01. 0580_m24_ms_42 Q: 6

Question	Answer	Marks	Partial Marks
(a)	15[.0] or 15.00 to 15.01	3	**M2** for $\frac{17.2}{\sin 68} \times \sin 54$ oe or **M1** for $\frac{\sin 54}{AC} = \frac{\sin 68}{17.2}$ oe
(b)	15.7 or 15.65 to 15.66	3	**M2** for $\sqrt{their15^2 + 12.8^2 - 2 \times their15 \times 12.8 \times \cos 68}$ OR **M1** for $their15^2 + 12.8^2 - 2 \times their15 \times 12.8 \times \cos 68$ **A1** for 244.9 to 245.2

Question	Answer	Marks	Partial Marks
(c)	13.9 or 13.90 to 13.92	3	**M2** for $\frac{x}{17.2} = \sin 54$ oe or $\frac{x}{their15} = \sin 68$ oe or **M1** for distance required is the perpendicular from A to BC soi

02. 0580_s24_ms_41 Q: 6

Question	Answer	Marks	Partial Marks
(a)	245	1	
(b)(i)	180 – (55 + 25) [=100]	M1	
(b)(ii)	$\frac{32 \times \sin 25}{\sin 100}$ oe	M2	**M1** for $\frac{\sin 25}{BH} = \frac{\sin 100}{32}$ oe
	13.73…	A1	

Question	Answer	Marks	Partial Marks
(c)	258 or 257.9 to 258.0…	**5**	**B4** for 67.9 to 68.0… OR **M2** for [cos =] $\left(\frac{11^2+13.7^2-14^2}{2\times13.7\times11}\right)$ **A1** for 0.3738 to 0.376 or **M1** for $14^2 = 11^2 + 13.7^2 - 2\times 11 \times 13.7 \times \cos B$ **M1dep** on at least M1 for 190 + *their* angle B
(d)(i)	2 44 pm or 14 44 cao	**4**	**B3** for 1 hour 44 or 1 hour 43.6 to 1 hour 43.8 or 104 or 103.6 to 103.8 or **B2** for 1.727 to 1.73 or **M2** for $\frac{32}{10\times1.852}\times60$ or **M1** for 32 ÷ (10 × 1.852)
(d)(ii)	7.857 to 7.88	**3**	**M2** for $\frac{x}{13.7} = \cos 55$ oe or **M1** for dist to H occurs when perpendicular from B meets CH soi

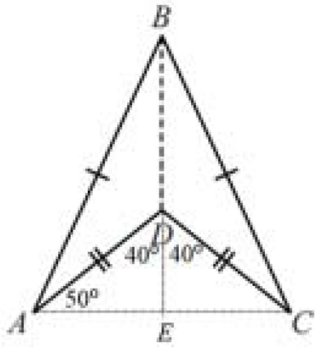
03. 0580_s24_ms_42 Q: 6

Question	Answer	Marks	Partial Marks
(a)	$\sqrt{10.4^2+6.5^2-2\times10.4\times6.5\times\cos64}$	**M2**	**M1** for $10.4^2 + 6.5^2 - 2\times 10.4 \times 6.5 \times \cos64$ **A1** for 91.1 to 91.2
	9.546 to 9.547	**A1**	

Question	Answer	Marks	Partial Marks
(b)(i)	$180-(26+42)$	**B1**	
(b)(ii)	6.89 or 6.888 to 6.892...	**3**	**M2** for $\frac{9.55}{\sin 112}\times \sin 42$ oe or **M1** for $\frac{\sin 112}{9.55}=\frac{\sin 42}{CD}$ oe
(c)	5.84[2…]	**3**	**M2** for $\frac{x}{6.5}=\sin 64$ oe or **M1** for identifying shortest distance from D is perpendicular to AB

04. 0580_s24_ms_43 Q: 6

Question	Answer	Marks	Partial Marks
(a)	4.27 or 4.272...	**2**	**M1** for $4^2 + 1.5^2$ oe

Question	Answer	Marks	Partial Marks
(b)	203 or 202.6…	**3**	**B2** for [angle at W =] 22.6... or for [angle at V =] 67.4 or 67.38… or **M1** for tan = $\frac{5}{12}$ or $\frac{12}{5}$ oe
(c)	25.2 or 25.20 to 25.21[0]  	**5**	**B4** for [BC or AB =] 7.6[0] or 7.604 to 7.605 OR **M3** for a complete explicit method leading to AB or BC, e.g. $\frac{5\sin 140}{\sin 25}$ OR **M2** for a complete implicit method leading to AB or BC, e.g. $\frac{\sin 25}{5} = \frac{\sin 140}{BC \text{ or } AB}$ oe and **M1** (dep on AB from trig) for 2 × *their* AB + 10 OR **B1** for any relevant angle E.g. $\angle BDA$ or $\angle BDC$ = 140, $\angle DAE$ or $\angle DCE$ = 50 or $\angle ADE$ or $\angle CDE$ = 40 or $\angle ADC$ = 80
(d)	79.5 or 79.6 or 79.54 to 79.55...	**5**	**B2** for [PR^2 =] 245 or 245.1 to 245.2 or [PR =] 15.65 to 15.66 or 15.7 or **M1** for [PR^2 =] $11^2 + 8^2 - 2 \times 11 \times 8 \times \cos 110$ **M2** for [cosPQR =] $\frac{10^2 + 14^2 - (\textit{their } PR)^2}{2 \times 10 \times 14}$ oe or **M1** for (*their* PR)^2 = $10^2 + 14^2 - 2 \times 10 \times 14\cos PQR$ oe

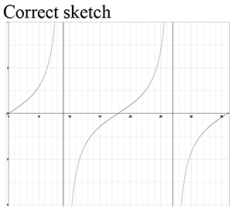
Question	Answer	Marks	Partial Marks
(a)	$\frac{3}{10} \times 360$ oe	**M2**	**M1** for $\frac{3}{3+7} = \frac{x}{360}$ or for $\frac{x}{360}$ $[\times 2\pi r] = \frac{3}{7} \times \frac{360-x}{360}$ $[\times 2\pi r]$ oe or better or $1\ [\times 2\pi r] = \frac{10}{7} \times \frac{360-x}{360}$ $[\times 2\pi r]$ oe or better or $\frac{360}{7+3} \times k$ ($k = 1$ or 7)
	108	**A1**	
(b)(i)	$\frac{1}{2}r^2 \sin y = \frac{1}{2} \times \frac{y}{360} \times \pi r^2$ or $\frac{y}{360} \times \pi r^2 = [2 \times \frac{1}{2}]\ r^2 \sin y$ and one further step leading to $360\sin y = \pi y$ with no errors	**2**	**M1** for $\frac{y}{360} \times \pi r^2$ or for $\frac{1}{2}r^2 \sin y$
(b)(ii)	341.18 or 341.22 341.00 341.49 or 341.54	**3**	**B1** for each
(b)(iii)	108.6 cao	**1**	

06. 0580_m23_ms_42 Q: 10

Question	Answer	Marks	Partial Marks
(a)	$\cos 31 = \frac{AB}{12.3}$ oe	M1	
	10.543...	A1	
(b)	$\cos = \frac{12.3}{16.5}$ oe	M1	
	41.801 to 41.802	A1	
(c)	16.7 or 16.8 or 16.74 to 16.75…	3	**M2** for $\sqrt{10.54^2 + 16.5^2 - 2\times 10.54\times 16.5\times\cos(31+41.8)}$ or for $\sqrt{6.33^2 + 11^2 - 2\times 6.33\times 11\times\cos(180-31)}$ OR **M1** for $10.54^2 + 16.5^2 - 2\times 10.54\times 16.5\times\cos(31+41.8)$ or for $6.33^2 + 11^2 - 2\times 6.33\times 11\times\cos(90+90-31)$ oe **A1** for 280 or 281 or 280.4 to 280.6

Question	Answer	Marks	Partial Marks
(d)	18.9 to 20.7… nfww	4	**M1** for $\sin 31 = \frac{BC}{12.3}$ oe or better and $\sin 41.8[0] = \frac{CD}{16.5}$ oe **M2dep on M1** for $\cos[DBC] = \frac{their(c)^2 + 6.34^2 - 10.998^2}{2\times their(c)\times 6.34}$ or **M1dep on M1** for $10.998^2 = their$ **(c)**$^2 + 6.34^2 - 2\times$ *their* **(c)** $\times 6.34\times\cos DBC$
(e)	2.05 to 2.24… nfww	4	**M1** for $\sin 31 = \frac{BC}{12.3}$ oe or better or $\sin 41.8[0] = \frac{CD}{16.5}$ oe **M2dep on M1** for $\frac{\text{dist}}{their BC} = \sin(their\ \text{angle}\ CBD)$ or $\frac{\text{dist}}{their CD} = \sin(their\ \text{angle}\ CDB)$ or **M1** for recognition of shortest distance

07. 0580_m23_ms_42 Q: 12

Question	Answer	Marks	Partial Marks
(a)	Correct sketch 	2	Condone curve touching asymptotes but not crossing **B1** for one section correct or for 3 sections in correct part of graph but with incorrect curvature and no other sections in incorrect part of graph
(b)	30 **and** 210 final answer	2	**B1** for each If 0 scored **SC1** for two answers (one acute and one reflex) with a difference of 180

Question	Answer	Marks	Partial Marks
(a)	$[\sin =]\dfrac{145}{\frac{1}{2}\times 6.4\times 5.7\times 15}$	**M2**	**M1** for $145 = \frac{1}{2}\times 6.4\times 5.7\times \sin x\times 15$ oe or for $\dfrac{1}{2}\times 6.4\times h\times 15 = 145$ and $\sin x = \dfrac{h}{5.7}$
	32.0[0]	**A1**	If M0, **SC1** for $145 = 0.5\times 6.4\times 5.7\times sin32\times 15$ oe
(b)	3.4[0] or 3.402 to 3.403 nfww	**3**	**M2** for $\sqrt{6.4^2+5.7^2-2\times 6.4\times 5.7\times\cos(32)}$ OR **M1** for $6.4^2+5.7^2-2\times 6.4\times 5.7\times\cos(32)$ **A1** for 11.6 or 11.57 to 11.58
(c)	3.02 or 3.020 to 3.021	**3**	**M2** for $\sin(32)=\dfrac{x}{5.7}$ $\sqrt{80^2+50^2-2\times 80\times 50\times\cos 75}$ or **M1** for recognition that the line from E is perpendicular to AB e.g. right angle seen or $\dfrac{1}{2}\times 6.4\times h$

Question	Answer	Marks	Partial Marks
(d)	10.8 or 10.9 or 10.84 to 10.85...	**4**	**M3** for $[\sin =]\dfrac{their\ (c)}{\sqrt{15^2+5.7^2}}$ or $[\tan =]\dfrac{their\ (c)}{\sqrt{(5.7\times cos32)^2+15^2}}$ or **M2** for $15^2+5.7^2$ or $(5.7\times\cos 32)^2+15^2$ oe or **M1** for recognition of correct angle
(e)	136 or 136.0...	**3**	**M2** for $938\times 145\times\dfrac{1000}{1000000}$ oe or **M1** for figs 136 or 13601

09. 0580_s23_ms_41 Q: 4

Question	Answer	Marks	Partial Marks
(a)(i)	96	**2**	**M1** for $\frac{1}{2}\times 24\times 8$
(a)(ii)	18.4 or 18.43...	**2**	**M1** for $\tan[x]=\frac{8}{24}$ oe

Question	Answer	Marks	Partial Marks
(b)	622 or 622.0 to 622.1....	**2**	**M1** for $[\frac{1}{2}\times]\ \pi\times 6^2\times 11$ or $\frac{1}{2}\times\pi\times 6^2[\times 11]$
(c)(i)	246 or 246.2 to 246.3...	**5**	**M4** for $15\times 20-4\times 4-\frac{270}{360}\times\pi\times 4^2$ oe OR **M2** for $\frac{270}{360}\times\pi\times 4^2$ oe or **M1** for $k\times\pi\times 4^2$, where $k\leq 1$ **M1** for 15×20 or 4×4 oe
(c)(ii)	80.8 or 80.9 or 80.84 to 80.85...	**3**	**M1** for $15+20+11+16$ oe **M1** for $\frac{3}{4}\times 2\times\pi\times 4$ oe

10. 0580_s23_ms_42 Q: 7

Question	Answer	Marks	Partial Marks
(a)	Angle $CAB = 52$	**B1**	
	$180 - 52 - \sin^{-1}\left(\frac{60\sin their 52}{87}\right)$	**M3**	**M2** for $[\sin[...]=]\ \frac{60\sin their 52}{87}$ oe or **M1** for $\frac{60}{\sin B} = \frac{87}{\sin their 52}$ oe
	95.08…	**A1**	
(b)	77.1 or 77.08 to 77.11	**6**	**B4** for dist travelled = 256.9 to 257[.0…] or **B3** for [AB =] 109.9 to 110[.0…] or **M3** for $60 + 87 + \sqrt{60^2 + 87^2 - 2\times60\times87\times\cos 95.1}$ oe or **M2** for $\sqrt{60^2 + 87^2 - 2\times60\times87\times\cos 95.1}$ oe or $AB^2 = 12093.\ldots$ to $12097.\ldots$ or $\frac{87\sin 95.1}{\sin their 52}$ oe or **M1** for $AB^2 = 60^2 + 87^2 - 2\times60\times87\times\cos 95.1$ oe or $\frac{\sin 95.1}{AB} = \frac{\sin their 52}{87}$ oe **M1** for *their* total distance $\div 3\frac{20}{60}$ oe

11. 0580_s23_ms_42 Q: 10

Question	Answer	Marks	Partial Marks
(a)	13.9 or 13.85 to 13.86	4	**M3** for $2x^2 = 28^2 - 20^2$ or better or $x = \left(\sqrt{28^2 - 20^2}\right)\sin 45$ oe or **M2** for $x^2 + x^2 + 20^2 = 28^2$ oe or $\sin 45 = \frac{x}{\sqrt{28^2 - 20^2)}}$ or **M1** for any correct Pythag in 2D or *their AC* × sin 45 oe dep on trig/Pythagoras attempt for *AC*
(b)	51.9 or 51.87 to 51.88	4	**M3** for $\sin = \frac{29 \text{ to } 30}{37 + 0.5}$ or $\frac{30 - 0.5}{37 \text{ to } 38}$ oe or **M2** for correct trig statement for correct angle with values in range 29 to 31 and 36 to 38 or **M1** for 30 + 0.5 or 30 – 0.5 or 37 + 0.5 or 37 – 0.5 seen or for identifying correct angle *RKM*

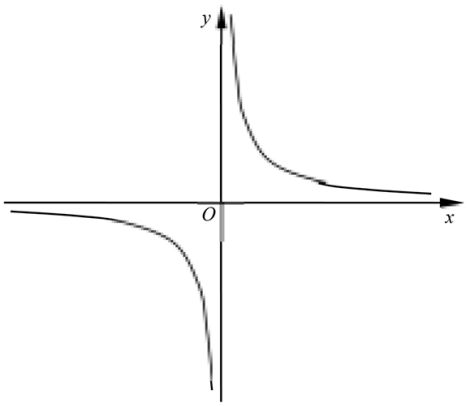
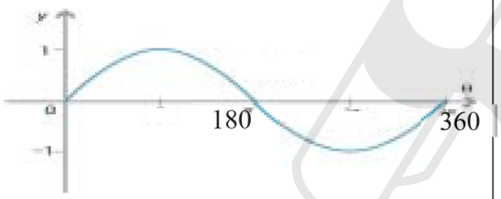
12. 0580_s23_ms_43 Q: 5

Question	Answer	Marks	Partial Marks
(a)(i)	2[.00] or 2.002 to 2.003 nfww	3	**M2** for $\sqrt{4.8^2 + 5.6^2 - 2 \times 4.8 \times 5.6 \times \cos 20.4}$ OR **M1** for $4.8^2 + 5.6^2 - 2 \times 4.8 \times 5.6 \times \cos 20.4$ **A1** for 4.01[17…] or 4.012
(a)(ii)	4.1[0] or 4.11 or 4.100 to 4.107 cao	2	**M1** for $\tan 64 = \frac{AX}{\textit{their}\ \textbf{(a)(i)}}$ or for $\frac{AX}{\sin 64} = \frac{\textit{their}\ \textbf{(a)(i)}}{\sin(90 - 64)}$ oe
(a)(iii)	6.96	2	**M1** for $\frac{1}{2} \times 4.8 \times 2.9$ oe

Question	Answer	Marks	Partial Marks
(b)	11.3 or 11.31..	**5**	**M4** for $2\times\frac{8}{\sin(45)}\times\sin 30$ or **B4** for PM = 5.65[685...] or 5.66 or better OR **B1** for *angle RPM* = 45° **M2** for $\frac{8}{\sin(their\ 45)}\times\sin 30$ or **M1** for implicit form

13. 0580_s23_ms_43 Q: 7

Question	Answer	Marks	Partial Marks
(a)	Cubic	**1**	

Question	Answer	Marks	Partial Marks
(b)(i)	Correct sketch  	2	**B1** for one branch correct or an attempt at the correct shape Maximum 1 mark if sketch crosses x-axis or y-axis
(b)(ii)	$\pm\frac{1}{2}$ **nfww**	2	**M1** for $4x^2 = 1$ oe or **B1** for $\frac{1}{2}$ or $-\frac{1}{2}$ nfww
(c)(i)	Correct sketch through (0, 0) (180, 0) and (360, 0) with max and min at 1 and –1 resp.  	2	**B1** for correct sine curve shape, starting at the origin, with minimum of 1 cycle.
(c)(ii)	199.5 or 199.47... and 340.5...	3	**B2** for one correct or **M1** for $\sin x = -\frac{1}{3}$ oe If 0 scored, **SC1** for two reflex angles with a sum of 540 or 2 non-reflex angles with a sum of 180

14. 0580_s23_ms_43 Q: 9

Question	Answer	Marks	Partial Marks
(a)(i)	311 or 311.0 to 311.1	**3**	**M2** for $11 \times 11 + 2 \times \frac{1}{4} \times \pi \times 11^2$ oe or **M1** for [2 ×] $\frac{1}{4} \times \pi \times 11^2$ or 11×11 oe
(a)(ii)	78.6 or 78.55 to 78.56...	**3**	**M2** for $4 \times 11 + 2 \times \frac{1}{4} \times 2 \times \pi \times 11$ oe or **M1** for [2 ×] $\frac{1}{4} \times 2 \times \pi \times 11$ or 4×11 oe
(b)	35.2 or 35.3 or 35.239… to 35.28	**4**	**M3** for [tan =] $\frac{7}{\sqrt{7^2+7^2}}$ or [sin =] $\frac{7}{\sqrt{7^2+7^2+7^2}}$ or [cos =] $\frac{\sqrt{7^2+7^2}}{\sqrt{7^2+7^2+7^2}}$ OR **M2** for $AG = \sqrt{7^2+7^2+7^2}$ or for $\sqrt{7^2+\left(\frac{7}{\sin 45}\right)^2}$ oe or for $AC = \sqrt{7^2+7^2}$ or $\frac{7}{\sin 45}$ oe OR **M1** for $7^2 + 7^2$ or for implicit trigonometry or identifying correct angle

15. 0580_w23_ms_42 Q: 6

Question	Answer	Marks	Partial Marks
	11.9 or 11.91 to 11.92	7	**B5** for $t = 1.055$ or 1.0550... **M1** for $\tan w = \frac{their\ t}{5}$ oe OR **M1** for $(2t+3)^2 = t^2 + 5^2$ oe seen isw **M2** for $3t^2 + 12t - 16[=0]$ oe seen isw or **B1** for $4t^2 + 6t + 6t + 9$ **M1FT** for $\frac{-12 \pm \sqrt{12^2 - 4(3)(-16)}}{2(3)}$ oe **M1** for $\tan w = \frac{their\ t}{5}$ oe

16. 0580_w23_ms_42 Q: 7

Question	Answer	Marks	Partial Marks
(a)(i)	21.5 or 21.52...	2	**M1** for $\tan(\ldots) = \frac{2.8}{7.1}$ oe
(a)(ii)	10.2 or 10.17 to 10.18	3	**M2** for $\left(\frac{2.8}{\tan 21}\right)^2 + 7.1^2$ oe or **M1** for $\frac{2.8}{PR} = \tan 21$ oe

Question	Answer	Marks	Partial Marks
(b)	76.5 or 76.52 to 76.53	3	**M2** for $[\sin =]\frac{16.7\sin 32}{9.1}$ oe or **M1** for $\frac{9.1}{\sin 32}=\frac{16.7}{\sin M}$ oe
(c)(i)	$\frac{1}{2}\times 12.3\times 21.5\sin(...)=62.89$ or better	M1	
	28.40 to 28.41…	A1	
(c)(ii)	12.2 or 12.17 to 12.18	3	**M2** for $\sqrt{12.3^2+21.5^2-2\times 12.3\times 21.5\times\cos 28.4}$ OR **M1** for $12.3^2+21.5^2-2\times 12.3\times 21.5\times\cos 28.4$ **A1** for 148 or 148.2 to 148.3
(c)(iii)	6.6[0] to 6.62	3	**M2** for $21.5\cos 28.4-12.3$ or **M1** for $21.5\cos 28.4$

17. 0580_w23_ms_43 Q: 7

Question	Answer	Marks	Partial Marks
(a)	0, –1.5 oe, –2.8	3	**B1** for each
(b)	Correct graph	4	**B3 FT** for 10 or 11 correct points FT *their* table or **B2 FT** for 8 or 9 correct points FT *their* table or **B1 FT** for 6 or 7 correct points FT *their* table
(c)	65 to 67	1	**FT** intersection of *their* graph with $y=-2$
(d)	$y=2-\frac{x}{40}$ oe ruled	M2	**M1** for $[y=]\,2-\frac{x}{40}$ oe soi or for $3\cos 2x=2-\frac{x}{40}$ oe soi
	32 to 36	B1	

18. 0580_m22_ms_42 Q: 4

Question	Answer	Marks	Partial Marks
(a)(i)	40.9 or 40.91...	3	**M2** for [sin ABC=] $\frac{29.5\sin 51.6}{35.3}$ oe or for [cos ABC =] $\frac{35.3^2+45^2-29.5^2}{2\times35.3\times45}$ or **M1** for $\frac{29.5}{\sin ABC}=\frac{35.3}{\sin 51.6}$ oe or for correct implicit cosine rule
(a)(ii)	520 or 520.0 to 520.2...	2	**FT** *their* (a)(i) if used provided working shown **M1** for $0.5\times29.5\times45\times\sin 51.6$ oe or for $0.5\times35.3\times45\times\sin$ (*their*(a)(i)) or for 0.5 × 35.3 × 29.5sin (180–51.6–*their*(a)(i))
(b)(i)	41.2 or 41.21 to 41.23	4	**M1** for $SQ = 2\times32\times\sin\left(\frac{1}{2}\times56\right)$ oe or $\sqrt{32^2+32^2-2\times32\times32\times\cos 56}$ oe or $\frac{32\sin 56}{\sin((180-56)\div2)}$ oe **M2** for $SR^2 = 47^2+(\text{their } SQ^2)-2\times47\times\text{their } SQ\times\cos 60$ or **M1** for implicit form
(b)(ii)	28.3 or 28.25 to 28.29...	3	**M2** for 32 × sin62 oe or **M1** for recognition that line from P is perpendicular to SQ

19. 0580_s22_ms_41 Q: 5

Question	Answer	Marks	Partial Marks
(a)(i)(a)	$\frac{(8-2)\times 180}{8\times 2}$ oe	M2	M1 for $\frac{(8-2)\times 180}{8}$ or $\frac{360}{8}$ or $\frac{(2\times 8-4)\times 90}{8}$
(a)(i)(b)	174 or 173.8....	4	M3 for $\frac{1}{2}\times 6\times OM$ oe or $\frac{1}{2}\times (OA)^2\times \sin 45$ oe or $\frac{1}{2}\times 6\times OA\times sin67.5$ oe where OA and OM are as in the M2 or M2 for $OM = 3\times \tan 67.5$ oe or for $OA = \left(\frac{3}{cos67.5}\right)$ or $\frac{6\times sin67.5}{sin45}$ oe or M1 for $\frac{OM}{3} = \tan 67.5$ oe or for $\frac{3}{OA} = cos67.5$ oe or for $\frac{sin45}{6} = \frac{sin67.5}{OA}$ oe
(a)(ii)	193 or 193.0 to 193.1	3	M2 for $\pi\times\left(\frac{3}{cos67.5}\right)^2$ oe or M1 for $\frac{3}{r} = cos67.5$ or $\frac{sin45}{6} = \frac{sin67.5}{r}$

Question	Answer	Marks	Partial Marks
(b)(i)	1.27 or 1.272 to 1.273	2	**M1** for $\left[\frac{1}{2}\times\right]\pi\times0.45^2\times4$ or $\frac{1}{2}\times\pi\times0.45^2[\times4]$
(b)(ii)	742 or 743	6	**M5** for a method leading to the volume of water e.g. $4\times\{2\times\frac{invcos\left(\frac{0.15}{0.45}\right)}{360}\times\pi\times0.45^2$ $-\frac{1}{2}\times0.45^2\times\sin\left(2invcos\left(\frac{0.15}{0.45}\right)\right)\}$ oe **OR** **M2** $[2\times]\frac{invcos\left(\frac{0.15}{0.45}\right)}{360}\times\pi\times0.45^2$ oe or $[2\times]\frac{90-invcos\left(\frac{0.15}{0.45}\right)}{360}\times\pi\times0.45^2$ oe or **M1** for use of $\frac{\theta}{360}\times\pi\times0.45^2$ oe **M2** for $\frac{1}{2}\times0.45^2\times\sin\left(2invcos\left(\frac{0.15}{0.45}\right)\right)$ oe or $\frac{1}{2}\times0.15\times0.45\times\sin\left(invcos\left(\frac{0.15}{0.45}\right)\right)[\times2]$ oe

Question	Answer	Marks	Partial Marks
(b)(ii)			**or M1 for use of** $\frac{1}{2}\times0.45^2\times\sin\theta$ **oe** **or** $[2\times]\frac{1}{2}\times0.15\times0.45\times\sin\beta$ **oe** **If 0 scored,** **SC1 for** *invcos* $\left(\frac{0.15}{0.45}\right)$ **or** *invsin* $\left(\frac{0.15}{0.45}\right)$ **or** $\sqrt{0.45^2-0.15^2}$ **soi**

20. 0580_s22_ms_41 Q: 7

Question	Answer	Marks	Partial Marks
(a)	39.6 or 39.57....	4	**M2** for [cos =] $\frac{14^2+12^2-9^2}{2\times14\times12}$ or **M1** for $9^2 = 14^2 + 12^2 - 2 \times 14 \times 12 \times \cos ACD$ **A1** for 0.7708... or 0.771 or $\frac{37}{48}$ oe
(b)	$\frac{14\sin 25}{\sin 123}$	M2	**M1** for $\frac{\sin 123}{14} = \frac{\sin 25}{BC}$ oe
	7.054…	A1	
(c)	3.74 or 3.735 to 3.739	3	**M2** for $7.05 \times \sin 32$ or **M1** for recognition that the line from B is perpendicular to AC
(d)	11.8 or 11.83 to 11.85	4	**M1** for $32 + their(a)$ soi **M2** for $12^2 + 7.05^2 - 2\times12\times7.05\times\cos(their(a)+32)$ or **M1** for $\cos(their(a)+32) = \frac{12^2+7.05^2-BD^2}{2\times12\times7.05}$
(e)	309.6 or 309.57...	2	**FT** $270 + their(a)$ **M1** for $270 + their(a)$ oe

21. 0580_s22_ms_42 Q: 4

Question	Answer	Marks	Partial Marks
(a)	7.06 or 7.058… or 7.059	**3**	**M2** for $\sqrt{6.4^2+10.9^2-2\times6.4\times10.9\times\cos38}$ oe OR **M1** for $6.4^2 + 10.9^2 - 2 \times 6.4 \times 10.9 \times \cos 38$ oe **A1**= 49.8...
(b)(i)	97	**1**	
(b)(ii)	15.3[0…]	**3**	**M2** for $[AB =] \frac{10.9\times\sin \textit{their } 97}{\sin 45}$ or **M1** for $\frac{\sin \textit{their } 97}{AB}=\frac{\sin 45}{10.9}$ oe
(c)	72.8 to 72.81…	**3**	**M2** for $\frac{1}{2}(6.4)\times10.9\times\sin38+\frac{1}{2}\textit{their } 15.3\times10.9\times\sin38$ oe or **M1** for $\frac{1}{2}\times6.4\times10.9\times\sin38$ oe or $\frac{1}{2}\times\textit{their}15.3\times10.9\times\sin38$ oe or **M1** for height $=10.9 \times \sin38$ oe

22. 0580_s22_ms_42 Q: 11

Question	Answer	Marks	Partial Marks
(a)(i)	4.455 to 4.456… [= 4.46]	**2**	**M1** for $[r =] \frac{28}{2\pi}$ oe
(a)(ii)	1250 or 1247 to 1249.9…	**2**	**M1** for $20 \times \pi \times 4.46^2$ oe
(a)(iii)	66[.0] or 65.95 to 66.02	**3**	**M2** for $[\tan] = \frac{20}{2 \times 4.46}$ oe or **B1** for identifying angle *ANB* on cylinder **not on rectangle**
(b)	11.8 or 11.82 to 11.83	**5**	**M2** for $[r =] \sqrt[3]{\frac{310 \times 3}{2\pi}}$ oe or $[h =] \sqrt[3]{\frac{310 \times 3 \times 4}{\pi}}$ oe or **M1** for $310 = \frac{1}{3}\pi \times r^2 \times 2r$ or $310 = \frac{1}{3}\pi\left(\frac{h}{2}\right)^2 h$ **M2** for $\sqrt{(their\ r)^2 + (2 \times their\ r)^2}$ oe or **M1** for $[l^2 =](their\ r)^2 + (2 \times their\ r)^2$ oe

23. 0580_s22_ms_43 Q: 4

Question	Answer	Marks	Partial Marks
(a)	$\frac{(12-2) \times 180}{12}$ [= 150] oe or $180 - \frac{360}{12}$ [= 150]	**1**	Accept $\frac{(2 \times 12 - 4) \times 90}{12}$ [= 150]
(b)(i)	$\frac{3}{\cos 75}$ oe or $\frac{6 \sin 75}{\sin 30}$	**M2**	**M1** for $\frac{3}{AO} = \cos 75$ oe or $\frac{r}{\sin 75} = \frac{6}{\sin 30}$
	11.59…	**A1**	
(b)(ii)(a)	72.8 or 72.9 or 72.82 to 72.89…	**2**	**M1** for $2 \times \pi \times 11.6$
(b)(ii)(b)	12.1 or 12.06 to 12.08	**2**	**M1** for [6 +] *their* **(b)(ii)(a)** ÷ 12 oe
(c)	806 or 807 or 805.9 to 807.4	**3**	**B2** for 402.9… to 403.7 OR **M2** for $\frac{1}{2} \times 6 \times 11.6 \times \sin 75 \times 12 \times 2$ oe or **M1** for $\frac{1}{2} \times 6 \times 11.6 \times \sin 75$ [$\times k$] oe

24. 0580_s22_ms_43 Q: 7

Question	Answer	Marks	Partial Marks
(a)	87.[0] or 86.98 to 86.99	3	**M2** for $\sqrt{82^2 + 55^2 - 2 \times 82 \times 55 \times \cos 76}$ oe OR **M1** for $82^2 + 55^2 - 2 \times 82 \times 55 \times \cos 76$ oe **A1** for 7570 or 7566 to 7567
(b)	66.1 or 66.2 or 66.13 to 66.17	3	**M2** for $\frac{82 \times \sin 76}{their\ \textbf{(a)}}$ oe or **M1** for $\frac{82}{\sin C} = \frac{their\ \textbf{(a)}}{\sin 76}$ oe
(c)	13.3 or 13.30 to 13.31	3	**M2** for $AG = 55 \cos 76$ oe or **M1** for recognition that CG is perpendicular to AB

Question	Answer	Marks	Partial Marks
(d)	54.1 or 54.13... **and** 125.9 or 125.86 to 125.87	5	**B4** for 54.1 or 54.13... or 125.9 or 125.86 to 125.87 **M3** for [sin Q =] $\frac{0.5 \times 82 \times 55 \times \sin 76}{0.5 \times 90 \times 60}$ oe or **M2** for $0.5 \times 82 \times 55 \times \sin 76 = 0.5 \times 60 \times 90 \times \sin Q$ oe or **M1** for $0.5 \times 82 \times 55 \times \sin 76$ oe or for $0.5 \times 60 \times 90 \sin Q$ = *their* area of ABC If **B4** not scored then **SC1** for two angles seen that sum to 180 (from use of sine ratio) but not 0 and 180.

25. 0580_s22_ms_43 Q: 10

Question	Answer	Marks	Partial Marks
(a)	20.8 or 20.76 to 20.79	4	**B3** for [BC =] 10.4 or 10.38 to 10.39... or $6\sqrt{3}$ oe or **M2** for $(2x)^2 + x^2 + 6^2 = 24^2$ oe or **M1** for $24^2 - 6^2$ oe or $x^2 + 6^2$ oe or $(2x)^2 + 6^2$ oe, or $x^2 + (2x)^2$ oe or **SC2** for final answer of $12\sqrt{5}$ or 26.8 or 26.83... OR **M3** for $x^2 + \left(\frac{x}{2}\right)^2 + 6^2 = 24^2$ oe or **M2** for $x^2 + \left(\frac{x}{2}\right)^2$ or **M1** for $x^2 + 6^2$ oe or $\left(\frac{x}{2}\right)^2 + 6^2$ oe or $24^2 - 6^2$ oe

Question	Answer	Marks	Partial Marks
(b)	14.5 or 14.47 to 14.48	3	**M2** for $\sin[\ldots] = \frac{6}{24}$ oe or **M1** for recognising the correct angle *GAC*

26. 0580_w22_ms_41 Q: 8

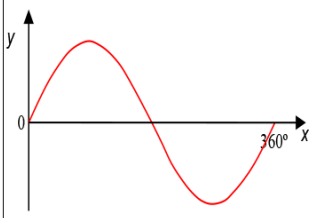
Question	Answer	Marks	Partial Marks
(a)	$[\cos =]\frac{15^2+8^2-20^2}{2.15.8}$	M2	**M1** for $20^2 = 15^2 + 8^2 - 2.15.8\cos(\quad)$
	117.54 to 117.55	A2	**A1** for $-\frac{37}{80}$ or $-\frac{111}{240}$ or –[0].4625

Question	Answer	Marks	Partial Marks
(b)	53.2 or 53.19 to 53.23	2	**M1** for $0.5 \times 8 \times 15 \times \sin(117.5)$ oe
(c)	15.5 or 15.52 to 15.53	2	**M1** for $15^2 + 4^2$ oe
(d)	7.1 or 7.13 or 7.125 to 7.126	3	**M2** for $\tan[P] = \frac{4-3}{8}$ oe or for 7.1 or 7.13 or 7.125 to 7.126 seen or **M1** for vertical line $= 4 - 3$ soi After 0 scored **SC1** for correct angle identified
(e)	11.5 nfww or 11.48 to 11.49...	5	**B1** for height of 3.5 soi **M2** for $15^2 + 4^2 - 2.15.4\cos(117.5)$ or **M1** for $\cos 117.5 = \frac{15^2+4^2-(\ldots)^2}{2.15.4}$ **M1** for $\tan = \frac{3.5}{\textit{their}\ 17.216\ldots}$ oe After M0 scored **SC1** for correct angle identified

27. 0580_w22_ms_42 Q: 7

Question	Answer	Marks	Partial Marks
(a)(i)	52.[0] or 52.01…	4	**M2** for $[\cos P =]\ \dfrac{39.4^2+46.5^2-38.2^2}{2\times39.4\times46.5}$ oe or **M1** for $38.2^2 = 39.4^2+46.5^2-2\times39.4\times46.5\times\cos P$ oe **A1** for 0.616 or 0.6155…
(a)(ii)	36.6 or 36.64 to 36.65	3	**M2** for $\dfrac{d}{46.5} = \sin(their\ 52.01)$ oe or **M1** for recognition that the line from Q is perpendicular to PR
(b)(i)	41[.0] or 41.01… nfww	3	**M2** for $29^2 + 21^2 + 20^2$ oe or better or **M1** for $29^2 + 21^2$ oe or $29^2 + 20^2$ oe or $21^2 + 20^2$ oe or better
(b)(ii)	29.2 or 29.18 to 29.2	3	**M2** for $\sin[GAC] = \dfrac{20}{their\ AG}$ oe or **M1** for angle GAC identified
(c)	bearing 286	B2	**B1** for angle $MLK = 49$ or for angle $MKL = 35$ correctly identified or angle from North to $ML = 106$
	distance 64.6 or 64.59…	B3	**M2** for $\dfrac{112\times\sin(their 35)}{\sin(96)}$ oe or **M1** for the implicit form

28. 0580_w22_ms_42 Q: 9

Question	Answer	Marks	Partial Marks
(a)	Correct sketch to go through (0, 0), and (360, 0) 	2	**M1** for correct sine curve shape through the origin or for almost correct sketch fitting all tramlines but with an omission at either end or incorrect curvature in one place only
(b)	233.1 or 233.13… and 306.9 or 306.86 to 306.87	3	**B2** for one correct angle or **M1** for $\sin x = -0.8$ oe If 0 scored **SC1** for 2 reflex angles that add to 540 or two non-reflex angles that add to 180

29. 0580_w22_ms_43 Q: 8

Question	Answer	Marks	Partial Marks
(a)	$[\cos B =] \frac{9.5^2+7.7^2-10^2}{2\times9.5\times7.7}$ oe	M2	**M1** for $10^2 = 9.5^2 + 7.7^2 - 2\times9.5\times7.7\cos B$ oe or better
	70.206 to 70.207 or 70.21 to 70.22	A2	**A1** for $\frac{2477}{7315}$ oe or 0.339 or 0.3386….
(b)(i)	140.4	1	
(b)(ii)	19.8	1	**FT** (180 – *their* **(b)(i)**) ÷ 2
(b)(iii)	70.2	1	**FT** 90 – *their* **(b)(ii)**
(c)	5.31 or 5.314 to 5.315	3	**M2** for $\frac{5}{\cos \textit{ their}\,\textbf{(b)(ii)}}$ oe or **M1** for $\frac{5}{r} = \cos(\textit{their}\,\textbf{(b)(ii)})$ oe
(d)	38.8 or 38.9 or 38.78 to 38.85	4	**M3** for $\frac{0.5\times9.5\times7.7\times\sin 70.2}{\pi\times(\textit{their}\,\textbf{(c)})^2}$ [×100] OR **M1** for $0.5\times9.5\times7.7\times\sin70.2$ **M1** for $\pi\times(\textit{their}\,\textbf{(c)})^2$

30. 0580_m21_ms_42 Q: 5

	Answer	Mark	Partial Marks
(a)	27[.0] or 26.97… nfww	3	**M2** for $[\cos =] \frac{8.6^2+9.7^2-4.4^2}{2\times8.6\times9.7}$ or **M1** for implicit form
(b)	9.19 or 9.192 to 9.193	4	**B1** for [angle BCD =] 73 seen **M2** for $\frac{9.7\times\sin 65}{\sin(180-65-42)}$ oe or **M1** for $\frac{\sin(180-65-42)}{9.7} = \frac{\sin 65}{DC}$ oe

	Answer	Mark	Partial Marks
(c)	6.15 or 6.149 to 6.151…	**3**	**M2** for $\frac{d}{their\,9.19} = \sin 42$ oe or **M1** for right angle between line from C to BD and BD soi

31. 0580_s21_ms_41 Q: 5

	Answer	Mark	Partial Marks
(a)	13.5 or 13.47…	**4**	**B1** for angle 102 seen **M2** for $\sqrt{10.6^2 + 6.4^2 - 2\times 10.6\times 6.4\times\cos(180-78)}$ OR **M1** for $10.6^2 + 6.4^2 - 2\times 10.6\times 6.4\times\cos(180-78)$ **A1** for 181.5…
(b)	8.68 or 8.682 to 8.683 nfww	**4**	**B1** for angle = 44 **M2** for $\sin(180-58-78)\times\frac{10.6}{\sin 58}$ oe or **M1** for $\frac{\sin(180-58-78)}{x} = \frac{\sin 58}{10.6}$ oe

	Answer	Mark	Partial Marks
(c)	78.2 or 78.17 to 78.19…	**3**	**M2** for $\frac{1}{2}\times 10.6\times(6.4 + their\ 8.68)\times\sin(78)$ oe OR **M1** for $\frac{1}{2}\times 10.6\times 6.4\times\sin(180-78)$ oe **M1** for $\frac{1}{2}\times 10.6\times their\ 8.68\times\sin 78$ oe

32. 0580_s21_ms_41 Q: 9

(a)	1350 or 1354….	**6**	**M2** for $20^2 - 13^2$ or **M1** for $BC^2 + 13^2 = 20^2$ **A1** for $\sqrt{231}$ or 15.2 or 15.19 to 15.20 **M1** for 20×24 and 13×24 and *their* 15.2×24 **M1** for [½ ×] *their* 15.2×13
(b)	2370 or 2369 to 2371… cao	**1**	
(c)	24.6 or 24.58 to 24.59	**4**	**M3** for $\sin[...] = \frac{13}{\sqrt{20^2 + 24^2}}$ oe or **M2** for $\sqrt{20^2 + 24^2}$ or $\sqrt{24^2 + 20^2 - 13^2}$ or **M1** for $AF^2 = 20^2 + 24^2$ or $24^2 + 20^2 - 13^2$ or **M1** for correct angle identified

33. 0580_s21_ms_42 Q: 6

	Answer	Mark	Partial Marks
(a)	$\sqrt{16^2 + 19^2 - 2 \times 16 \times 19 \cos 57}$ oe	**M2**	or **M1** for $16^2 + 19^2 - 2 \times 16 \times 19 \cos 57$ **A1** for 285.8 to 285.9
	16.90 to 16.91	**A1**	

	Answer	Mark	Partial Marks
(b)	74.3 or 74.30 to 74.33	**4**	**M2** for [sin ... =] $\frac{16.9 \times \sin 75}{32}$ oe or **M1** for $\frac{16.9}{\sin C} = \frac{32}{\sin 75}$ oe **B1** for [angle *BCD* =] 30.7 or 30.67 to 30.69… or **M1dep** for 105 – *their* angle *BCD*
(c)	388 or 387.7 to 387.9… nfww	**3**	**M1** for $\frac{1}{2} \times 16 \times 19 \times \sin 57$ oe **M1** for $\frac{1}{2} \times 16.9 \times 32 \times \sin$ *their* **(b)** oe
(d)	13.4 or 13.41 to 13.42 nfww	**3**	**M2** for $\frac{x}{16} = \sin 57$ oe or **M1** for distance required is perpendicular to *AD* soi

34. 0580_s21_ms_42 Q: 8

	Answer	Mark	Partial Marks
(a)	[L =] 11.8 [W =] 5.9 [H =] 7.1	**5**	**M1** for $L = 2W$ oe soi **M1** for $W + 2H = 20.1$ oe **M1** for $2L + 2H = 37.8$ oe **B1** for at least one correct answer
(b)(i)	0.559 to 0.56[0…]	**B4**	**M2** for $\frac{1}{3}\times 18\times 15\times\sqrt{24^2-18^2}$ isw conversion or **M1** for $h^2 + 18^2 = 24^2$ oe or better **M1** for figs 800 ÷ figs *their* volume isw
	g/cm^3 or g cm^{-3} final answer	**B1**	

	Answer	Mark	Partial Marks
(b)(ii)	34.1 or 34.11 to 34.12	**4**	**M3** for tan [ ] = $\frac{\sqrt{24^2-18^2}}{\sqrt{18^2+15^2}}$ oe or **M2** for $\sqrt{18^2 + 15^2}$ isw or $\sqrt{24^2 + 15^2}$ isw or **M1** for $18^2 + 15^2$ isw or $24^2 + 15^2$ isw or **M1** for indicating required angle is *EBD*

35. 0580_s21_ms_43 Q: 9

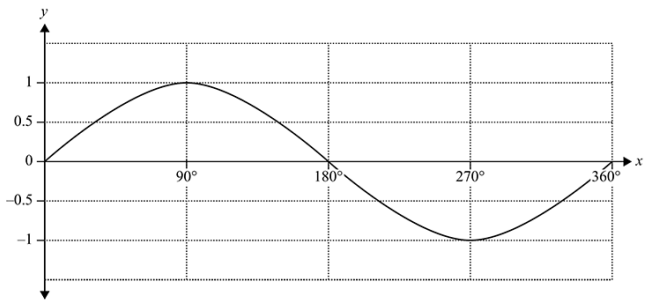
	Answer	Mark	Partial Marks
(a)	42.3 or 42.28 to 42.30...	**7**	**M1** for $\frac{AB}{14} = \cos 35$ oe **M1** for $\frac{AD}{14} = \sin 35$ oe **B1** for [C =] 75 **M3** for [BC =] $\frac{14\sin 60}{\sin \textit{their}\,75}$ oe **and** [DC] $\frac{14\sin 45}{\sin \textit{their}\,75}$ oe or **M2** for $\frac{14\sin 60}{\sin \textit{their}\,75}$ **or** $\frac{14\sin 45}{\sin \textit{their}\,75}$ oe or **M1** for $\frac{\sin \textit{their}\,75}{14} = \frac{\sin 60}{BC}$ oe or $\frac{\sin \textit{their}\,75}{14} = \frac{\sin 45}{CD}$ oe

	Answer	Mark	Partial Marks
(b)(i)	4.91 or 4.907...	**3**	**B2** for $[l^2 =]$ 24.1 or 24.08... or M2 for $\sqrt{3}\, l = 8.5$ or $[l =] \sqrt{\frac{8.5^2}{3}}$ oe or **M1** for $l^2 + l^2 + l^2 = 8.5^2$ oe
(b)(ii)	35.3 or 35.26 to 35.3 nfww	**3**	**M2dep** for sin (angle) = $\frac{\textit{their}\ \textbf{(b)(i)}}{8.5}$ oe or **M1** for clear recognition of correct angle

36. 0580_m20_ms_42 Q: 8

	Answer	Mark	Partial Marks
(a)(i)	2.67 or 2.666…	**3**	**M2** for $\frac{6 \times \sin 25}{\sin 72}$ or **M1** for implicit version
(a)(ii)	4.14 or 4.140…	**3**	**M1** for $6^2 + 7.4^2 - 2 \times 6 \times 7.4 \times \cos 34$ **A1** for 17.1 to 17.2
(a)(iii)	20.4 or 20.35 to 20.36…	**4**	**B1** for angle $SQR = 83$ **M1** for $\frac{1}{2} \times 6 \times$ *their* **(a)(i)** $\times \sin$ *their* (180–72–25) oe **M1** for $\frac{1}{2} \times 6 \times 7.4 \times \sin 34$ oe
(b)(i)	8.7[0] or 8.695…	**4**	**B3** for $\sqrt{980}$ oe or 31.3 or 31.30… or **M3** for $40 - \sqrt{20^2 + 18^2 + 16^2}$ oe or **M2** for $20^2 + 18^2 + 16^2$ oe or **M1** for any correct attempt at 2-dimensional Pythagoras' e.g. $18^2 + 16^2$
(b)(ii)	30.7 or 30.73 to 30.74…	**3**	**M2** for $[\sin =] \frac{16}{\sqrt{20^2 + 18^2 + 16^2}}$ oe or **B1** for identifying angle *GAC*

37. 0580_p20_ms_40 Q: 8

	Answer	Mark	Partial Marks
(a)	70.5 and 289.5	4	**B3** for one correct value or 2 correct values not rounded to 1 decimal place or **M2** for $\cos^{-1}\left(\frac{1}{3}\right)$ or **M1** for $\cos x = \frac{1}{3}$ If 0 scored **SC1** for two solutions which sum to 360°
(b)		2	**B1** for correct shape but inaccurate amplitude or period

38. 0580_s20_ms_41 Q: 7

	Answer	Mark	Partial Marks
(a)	$[BC^2 =]\ 80^2 + 115^2 - 2 \times 80 \times 115 \cos 72$ oe	**M1**	
	118.06…	**A2**	**A1** for 13939…

	Answer	Mark	Partial Marks
(b)	67.8 or 67.9 or 67.83 to 67.88	3	**M2** for $[\sin B =]\ \frac{115 \times \sin 72}{118.1}$ oe or **M1** for $\frac{115}{\sin B} = \frac{118.1}{\sin 72}$ oe
(c)(i)	255	3	**B1** for bearing of B from A is 75 soi **M1** for 180 + 75 oe
(c)(ii)	[00]7.2	2	**M1** for *their* **(c)(i)** – *their* **(b)** –180
(d)	11.8 or 11.82 to 11.83	3	**M1** for 115 ÷ 35 oe **M1** for *their* speed in m/s × 60 × 60 ÷ 1000
(e)	76.1 or 76.08 to 76.09	3	**M2** for $\frac{\text{distance}}{80} = \sin 72$ oe or **M1** for distance required is perpendicular to AC soi

39. 0580_s20_ms_41 Q: 8

	Answer	Mark	Partial Marks
(a)(i)	Correct sketch	**2**	**B1** for correct shape but inaccurate
(a)(ii)	Rotational [symmetry] order 2 [centre] (180, 0)	**2**	**B1** for rotational [symmetry]
(b)	48.6 or 48.59 to 48.60 and 131.4 or 131.40 to 131.41	**3**	**B2** for 48.6 or 48.59 to 48.60 or 131.4 or 131.40 to 131.41 or **M1** for $\sin x = 0.75$ or better If 0 scored, **SC1** for two answers adding to 180
(c)(i)	$(x + 5)^2 - 11$	**2**	**M1** for $(x + 5)^2 + k$ or $(x + \textit{their}\ 5)^2 + 14 - (\textit{their}\ 5)^2$ or $a = 5$
(c)(ii)	Sketch of U-shaped parabola with a minimum indicated at (–5, –11) with no part of graph in 4th quadrant	**3**	**FT** *their* $(x + 5)^2 - 11$ provided in that form **B1** for U shape curve **B1FT** for turning point at $(-5, k)$ or $(k, -11)$

40. 0580_s20_ms_42 Q: 4

	Answer	Mark	Partial Marks
(a)	65.4 or 65.36 to 65.37	**3**	**M1** for $150^2 + 120^2 - 2 \times 150 \times 120 \cos 25$ **A1** for 4270 or 4272 to 4273
(b)	125 or 124.7 to 124.8	**4**	**B1** for [angle S =] 80 **M2** for $\frac{150\sin 55}{\sin \textit{their}\, 80}$ or **M1** for $\frac{\sin \textit{their}\, 80}{150} = \frac{\sin 55}{RS}$ oe
(c)	10 400 or 10 410 to 10 440 nfww	**3**	**M1** for $\frac{1}{2} \times 120 \times 150 \sin 25$ oe **M1** for $\frac{1}{2} \times 150 \times \textit{their}$ **(b)** $\sin 45$ oe

41. 0580_s20_ms_42 Q: 5

	Answer	Mark	Partial Marks
(a)	[0]38 or [0]37.9 or [0]37.87...	**2**	**M1** for $\tan = \frac{350}{450}$ oe If 0 scored, **SC1** for answer [0]52 or [0]52.1 or [0]52.12 to [0]52.13
(b)	624 or 623.8 to 623.9	**6**	**M2** for $450 - 400 \sin 50$ or **M1** for $\sin 50 = \frac{\ldots}{400}$ **M2** for $350 + 400 \cos 50$ or **M1** for $\cos 50 = \frac{\ldots}{400}$ **M1** for (*their* $(450 - 400 \sin 50))^2 + ($*their* $(350 + 400 \cos 50))^2$
(c)	10 min 8 s	**4**	**B3** for 10.1 or 10.13… or **M2** for (400 + 350 + 450 + *their DA*) ÷ 3 [÷ 60] oe or **M1** for any distance ÷ 3 **M1** for rounding *their* minutes into minutes and seconds to nearest second if clearly seen

42. 0580_s20_ms_43 Q: 5

	Answer	Mark	Partial Marks
(a)	$(4x-5)(x+3)+(x+1)(x-3)=342$ or $2x(4x-5)-(3x-6)(x-3)=342$	M2	**M1** for $(4x-5)(x+3)$ or $(x+1)(x-3)$ or for $2x(4x-5)$ or $(3x-6)(x-3)$
	$4x^2+12x-5x-15$ oe and $x^2+x-3x-3$ oe seen OR $8x^2-10x$ and $3x^2-15x+18$ seen	M2	**M1** for each
	$5x^2+5x-18=342$ leading to $x^2+x-72=0$	A1	no errors or omission
(b)	$(x+9)(x-8)$	M2	**B1** for $(x+a)(x+b)$ where $ab=-72$ or $a+b=1$ and a, b are integers
	8, –9	B1	
(c)	86	2	**FT** for $12\times$*their* $x-10$ (x positive) **B1** for any one of 27, 11, 16 seen or for $2x+2x+4x-5+4x-5$ oe or better soi
(d)	22.2 or 22.16 to 22.17	2	**M1** for tan = $\frac{11}{27}$ or $\frac{\textit{their}\ x+3}{4\times\textit{their}\ x-5}$

43. 0580_s20_ms_43 Q: 10

	Answer	Mark	Partial Marks
(a)(i)	$x+5$	2	**B1** for linear equation with positive gradient or intercept 5
(a)(ii)	2 sin x oe	2	**B1** for recognition of sin or cos($x-90$)
(b)	tangent ruled at P	B1	
	1.3 to 1.4	B2	**dep** on tangent drawn **M1** for rise/run

44. 0580_w20_ms_41 Q: 4

	Answer	Mark	Partial Marks
(a)	38.6	**3**	**M2** for [2 ×] (8.5 + 0.05 + 10.7 + 0.05) or **M1** for 8.5 + 0.05 or 10.7 + 0.05
(b)(i)	8.86 or 8.863…	**2**	**M1** for $\frac{h}{9}$ = sin 80 or better oe
(b)(ii)	∠CDF = 100 leading to ∠*DCF* = 40 Or ∠EDF = 80 leading to ∠*DCF* = 40	**M1**	Implied by 180-(100 + 40) = 40 or 80 – 40
	'two equal angles'	**A1**	With no incorrect work seen
(b)(iii)	66.5 or 66.45 to 66.47…	**3**	**M2** for 0.5(3 + 12) × *their* **(b)(i)** or 12 × *their* **(b)(i)** – 0.5 × 9 × 9 × sin 100 oe or **B1** for *DC* = 9 or *BC* = 3

	Answer	Mark	Partial Marks
(c)	130 nfww or 129.6 to 129.8	**5**	**B1** for $\angle ACD = 21^\circ$ or $\angle CAD = 69^\circ$ **Method 1** **M2** for $\cos 21 = \frac{12}{AC}$ oe or **M1** for $\angle ADC = 90$ soi **M1** for $\pi(\text{their } AC/2)^2$ OR **Method 2** **M2** for $\frac{12}{\sin 138} = \frac{r}{\sin 21}$ oe or **M1** for $\angle COD = 138$ soi **M1** for $\pi(\text{their } r)^2$ OR **Method 3** **M2** for $\cos 21 = \frac{6}{OC}$ oe or **M1** for $\angle CXO = 90$ soi where X is the point where the perpendicular from O meets the chord CD **M1** for $\pi(\text{their } OC)^2$
(d)	78.4 or 78.37 to 78.41	**3**	**M2** for $\frac{x}{360} \times 2 \times \pi \times 9.5 + 2 \times 9.5 = 4 \times 8$ oe or **M1** for $\frac{x}{360} \times 2 \times \pi \times 9.5$ After **M0, SC1** for $9.5x + 19 = 32$ oe

45. 0580_w20_ms_41 Q: 6

	Answer	Mark	Partial Marks
(a)(i)	106.01 to 106.02	**4**	**M2** for $[\cos[\angle CBD] =] \frac{192^2 + 168^2 - 287.9^2}{2 \times 192 \times 168}$ oe or **M1** for the implicit form **A1** for –0.276 to – 0.275
(a)(ii)	292.0 or 291.98 to 291.99	**1**	
(a)(iii)	310.0 or 310.03 to 310.04	**5**	**M2** for $[\sin A =] \frac{168 \times \sin(90 - 38)}{205.8}$ or **M1** for $\frac{\sin A}{168} = \frac{\sin(90 - 38)}{205.8}$ **A1** for [A =] 40.0 or 40.03 to 40.04 **M1 dep** for 270 + *their* angle *DAB* oe
(b)(i)	15 500 or 15 501 to 15 503. …	**2**	**M1** for $0.5 \times 192 \times 168 \times \sin(106)$ oe
(b)(ii)	55 400	**2**	**FT** $3.575 \times$ *their* **(b)(i)** oe rounded to nearest 100 **M1** for figs 35 75 × figs *their* **(b)(i)** or figs 554 or figs 5541 to figs 5543

46. 0580_w20_ms_42 Q: 9

	Answer	Mark	Partial Marks
(a)	315 or 314.5 to 315.0	6	**M1** for $\tan 70 = \frac{\text{height}}{\frac{1}{2}(8-5)}$ oe or better seen **M1dep** for $\frac{1}{2}(8+5)\times$ *their* height or better seen **dep** on trig attempt for height **M2** for $12 \times \frac{\frac{1}{2}(8-5)}{\cos 70}$ oe or better seen or **M1** for $\frac{\frac{1}{2}(8-5)}{\cos 70}$ oe or better seen **M1** for 8×12 oe isw and 5×12 oe isw
(b)(i)	$8 - ½ (8 - 5)$ or $5 + ½ (8 - 5)$	M1	
(b)(ii)	13.6 or 13.64 to 13.65	2	**M1** for $12^2 + (6.5)^2$ oe
(b)(iii)	16.8 or 16.9 or 16.79 to 16.91… nfww	2	**M1** for identifying angle *GAX* from a diagram or from working or better

47. 0580_w20_ms_43 Q: 6

	Answer	Mark	Partial Marks
(a)	440	2	**M1** for $8 \times 5 \times 11$
(b)	$\sqrt{8^2+5^2+11^2}$ oe or $8^2 + 5^2 + 11^2$ and 13^2 ALTERNATIVE $\sqrt{8^2+11^2}$ or $8^2 + 11^2$ and 13^2	M3	**M2** for $8^2 + 5^2 + 11^2$ or $8^2 + 11^2$ oe or **M1** for $8^2 + 5^2$ or $5^2 + 11^2$ oe
	Yes and 14.5 or 14.4 or 14.49… or Yes and 13.6[0…]	A1	Accept equivalent conclusion
(c)(i)	32.0[…]	2	**M1** for $\tan[..] = \frac{5}{8}$ oe
(c)(ii)	49.4 or 49.38 to 49.39	2	**M1** for $\sin[..] = \frac{11}{\text{their } AG}$ oe

48. 0580_s19_ms_42 Q: 8

	Answer	Mark	Partial Marks
(a)(i)	15.7 or 15.70...	4	**M2** for $16.5^2 + 12.4^2 - 2\times16.5\times12.4\times\cos 64$ or **M1** for implicit form **A1** for 246 to 247

	Answer	Mark	Partial Marks
(a)(ii)	18.7 or 18.68 to 18.69	4	**B1** for 32 or angle $DBM = 37$ or angle $CBM = 58$ **M2** for $\frac{12.4\times\sin 53}{\sin 32}$ oe or **M1** for implicit form oe
(b)(i)	116.1 or 116.08 to 116.09...	2	**M1** for $\frac{y}{360}\times 2\times\pi\times 3.8 = 7.7$ oe
(b)(ii)	14.6 or 14.61 to 14.63…	2	**M1** for $\frac{\textit{their}\textbf{(b)(i)}}{360}\times\pi\times 3.8^2$ oe

49. 0580_w19_ms_41 Q: 4

	Answer	Mark	Partial Marks
(a)(i)	955 or 955.0 to 955.2	2	**M1** for $2\times\pi\times 8\times 19$ oe
(a)(ii)	812 or 811.7 to 811.9...	2	**FT** *their* (i) × 0.85 **M1** for *their* (i) × 0.85 or *their* (i) × 85
(b)(i)	$\frac{\frac{4}{3}\times\pi\times 6^3}{\frac{1}{3}\times\pi\times 8^2}$ or cancelling clearly seen to reach 13.5	M2	**M1** for $\frac{4}{3}\times\pi\times 6^3 = \frac{1}{3}\times\pi\times 8^2\times h$
(b)(ii)	15.7 or 15.69...	2	**M1** for $8^2 + 13.5^2$ or better
(b)(iii)	394 or 395 or 394.3 to 394.6...	1	**FT** π × 8 × *their* (b)(ii)

	Answer	Mark	Partial Marks
(c)	567	**3**	**M2** for $\frac{168}{V} = \left(\frac{80}{180}\right)^{\frac{3}{2}}$ oe or better or **M1** for $\left(\frac{180}{80}\right)^{\frac{1}{2}}$ or $\left(\frac{80}{180}\right)^{\frac{1}{2}}$ oe seen or better
(d)	51.3 or 51.34...	**3**	**M2** for $\tan = \frac{5}{4}$ oe or **M1** for recognition of angle *PBX*

50. 0580_w19_ms_41 Q: 5

	Answer	Mark	Partial Marks
(a)	4.29 or 4.285 to 4.286	**3**	**M2** for $\frac{150}{\frac{450}{3.6} - \frac{120}{4} - \frac{180}{3}}$ or **M1** for [time =] 120 ÷ 4 or 180 ÷ 3 or 450 ÷ 3.6 or $3.6 = \frac{150+180+120}{\text{total time}}$
(b)	82.8 or 82.81 to 82.82 using cosine rule	**4**	**M2** for $\frac{150^2 + 120^2 - 180^2}{2 \times 150 \times 120}$ or **M1** for $180^2 = 120^2 + 150^2 - 2 \times 120 \times 150 \cos(...)$ **A1** for $\frac{4500}{36000}$ oe
(c)(i)	127.2 or 127.1 to 127.2 or 127	**1**	**FT** 210 – *their* (b)
(c)(ii)	307.2 or 307.1 to 307.2 or 307	**2**	**FT** 180 + *their*(c)(i) **M1** for 180 + *their* (c)(i)
(d)	15 or 14.99 to 15.04	**2**	**M1** for $\cos(\textit{their}\ (b)) = \frac{\text{dist}}{120}$ oe

51. 0580_w19_ms_42 Q: 4

	Answer	Mark	Partial Marks
(a)	452 or 452.2 to 452.4…	**2**	**M1** for $\left[\frac{1}{2}\times\right]\frac{4}{3}\times\pi\times 6^3$
	cm^3	**1**	
(b)(i)(a)	400 or 399.6 to 399.9	**6**	**B3** for [CD =] $\sqrt{72.96}$ or [angle CBD =] 58.7 or 58.66 to 58.67 or **M2** for $\sqrt{10^2-5.2^2}$ oe or [CBD =] $\cos^{-1}\left(\frac{5.2}{10}\right)$ oe or **M1** for $(CD)^2 + 5.2^2 = 10^2$ oe or $\cos[CBD] = \frac{5.2}{10}$ oe or $\sin[CDB] = \frac{5.2}{10}$ oe **M1dep** for $\frac{5.2\times \textit{their } CD}{2}$ oe or $\frac{1}{2}\times 5.2\times 10\times\sin(\textit{their } CBD)$ oe **M1** for *their* area × 18 oe
(b)(i)(b)	14.6 or 14.62 to 14.63…	**4**	**M3** for $\sin BEC = \frac{5.2}{\sqrt{10^2+18^2}}$ oe or **M2** for [BE=] $\sqrt{10^2+18^2}$ oe seen or [EC =] $\sqrt{18^2+10^2-5.2^2}$ oe seen or **M1** for [BE^2 =] $10^2 + 18^2$ oe seen or [EC^2=] $18^2 + 10^2 - 5.2^2$ seen
(b)(ii)	125 or 124.9 to 125.0…	**3**	**B2** for 55[.0…] seen or **M2** for $180 - \tan^{-1}\left(\frac{10}{7}\right)$ oe or $\cos EGB = \frac{11^2+(10^2+7^2)-(10^2+18)^2}{2\times 11\times\sqrt{10^2+7^2}}$ oe or **M1** for $\tan[\ \ ] = \left(\frac{10}{7}\right)$ oe or for $(10^2+18^2) = 11^2 + (10^2+7^2) - 2\times 11\times$ $\sqrt{10^2+7^2}\ \cos EGB$ oe

52. 0580_w19_ms_42 Q: 6

	Answer	Mark	Partial Marks
(a)(i)	13.9[0…] from cosine rule	**4**	**M2** for $8^2 + 13^2 - 2 \times 8 \times 13\cos 79$ or **M1** for $\cos 79 = \frac{13^2 + 8^2 - BC^2}{2 \times 8 \times 13}$ **A1** for 193 ....
(a)(ii)	66.6 or 66.60… to 66.65 from sine rule	**3**	**M2** for [$\sin ACB =$] $\frac{13 \times \sin 79}{their(a)(i)}$ or **M1** for $\frac{\sin ACB}{13} = \frac{\sin 79}{their(a)(i)}$ oe
(b)(i)	$\frac{1}{2}(x+4)(4x-5)\sin 30 = 70$	**M1**	
	$4x^2 + 16x - 5x - 20 = 280$	**M2**	**Dep on M1** **B1** for $4x^2 + 16x - 5x - 20$ or better
	Leading to $4x^2 + 11x - 300 = 0$	**A1**	with no errors or omissions seen

	Answer	Mark	Partial Marks
(b)(ii)	$\frac{-11 \pm \sqrt{11^2 - 4 \times 4 \times -300}}{2 \times 4}$	**B2**	**B1** for $\sqrt{11^2 - 4(4)(-300)}$ or better or for $\frac{-11 + \sqrt{q}}{2 \times 4}$ or $\frac{-11 - \sqrt{q}}{2 \times 4}$
	–10.14 and 7.39	**B2**	**B1** for each or **SC1** for final answers –10.1 or –10.144 to –10.143 **and** 7.4 or 7.393 to 7.394 or –10.14 **and** 7.39 seen in working or for –7.39 **and** 10.14 as final answer
(b)(iii)	11.4 or 11.39…	**1**	**FT** *their* positive root + 4

53. 0580_w19_ms_43 Q: 4

	Answer	Mark	Partial Marks
(a)	36.8 or 36.84…	2	**M1** for $\frac{h}{107} = \tan 19$ or $\frac{h}{\sin 19} = \frac{107}{\sin 71}$ oe or better
(b)	42.1 or 42.12… from cosine rule	4	**M2** for $[\cos BAC =]\frac{158^2 + 132^2 - 107^2}{2 \times 158 \times 132}$ or **M1** for implicit version **A1** for $[\cos BAC =]\frac{30939}{41712}$ or 0.7417…
(c)	35.8 or 35.84… from sine rule	3	**M2** for $\frac{86 \times \sin 116}{132}[= 0.58557...]$ or **M1** for $\frac{\sin CAD}{86} = \frac{\sin 116}{132}$ oe
(d)	9670 or 9669 to 9676	3	**M2** for $\frac{1}{2} \times 158 \times 132 \times \sin(their\ (b))$ oe and $\frac{1}{2} \times 86 \times 132 \times \sin(64 - their\ (c))$ oe or **M1** for either area
(e)	214.2 or 214.1… or 214	2	**M1** for [180 +]70–*their* (c) oe

54. 0580_m18_ms_42 Q: 8

	Answer	Mark	Partial Marks
(a)	356 or 356.2 to 356.3	4	**B1** for [Angle *LPM*] = 74 soi **M2** for $\frac{248 \times \sin their\ 74}{\sin 42}$ oe or **M1** for implicit statement
(b)(i)	320 or 319.9 to 320.2...	3	**B1** for angle *PLM* = 64 soi or for angle between *LM* and perpendicular from *M* = 26 soi or [*PM* =] 333.[1…] **M1** for *their* 356 × sin *their* 64 oe or *their* 356 × cos *their* 26 oe
(b)(ii)	0257 or 2 57 am	3	**B2** for 6 hours 12 mins or 372 mins seen or **M1** for 248 ÷ 40 oe If 0 scored, **SC1** for *their* time in hours converted to hours and minutes

55. 0580_s18_ms_42 Q: 5

	Answer	Mark	Partial Marks
(a)	$8^2 + 7^2 - 2 \times 7 \times 8 \times \cos 78$ oe	**M2**	**M1** for correct implicit version
	9.471.. to 9.472	**A2**	**A1** for 89.7…
(b)	46.3 or 46.29 to 46.30…	**3**	**M2** for $[\sin OAC =]\frac{7\sin 78}{9.47}$ or **M1** for $\frac{\sin OAC}{7} = \frac{\sin 78}{9.47}$

	Answer	Mark	Partial Marks
(c)	$29.5 - (7 + 8 + 9.47)$	**M1**	
	$\frac{360 \times (29.5 - (7 + 8 + 9.47))}{2 \times \pi \times 7}$	**M3**	**M2** for $\frac{x}{360} \times 2 \times \pi \times 7 =$ *their* arc length oe or **M1** for $\frac{x}{360} \times 2 \times \pi \times 7$ oe
	41.15 to 41.171..	**B1**	
(d)	45[.0] or 44.98 to 45.01 nfww	**4**	**M3** for ½ × 8 × 7 × sin 78 oe + $\frac{41.2}{360} \times \pi \times 7^2$ oe OR **M1** for ½ × 8 × 7 × sin 78 oe or ½ × 8 × 9.47 × sin *their* **(b)** oe **M1** for $\frac{41.2}{360} \times \pi \times 7^2$ oe

56. 0580_s18_ms_42 Q: 7

	Answer	Mark	Partial Marks
(a)	$x^2 + (2x - 3)^2 = 6^2$ oe or $x^2 + 4x^2 - 6x - 6x + 9 = 36$	**M1**	
	$4x^2 - 6x - 6x + 9$ or better	**B1**	
	$5x^2 - 12x - 27 = 0$	**A1**	Dep on **M1B1** with no errors or omissions
(b)	$\frac{-(-12) \pm \sqrt{(-12)^2 - 4(5)(-27)}}{2 \times 5}$ or better or $\frac{12}{10} \pm \sqrt{\left(\frac{12}{10}\right)^2 + \frac{27}{5}}$	**B2**	**B1** for $\sqrt{(-12)^2 - 4(5)(-27)}$ or for $\left(x - \frac{12}{10}\right)^2$ oe or $\frac{-(-12) + \sqrt{q}}{2 \times 5}$ oe or $\frac{-(-12) - \sqrt{q}}{2 \times 5}$ oe or both
	– 1.42, 3.82 final answers	**B2**	**B1** for each If **B0**, **SC1** for answers – 1.4 or –1.415… to – 1.415 **and** 3.8 or 3.815 to 3.815… or answers –1.41 and 3.81 or – 1.42 **and** 3.82 seen in working or for –3.82 and 1.42 as final ans
(c)	14.4 or 14.5 or 14.44 to 14.46	**2**	**2FT** for 3 × *their* positive root + 3 evaluated to 3sf or better **M1** for 3 × *their* positive root + 3 oe
(d)	39.5 or 39.46 to 39.54…	**2**	**M1** for trig statement seen to find either angle sin = $\frac{\textit{their}\, x}{6}$ oe or sin = $\frac{\textit{their}\,(2x - 3)}{6}$ oe

57. 0580_s18_ms_43 Q: 6

	Answer	Mark	Partial Marks
(a)(i)	116.6 or 116.56 to 116.57	**4**	**M1** for $\sin[EAD]=\frac{6}{12}$ oe **M1** for $\tan[BAC]=\frac{6}{12}$ oe **B1** for [angle DAC] = 60
(a)(ii)	13.4 or 13.41 to 13.42	**2**	**M1** for 12^2+6^2
(a)(iii)	10.4 or 10.39…	**3**	**M2** for $\sqrt{12^2-6^2}$ or **M1** for $AE^2+6^2=12^2$
(a)(iv)	130 or 129.5… to 129.6	**4**	**M1** for $0.5\times6\times theirAE$ oe **M1** for $0.5\times12\times12\times\sin60$ oe **M1** for $0.5\times6\times12$ oe
(b)(i)	3	**1**	
(b)(ii)	51.3 or 51.30 to 51.34…	**4**	**M3** for $\tan=\frac{8}{\sqrt{4^2+5^2}}$ or $\sin=\frac{8}{\sqrt{4^2+5^2+8^2}}$ oe or **M2** for $\sqrt{4^2+5^2}$ or $\sqrt{4^2+5^2+8^2}$ or **M1** for angle ARB clearly indicated

58. 0580_w18_ms_41 Q: 5

	Answer	Mark	Partial Marks
(a)(i)	$[h=]\ 253.8\div18\div\left(\frac{6}{2}\right)$ or $[h=]\ \frac{253.8\times2}{6\times18}$ or $[h=]\ \frac{253.8}{18\times\frac{6}{2}}$	**3**	For **M3** no errors at any stage **M2** for $253.8=\frac{1}{2}\times6\times h\times18$ oe (no previous errors) or **M1** for triangle area $=\frac{1}{2}\times6\times h$ soi
(a)(ii)	38.1 or 38.06 to 38.08	**2**	**M1** for $\tan=\frac{4.7}{6}$ oe
(b)	358 or 357.9 to 358	**6**	**M1** for $6^2+4.7^2$ **M1** for $\sqrt{6^2+4.7^2}\times18$ [$\times2$] **M1** for 6×18 [$\times2$] **M1** for 4.7×18 **M1** for $2\times\frac{1}{2}\times6\times4.7$ oe

59. 0580_w18_ms_41 Q: 7

	Answer	Mark	Partial Marks
(a)	42.2 or 42.23....	**2**	**M1** for $\frac{1}{2}\times 8.9\times 12.5\times \sin 130.6$ oe
(b)(i)	27[.0] or 27.00 to 27.01	**3**	**M2** for $\frac{11.6\times \sin 123.5}{21.3}$ or **M1** for $\frac{11.6}{\sin BCD}=\frac{21.3}{\sin 123.5}$ oe
(b)(ii)	15.9 or 15.90 to 15.91	**5**	**M1** for angle *ABD* = *their* angle *BCD* + 33.5 **and** **M2** for $11.6^2+18^2-2\times 11.6\times 18\times \cos(their ABD)$ or **M1** for implicit version **A1** for 252.9 to 253

60. 0580_w18_ms_42 Q: 8

	Answer	Mark	Partial Marks
(a)	370 or 370.2 to 370.3	**2**	**M1** for 864 ÷ *their* time
(b)	991 or 990.5 …	**4**	**M2** for $864^2 + 928^2 - 2 \times 864 \times 928\cos 67$ or **M1** for correct implicit version **A1** for 981100 to 981110
(c)(i)	313	**2**	**M1** for 180 + 133 or 360 – 47
(c)(ii)	[0]79.5 to [0]79.6 …	**4**	**M2** for $\frac{928\times \sin 67}{their\ 991}$ or $\frac{864\times \sin 67}{their\ 991}$ oe or **M1** for implicit form of either **A1** for [angle *HGB* =] 59.5 to 59.6 … or [angle *HBG* =] 53.4 or 53.37 to 53.42 **M1 dep** for *their* angle *HGB* + 20 leading to answer or for 133 – *their* angle *HBG* leading to answer

61. 0580_m17_ms_42 Q: 10

	ANSWER	MARK	PARTIAL MARKS
(a) (i)	$(6 - 2) \times 180$ or $(2 \times 6 - 4) \times 90$ or $(360 \div 6)$	**M1**	
	$(6 - 2) \times 180 \div 6$ or $(2 \times 6 - 4) \times 90 \div 6$ or $180 - (360 \div 6)$	**M1dep**	dep on previous M1
(ii)	$1.73x$ or $x\sqrt{3}$ oe	**3**	**M2** for $2x\sin 60$ or $2x\cos 30$ oe or for $\sqrt{x^2 + x^2 - 2 \times x \times x \times \cos 120}$ or **M1** for $x\sin 60$ or $x\cos 30$ oe or for $x^2 + x^2 - 2 \times x \times x \times \cos 120$

	ANSWER	MARK	PARTIAL MARKS
(iii)	$(10 - x)\sin 30$ seen oe	**M1**	
	$10 + 2\big((10 - x)\sin 30\big)$ oe	**M1dep**	dep on previous **M1**
	$10 + 10 - x$ or $10 + 2 \times \frac{1}{2} \times (10 - x)$	**A1**	with no errors or omissions seen
(b)	12.7 or 12.67 to 12.68.... nfww	**4**	**B3** for 7.32 to 7.33 or **M2** for $x = 20 \div (1 + 1.73)$ oe or **M1** for $20 - x =$ *their* **(a)(ii)** oe

62. 0580_s17_ms_41 Q: 8

	ANSWER	MARK	PARTIAL MARKS
(a)(i)	290	**2**	**M1** for 180 + 110 oe
(a)(ii)	156.8 or 156.7[9..]	**5**	**B1FT** for $CBA = 10°$ (*their* **(a)** – 280) and **B3** for [angle ACB =]13.2° or **M2** for [sin C] = $\frac{50\sin(\textit{their}10)}{38}$ or **M1** for $\frac{50}{\sin C} = \frac{38}{\sin(\textit{their}10)}$ oe

	ANSWER	MARK	PARTIAL MARKS
(a)(iii)	8.68 or 8.677 to 8.684	**3**	**M2** for [x =]50sin(*their*10) oe or **M1** for $\sin(\textit{their}10) = \frac{x}{50}$ oe or **M1** for a correct right-angled triangle drawn with 50 as hypotenuse
(b)(i)	$x\,(x - 25) = 2200$	**1**	and no errors seen
(b)(ii)	$\frac{-(-25) \pm \sqrt{(-25)^2 - 4(1)(-2200)}}{2(1)}$ or better	**B2**	**B1** for $\sqrt{(-25)^2 - 4(1)(-2200)}$ or better **or** for $\left(x - \frac{25}{2}\right)^2$ oe or **B1** for $\frac{-(-25) + \sqrt{q}}{2(1)}$ or $\frac{-(-25) - \sqrt{q}}{2(1)}$ or both or for $\frac{25}{2} + \text{or} - \sqrt{\left(\frac{25}{2}\right)^2 + 2200}$
	–36.04 and 61.04 final answer	**B1,B1**	If **B0B0, SC1** for values in ranges –36.042 to –36.041 **and** 61.041 to 61.042 seen or for answers –36[.0] or –36.042 to –36.041 **and** 61[.0] or 61.041 to 61.042 or –36.04 **and** 61.04 seen in working or for –61.04 **and** 36.04 as final ans

63. 0580_s17_ms_42 Q: 8

	ANSWER	MARK	PARTIAL MARKS
(a)	66[.0] or 66.03 to 66.04	**2**	**M1** for tan = $\frac{9}{4}$ oe
(b)	$\sqrt{3^2+4^2}$ or $\frac{1}{2}\sqrt{6^2+8^2}$	**M1**	Any alternative method must be full and complete and result in exactly 5
(c)	60.9 or 60.94 to 60.95	**2**	**M1** for tan = $\frac{9}{5}$ oe
(d)	5.83 or 5.84 or 5.827 to 5.840	**6**	**M1** for [PB or PC =] $\sqrt{9^2+5^2}$ or [XC =] $\sqrt{9^2+5^2}$ − 7.5 **M1** for angle $BPX = 2 \times \text{invsin}\frac{3}{\textit{their } PB}$ oe **B1** for [PB or PC =] $\sqrt{106}$ = 10.29 to 10.30 or XC = 2.79 to 2.8[0] or angle BPX = 33.9 or 33.86 to 33.90… **M2** for $\sqrt{(\textit{their } PB)^2 + 7.5^2 - 2 \times \textit{their } PB \times 7.5 \times \cos(\textit{their } BPX)}$ oe or **M1** for correct implicit equation

64. 0580_s17_ms_43 Q: 9

	ANSWER	MARK	PARTIAL MARKS
(a)	1120 or 1121.	**4**	**M2** for $[AC^2 =]$ $525^2 + 872^2 - 2\times525\times872\times\cos 104$ or **M1** for implicit version **A1** for 1257000 to 1258000
(b)	$[QB$ or $x =]$ $872 \times \tan 1$ seen	**M2**	**M1** for $\tan 1 = \frac{QB}{872}$
	tan = *their* $QB \div 525$	**M1**	
	1.7 or 1.660 to 1.661 nfww	**A1**	dep on **M3**
(c)(i)	222000 or 222100. .... or 222101	**2**	**M1** for $\frac{1}{2}\times525\times872\times\sin104$
(c)(ii)	5.55 or 5.550 to 5.553 nfww	**2FT**	**FT** *their* **(c)(i)** $\times 100^2 \div 20000^2$ **M1** for *their* **(c)(i)** $\times 100^2 \div 20000^2$ or restart

65. 0580_w17_ms_41 Q: 10

	ANSWER	MARK	PARTIAL MARKS
(a)	$12.5^2 = x^2 + 8.5^2 - 2 \times x \times 8.5\cos 60$ oe isw	**M2**	**M1** for $\cos 60 = \frac{x^2 + 8.5^2 - 12.5^2}{2 \times x \times 8.5}$
	$156.25 = x^2 + 72.25 - 8.5x$	**A1**	or better
	$2x^2 - 17x - 168 = 0$	**A1**	with no errors or omissions
(b)	$\frac{[--]17 \pm \sqrt{([-]17)^2 - 4(2)(-168)}}{2 \times 2}$	**2**	**B1** for $\sqrt{([-]17)^2 - 4(2)(-168)}$ or better seen and if in form $\frac{p + or - \sqrt{q}}{r}$ **B1** for $p = [- -]\ 17$ **and** $r = 2 \times 2$
	14.35, –5.85 final answers	**1, 1**	**SC1** for 14.352 to 14.353 and –5.853 to –5.852 seen or 14.3 or 14.4 and –5.8 or –5.9 as final answers or –14.35 and 5.85 as final answers or 14.35 and –5.85 seen in working
(c)	12.2 or 12.17… nfww	**3**	**M2** for $\frac{their\ 14.35 \times \sin 46}{\sin 58}$ or **M1** for $\frac{\sin 46}{CD} = \frac{\sin 58}{their 14.35}$
(d)	138 or 137.5 to 137.8 nfww	**3**	**M1** for $0.5 \times their\ 14.35 \times 8.5\sin 60$ **M1** for $0.5 \times their\ 14.35 \times their 12.2 \times \sin 76$

66. 0580_w17_ms_42 Q: 3

	ANSWER	MARK	PARTIAL MARKS
(a)	7040 or 7035. …	**3**	**M1** for $\frac{1}{2}\times 100\times 70$ oe **M1** for $\frac{1}{2}\times 100\times 110\times \sin 40$ oe
(b)	374 or 375 or 374.4 to 374.5….	**5**	**M2** for $110^2+100^2-2\times 110\times 100\times \cos 40$ oe or **M1** for implicit form **A1** for 5250 or 5247. … (or 72.4 or 72.43 to 72.44) **M1** for 70^2+100^2
(c)	64.3 or 64.27 to 64.28 nfww	**2**	**M1** for $\sin 40 = \frac{\text{distance}}{100}$ oe
(d)	235	**3**	**B2** for [angle ACB =] 34.99 to 35 or [angle ABC =] 55[.0…] or **M1** for $\tan[\,ACB\,] = \frac{70}{100}$ or $\tan[\,ABC] = \frac{100}{70}$ or equivalent trig ratio

67. 0580_w17_ms_43 Q: 1

	ANSWER	MARK	PARTIAL MARKS
(a)(i)	180 ÷ (2 + 3 + 5) × 5 [= 90]	**1**	with no errors seen
(a)(ii)	7.05 or 7.053….	**3**	**M2** for $\frac{x}{12} = \sin 36$ oe or better or **B1** for 36 or 54 seen
(b)(i)	13	**2**	**M1** for 7.8 ÷ 3 soi
(b)(ii)	36.9 or 36.86 to 36.87	**3**	**B1** for smallest angle identified **M1** for $\sin[\,] = \frac{3}{5}$ oe or $\sin[\,] = \frac{7.8}{\textit{their}\ \textbf{(b)(i)}}$ oe If zero scored, **SC1** for calculation of 53.1

68. 0580_w17_ms_43 Q: 6

	ANSWER	MARK	PARTIAL MARKS
(a)(i)	25.5 or 25.46…	**2**	**M1** for $\pi \times 5^2 \times h = 2000$ oe
(a)(ii)	9.85 or 9.847…	**3**	**M2** for $[r^3=]\ 2000 \div \left(\frac{2}{3}\pi\right)$ oe or **M1** for $\frac{2}{3}\pi r^3 = 2000$ oe
(a)(iii)	952 or 952.4….	**3**	**M2** for $[6 \times]\ \sqrt[3]{2000}^2$ or **M1** for $\sqrt[3]{2000}$ or 6 times *their* area of one face
(b)(i)	22.5 or 22.49…	**2**	**M1** for $\frac{1}{2} \times 7 \times 10 \times \sin 40$
(b)(ii)	$\sqrt{(10^2 + 7^2 - 2 \times 10 \times 7 \cos 40)} + 7 + 10$	**M3**	**M2** for $10^2 + 7^2 - 2 \times 10 \times 7 \cos 40$ or **M1** for correct implicit cosine rule
	23.46…	**A2**	**A1** for 6.46… or 41.7 to 41.8
(c)	64.9 or 64.92 to 64.94	**3**	**M2** for $28.2 - 2 \times 9 = \frac{c}{360} \times 2 \times \pi \times 9$ oe or **M1** for $\frac{c}{360} \times 2 \times \pi \times 9$ soi