} = \frac{8.7}{\sin 64}$ $AC = \frac{8.7}{\sin 64} \times \sin 49$ (= 7.305…) $\frac{1}{2} \times 8.7 \times 7.305... \times \sin(180 - 64 - 49)$	29.3	5	M1 for $\frac{AC}{\sin 49} = \frac{8.7}{\sin 64}$ oe M1 for $(AC =) \frac{8.7}{\sin 64} \times \sin 49$ A1 for 7.3(05…) M1 for $\frac{1}{2} \times 8.7 \times$ '7.305' $\times \sin(180 - 64 - 49)$ A1 for 29.19 – 29.3 **OR** M1 for $\frac{BC}{\sin(180 - 64 - 49)} = \frac{8.7}{\sin 64}$ oe M1 for $(BC =) \frac{8.7}{\sin 64} \times \sin'67'$ A1 for 8.9(10...) M1 for $\frac{1}{2} \times 8.7 \times$ '8.910' $\times \sin 49$ A1 for 29.19 – 29.3 **OR** (X is point such that AX is perpendicular to BC) M1 for $AX = 8.7\times\sin 49$ (= 6.565…) **or** $XB = 8.7\times\cos 49$ (= 5.707...) M1 for $XB = 8.7\times\cos 49$ (= 5.707...) **and** $CX =$ '6.565' ÷ tan 64 oe (= 3.202…) A1 for 8.9(10...) **or** 5.7(07...) and 3.2(02...) M1 for ½ × '6.565…' × ('5.707' + '3.202') oe A1 for 29.19 – 29.3

Pearson Edexcel - Friday 12 November 2010 - Paper 4 (Calculator) Higher Tier

14.

1	$5 \times 8 \div 2$	20	2	M1 for $5 \times 8 \div 2$ oe A1 cao

Pearson Edexcel - Friday 12 November 2010 - Paper 4 (Calculator) Higher Tier

15.

28	(a)	Area = ½ (8.3 × 10.5) sin 62° = 43.575 × 0.88294... = 38.47444136	38.5	2	M1 for ½ (8.3 × 10.5) sin 62° A1 for 38.4 - 38.5 SC M1A0 for ±32.2 (radians) or 36.0 (grad)
	(b)	$QR^2 = 8.3^2 + 10.5^2$ $- 2(8.3)(10.5) \cos 62$ $= 68.89 + 110.25$ $- 174.3 \times 0.46947...$ $= 179.14 - 81.828...$ $QR = \sqrt{97.3111...}$ $= 9.86463920$	9.86		M1 for correct substitution into cosine rule M1 (dep) for correct order of evaluation (excluding square root) A1 for 9.86 - 9.865 SC M2A0 for 7.86 (radians) or 9.01 (grad)

Pearson Edexcel - Friday 11 June 2010 - Paper 4 (Calculator) Higher Tier

16.

12	(a)	$0.5 \times 6 \times 14$	42	2	M1 for $0.5 \times 6 \times 14$ oe A1 cao
	(b)	$\sqrt{6^2 + 14^2} = \sqrt{232}$	15.23	3	M1 for $6^2 + 14^2$ or 36+196 or 232 M1 for $\sqrt{36 + 196}$ or $\sqrt{232}$ A1 for answer in the range 15.2 to 15.3

Pearson Edexcel - Tuesday 10 November 2009 - Paper 4 (Calculator) Higher Tier

17.

26	(a)	$0.5 \times 5 \times 8 \times \sin 75$	19.3	2	M1 for $0.5 \times 5 \times 8 \times \sin 75$ A1 for 19.3 – 19.32 SC M1A0 for 7.7(5..) or – 7.7(5..) or 18.4(7..) seen
	(b)	$AB^2 = 5^2 + 8^2 - 2 \times 5 \times 8 \times \cos 75$ $= 25 + 64 - 80 \times \cos 75 = 68.29...$ $AB = \sqrt{89 - 80 \times \cos 75}$ $= 8.264...$	8.26	3	M1 for $AB^2 = 5^2 + 8^2 - 2 \times 5 \times 8 \times \cos 75$ M1 (dep) for 89 – '80' cos 75 A1 for 8.26 (4...) SC M1M1A0 for 3.9(0..) or 7.6(4..) seen

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18.

13			50	**4**	**B1** for 2.5 oe soi **M2** for $8 \times (5 \div 2)^2$ oe or **M1** for $(5 \div 2)^2$ soi by 6.25 oe <u>Alternative method:</u> **B1** for [AB : AC =] 2 : 5 oe soi **M2** for $(8 \div 2^2) \times 5^2$ oe or **M1** for [area ratio] $2^2 : 5^2$ oe soi <u>Alternative method:</u> **B1** for 2.5 oe soi **M1** for numerical $\frac{b \times h}{2} = 8$ where $b \times h = 16$ **M1** for $\frac{2.5\ their\ b \times 2.5\ their\ h}{2}$ <u>If evidence of using 2 : 3 seen:</u> **B0** for [AB : AC =] 2 : 3 or 1.5 oe soi **M2** for $(8 \div 2^2) \times 3^2$ oe or **M1** for [area ratio] $2^2 : 3^2$ or 1.5^2 oe soi <u>If no working:</u> **SC1** for final answer 18	Final answer 20 implies **B1** (from use of linear scale factor) 6.25 scores **B1M1** $2^2 : 5^2$ scores May be seen in stages

OCR GSCE – Monday 12 November 2018 – Paper 6 (Calculator) Higher Tier

19.

19			32.2 to 32.3	**6**	**M2** for $x^2 - 10x + 19 = 0$ oe or **M1** for $9^2 = 10^2 + x^2 - 2 \times 10 \times x \times \cos 60$ AND **M1FT** for $\frac{10 \pm \sqrt{10^2 - 4 \times 1 \times 19}}{2}$ **A1** for $x = 7.45$ or $5 + \sqrt{6}$ AND **M1** for $\frac{1}{2} \times 10 \times their 7.45 \times \sin 60$ oe <u>Alternative</u> **M1** for $\frac{\sin 60}{9} = \frac{\sin B}{10}$ oe **M1** for $\sin B = \frac{10}{9} \sin 60$ or better **A1** for $B = 74.2(\ldots)$ AND **M1** for $A = 180 - 60 - their\ 74.2$ soi by 45.8 AND **M1** for $\frac{1}{2} \times 9 \times 10 \times their \sin 45.8$	Accept 32 after full correct method Use of cosine rule **FT** their quadratic = 0 <u>Alternative</u>: **M1** for $(x - 5)^2 - 6 = 0$ Ignore 2.55 or $5 - \sqrt{6}$ *Their* 7.45 should be from cosine rule followed by quadratic (not from measuring etc.) Use of sine rule Isolates sin*B* *Their* 45.8 should be from sine rule followed by 180 – *their* sine rule answer (not from measuring etc.)

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20.

18			11.1 or 11.14 or 11.13[6…] or accept 11 with supporting working.	**6**	**M3** for correct cos rule with cos as subject e.g. [cos =] $\frac{6.4^2+5.8^2-3.9^2}{2\times6.4\times5.8}$ or **M2** for the above (M3) formula with one error or for $3.9^2=6.4^2+5.8^2-2\times6.4\times5.8\times\cos[.]$ or **M1** for this (M2) formula with one error AND **M2** for $\frac{1}{2}\times6.4\times5.8\times\sin(\textit{their}36.87\ldots)$ or **M1** for the use of this formula with one error	accept any correct method and they can find any angle, see additional guidance for the other angles this angle (opposite 3.9) is 36.87… which implies **M3**