Mark Scheme

1. Kerjain semua nomor, pasti bisa trigonometry

(a)	$\frac{1}{2}\times16\times5.4\times\sin62$ oe	**M1**	
	38.14...	**A1**	
(b)	95.6 or 95.64 to 95.65	**4**	**M2** for $\frac{6.7\times\sin48}{8.4}$ **or M1** for implicit form **and M1dep** for 180 – 48 – *their* 36.4
(c)	286 or 285.7 to 285.8	**5**	**B1** for [Angle *APB*=] 83° **M2** for $180^2+245^2-2\times180\times245\times\cos$ *their* 83 **or M1** for implicit form **and A1** for [AB^2 =] 81676[.1...] After 0 scored, **SC2** for ans 406.87 to 406.88 or 406.9 or 407 if 146° used in cos rule Or **SC1** for $180^2+245^2-2\times180\times245\times\cos146$

2.

130 or 130.0 to 130.1	**2**	**M1** for ½ × 22.3 × 27.6 × sin25

3.

111.2 or 111.1 to 111.2	**4**	**M2** for [cos =] $\frac{2.8^2+3.6^2-5.3^2}{2\times2.8\times3.6}$ or **M1** for implicit form **A1** for [cos =] –0.362 to –0.361

4.

[0]47	**2**	**B1** for 133 or 47 seen or **M1** for 227 – 180 oe

5.

(a)	**(i)**	275	**2**	**M1** for 360 – 40 – 45 oe
	(ii)	095	**2FT**	**FT** *their* (a) – 180 **M1** for *their* (a) – 180 oe or 180 – 40 – 45
(b)		464.66 to 464.67 [= 464.7]	**4**	**M2** for $510^2+720^2-2\times510\times720\cos40$ or **M1** for correct implicit equation **A1** for 215 900 to 215 920
(c)		44.9 or 44.86 to 44.87…	**3**	**M2** for $\frac{510\sin(40)}{464.7}$ or **M1** for correct implicit equation

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6.

(a)	20.1 or 20.07 to 20.08	**2**	**M1** for $\frac{1}{2}\times 7\times 10\times \sin 35$ oe
(b)	5.86 or 5.858…..	**4**	**M2** for $7^2+10^2-2\times 7\times 10\times \cos 35$ **A1** for 34.3 .. or **M1** for $\cos 35=\frac{7^2+10^2-AC^2}{2\times 7\times 10}$

7.

(a)	126 or 126.4 to 126.5	**3**	**M2** for $\sqrt{220^2-180^2}$ oe or **M1** for $BC^2+180^2=220^2$ oe
(b)	99.9 or 99.86 to 99.87	**4**	**M2** for $180^2+170^2-2\times 180\times 170\cos 33$ or **M1** for $\cos 33=\frac{180^2+170^2-CD^2}{2\times 180\times 170}$ **A1** for 9970 or 9973 to 9974
(c)	92.6 or 92.58 to 92.59	**2**	**M1** for $\frac{\text{dist}}{170}=\sin 33$ oe
(d)	115.1 or 115.0 to 115.1	**3**	**M1** for $\cos =\frac{180}{220}$ oe **M1dep** for 47 + 33 + *their* angle *BAC*
(e)	19700 or 19708 to 19720	**3**	**M1** for 0.5 × 180 × 170 × sin33 oe or 0.5 × 180 × *their* **(c)** oe **M1** for 0.5 × 180 × *their* **(a)** oe or 0.5 × 180 × 220 × sin(*their BAC*) oe

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8.

(a)	$\frac{240\sin 85}{\sin 50}$	**M2**	or **M1** for $\frac{\sin 50}{240}=\frac{\sin 85}{AB}$ oe	
	312 or 312.1 ….	**B1**		
(b)	$\frac{1}{2}\times 180\times 240\times \sin A = 12000$	**M1**		
	33.748 to 33.749	**A2**	**A1** for sin = $\frac{24000}{43200}$ or better or 0.555 or 0.556 or $0.\dot{5}$ or 0.5555 to 0.5556	
(c)	328 or 328.3 to 328.5	**5**	**B1** for [angle A =] 78.75 seen **M2** for $180^2+(\textit{their } AB)^2-2\times 180\times \textit{their } AB\times\cos 78.75$ or **M1** for $\cos 78.75=\frac{180^2+(\textit{their}AB)^2-x^2}{2\times 180\times(\textit{their}AB)}$ **A1** for 107 800 to 107 900	
(d) (i)	108.75 or 108.7 or 108.8	**1**		
(ii)	288.75 or 288.7 or 288.8	**2FT**	**FT** 180 + *their* **(d)(i)** **M1** for 180 + *their* **(d)(i)** or 360 – (180 – *their***(d)(i)**)	

9.

(a)	$[\cos ABL =]\frac{40^2+61.1^2-92.1^2}{2\times 40\times 61.1}$	**M2**	**M1** for correct implicit version
	130.11…	**A2**	**A1** for $[\cos ABL =]$ –0.644… or $-\frac{7873}{12220}$ or $-\frac{3149.2}{4888}$
(b)	[0]59.5 or 59.50 to 59.511	**4**	**M2** for $\frac{40\sin 130.1}{92.1}$ or $\frac{61.1\sin 130.1}{92.1}$ or **M1** for $\frac{\sin A}{40}=\frac{\sin 130.1}{92.1}$ or $\frac{\sin L}{61.1}=\frac{\sin 130.1}{92.1}$ **and** **A1** for 19.39 to 19.4… or 30.48 to 30.49…

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(c)	1h 50min	**5**	**M2** for $[BC =]\ 2 \times 40 \times \cos(180 - 130.1)$ oe or **M1** for $\frac{x}{40} = \cos(180 - 130.1)$ oe OR **M2** for $[BC =]\ \sqrt{\{40^2 + 40^2 - 2 \times 40 \times 40\cos(\textit{their}\ 80.2)\}}$ or **M1** for correct implicit version OR **M2** for $[BC =]\ \frac{40\sin(\textit{their}\ 80.2)}{\sin 49.9}$ or **M1** for correct implicit version **and** **M1** for $\frac{\textit{their}\ BC}{28}$ **A1** for 1.84[0…] to 1.841

10.

(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

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(a)(iii)	8.68 or 8.677 to 8.684	**3**	**M2** for $[x =]50\sin(their10)$ oe or **M1** for $\sin(their10) = \frac{x}{50}$ oe or **M1** for a correct right-angled triangle drawn with 50 as hypotenuse
3(b)(i)	$x(x - 25) = 2200$	**1**	and no errors seen
3(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

11.

(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 1 257 000 to 1 258 000
(b)	[*QB* or *x* =] 872 × tan 1 seen	**M2**	**M1** for $\tan 1 = \frac{QB}{872}$
	tan = *their QB* ÷ 525	**M1**	
	1.7 or 1.660 to 1.661 nfww	**A1**	dep on **M3**
(c)(i)	222 000 or 222 100. .... or 222 101	**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)** × $100^2 \div 20\,000^2$ **M1** for *their* **(c)(i)** × $100^2 \div 20\,000^2$ or restart

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12.

73.6 or 73.63 to 73.64	**4**	**B3** for 27.4 or 27.36… OR **M2** for $\frac{5.9\sin 79}{12.6}$ oe or **M1** for $\frac{\sin[C]}{5.9}=\frac{\sin 79}{12.6}$ oe and **M1dep** for 180 – 79 – *their C* (dep on at least **M1** earned)

13.

(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 $\frac{\textit{their}\,14.35\times\sin 46}{\sin 58}$ or **M1** for $\frac{\sin 46}{CD}=\frac{\sin 58}{\textit{their}14.35}$
(d)	138 or 137.5 to 137.8 nfww	**3**	**M1** for 0.5 × *their* 14.35 × 8.5sin60 **M1** for 0.5 × *their* 14.35 × *their*12.2 × sin76

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14.

(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

15.

(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 $\frac{928\times \sin 67}{\textit{their}\ 991}$ or $\frac{864\times \sin 67}{\textit{their}\ 991}$ 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

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16.

(a)	52[.0] or 52.02…	**4**	**M2** for $[\cos =]\ \dfrac{13^2+4^2-11^2}{2\times13\times4}$ or **M1** for $11^2=13^2+4^2-2\times13\times4\cos(...)$ **A1** for $[\cos^{-1}=]\dfrac{64}{104}$ oe or 0.615 or 0.6153 to 0.6154
(b)	62.7 or 62.69 to 62.70	**4**	**M3** for $180-\sin^{-1}\left(\dfrac{8\sin80}{13}\right)-80$ oe or **M2** for $\sin A=\dfrac{8\sin80}{13}$ or **M1** for $\dfrac{13}{\sin80}=\dfrac{8}{\sin A}$ oe **A1** for 37.3 or 37.30… If 0 scored, **M1** for 180 – 80 – *their A*
(c)	66.7 or 66.68 to 66.71	**3**	**M1** for $0.5\times13\times4\times\sin(theirACB)$ oe **M1** for $0.5\times8\times13\times\sin(their\ ACD)$ oe

17.

19.3 or 19.26 to 19.27 nfww	**3**	**M2** for $[\sin=]5.9\times\dfrac{\sin84.6}{17.8}$ or **M1** for $\dfrac{5.9}{\sin B}=\dfrac{17.8}{\sin84.6}$ oe

18.

(a)(i)	116.6 or 116.56 to 116.57	**4**	**M1** for $\sin[EAD]=\dfrac{6}{12}$ oe **M1** for $\tan[BAC]=\dfrac{6}{12}$ 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

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19.

3(a)	356 or 356.2 to 356.3	**4**	**B1** for [Angle LPM] = 74 soi **M2** for $\frac{248 \times \sin \textit{their } 74}{\sin 42}$ 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)	02 57 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

20.

(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

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21.

(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
(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

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22.

(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

23.

(a)(i)	180 – 60 – 39 [= 81]	**1**	
(a)(ii)	147 or 147.1…	**3**	**M2** for $\frac{129 \sin(81)}{\sin 60}$ oe or **M1** for $\frac{\sin(81)}{CD} = \frac{\sin 60}{129}$ oe
(a)(iii)	$[\cos =]\ \frac{85^2 + 129^2 - 72^2}{2 \times 85 \times 129}$	**M2**	**M1** for $72^2 = 85^2 + 129^2 - 2 \times 85 \times 129 \cos ABD$
	31.58…	**A2**	**A1** for 0.851 to 0.852 or $\frac{9341}{10965}$ or equivalent fraction
(a)(iv)	44.5 or 44.51 to 44.54	**3**	**M2** for implicit correct method e.g. $\frac{d}{85} = \sin 31.6$ oe or **M1** for recognition that the line from *A* is perpendicular to *BD*
(a)(v)	247 or 247.4…	**2**	**M1** for 180 + (180 – 81 – 31.6) oe or for $\angle NBC = 180 - 81 - 31.6$ oe or for $\angle NCB = 81 + 31.6$ oe