Mark Scheme

Q1.

Question	Answer	Mark	Mark scheme	Additional guidance
	17.4	B1	for stating any correct bound, eg. 6.75 or 6.85 or 0.045 or 0.055	Accept 6.849 or 6.8499... for 6.85 and 0.0549 or 0.05499.. for 0.055
		M1	using both UB of e and LB of f to work out value of $2e \div f$, eg 2[UB of e] ÷ [LB of f] or $\frac{2\times6.85}{0.045}$	$6.8 <$ UB(e) ≤ 6.85 $0.045 \leq$ LB(f) < 0.05
		A1	for answer in the range 17.4 to 17.5 from correct working	If an answer is given in the range in working and then rounded incorrectly award full marks. Award 0 marks for a correct answer with no (or incorrect) supportive working

(Q16 1MA1/3H, June 2022)

Q2.

Question	Working	Answer	Mark	Notes
		0.0654011543	B1	for stating bound for p, 5.365 or 5.375 or bound for s, 2.85 or 2.95
			M1	for use of two lower bounds in equation
			A1	for 0.0654…

(Q20 1MA1/2H/M3, Specimen papers)

Q3.

Question	Working	Answer	Mark	Notes
		$7.3 \leq x < 7.4$	B2 (B1)	cao (for 7.3 and 7.4)

(Q08 1MA1/3H/M3, Specimen papers)

Q4.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	7.25	B1	oe	
(b)	No with supporting reason	C1	No with supporting reason **Acceptable reasons:** No, the 9 should be recurring No, 7.3491 is greater No, there are numbers between 7.349 and 7.350 **Not acceptable reasons:** Yes with any reason given Leila is correct … 7.350 would round down She has rounded to 3sf and should only round to 2sf 7.349 rounds to 7.4	

(**Q09 1MA1/2H, June 2024**)

Q5.

Question	Answer	Mark	Mark scheme	Additional guidance
	60 and reason	B1	for 432.5 **or** 437.5 **or** 9.75 **or** 9.85 **or** 2.45 **or** 2.55	
		M1	for a correct process to find a bound for T eg [LB of w] ÷ [UB of a – LB of c] where 432.5 ⩽ [LB of w] < 435 and 9.8 < [UB of a] ⩽ 9.85 and 2.45 ⩽ [LB of c] < 2.5 **or** [UB of w] ÷ [LB of a – UB of c] where 435 < [UB of w] ⩽ 437.5 and 9.75 ⩽ [LB of a] < 9.8 and 2.5 < [UB of c] ⩽ 2.55	
		M1	for a correct process to find both LB and UB bound for T eg [LB of w] ÷ [UB of a – LB of c] where 432.5 ⩽ [LB of w] < 435 and 9.8 < [UB of a] ⩽ 9.85 and 2.45 ⩽ [LB of c] < 2.5 **and** [UB of w] ÷ [LB of a – UB of c] where 435 < [UB of w] ⩽ 437.5 and 9.75 ⩽ [LB of a] < 9.8 and 2.5 < [UB of c] ⩽ 2.55	
		A1	(dep on all previous marks) for 58.44(5...) **and** 60.76(3...) with both values clearly coming from working with correct values	Accept bounds rounded or truncated to at least 4 sf
		C1	for 60 from 58.44... and 60.76... **and** statement that both LB and UB round to 60	

Letter	Given	LB	UB
w	435	432.5	437.5
a	9.8	9.75	9.85
c	2.5	2.45	2.55

UB

Letter	Given	LB	UB
w	435	432.5	**437.5**
a	9.8	**9.75**	9.85
c	2.5	2.45	**2.55**

LB

Letter	Given	LB	UB
w	435	**432.5**	437.5
a	9.8	9.75	**9.85**
c	2.5	**2.45**	2.55

(**Q19 1MA1/2H, Nov 2024**)

Q6.

Question	Answer	Mark	Mark scheme	Additional guidance
	10.2 and 10.3	B1	for 10.2 in the correct place	
		B1	for 10.3 in the correct place	Accept $10.2\dot{9}$ or 10.299(99…)

(Q07 1MA1/3H, Nov 2024)

Q7.

Question	Answer	Mark	Mark scheme	Additional guidance
	12.65, 12.75	B1	for 12.65 in correct position	
		B1	for 12.75 in correct position	Accept $12.74\dot{9}$ or 12.7499(…)

(Q26 1MA1/2F, June 2023)

Q8.

Question	Answer	Mark	Mark scheme	Additional guidance
	46.989...	B1	for stating at least one bound, 9.25 or 9.35 or 12.55 or 12.65	Accept $9.34\dot{9}$ or 9.3499(…) or $12.64\dot{9}$ or 12.6499(…)
		P1	for correct use of LB and UB, eg $\sin x = \frac{[\text{LB of } AB]}{[\text{UB of } AC]}$	$9.25 \le \text{LB} < 9.3$ $12.6 < \text{UB} \le 12.65$ $\sin(x) = 0.731(\ldots)$
		A1	for answer in the range 46.98 to 47 from correct working	Answer only award no marks.

(Q19 1MA1/2H, June 2023)

Q9.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	81.0662	M1	for one of 26.15 or 26.25 or 4.25 or 4.35	Accept $26.24\dot{9}$ for 26.25 and $4.34\dot{9}$ for 4.35
		M1	for a correct process to find the upper bound for D $[\text{UB of } u]^2 \div [2 \times \text{LB of } a]$ eg $\frac{26.25^2}{2\times 4.25}$ where $26.2 < \text{UB of } u \le 26.25$ and $4.25 \le \text{LB of } a < 4.3$	Award for $\frac{26.25^2}{4.25}$
		A1	for answer given in the range 81.0661 to 81.0662 from correct working	
(b)	80	B1	for 80 ft answer to (a) with 78.6003	
	explanation	C1	for explanation relating to the upper bound found in (a) **Acceptable examples** bounds agree when rounded to 80 bounds agree to nearest 10 **Not acceptable examples** 80 79.83325 rounded to nearest tenth	

(Q19 1MA1/3H, June 2019)

Q10.

Question	Working	Answer	Notes	
	$\sqrt{8.35^2 - 6.05^2}$	5.754997828	B1	for finding bounds of one measurement,8.25 8.35, 6.05 or 6.15
			P1	for process of choosing and using correct bounds
			P1	for process of Pythagoras' rule with correct bounds
			A1	for 5.754(997…)

(**Q17 1MA1/2H/S2, Specimen papers**)

Q11.

Question	Answer	Mark	Mark scheme	Additional guidance
	2.7 with statement	B1	for 179.5 or 180.5 or 180.4999...	
		B1	for 486.5 or 487.5 or 487.4999...	
		P1	for a correct process to find a bound for average speed, eg [upper bound of distance] ÷ [lower bound of time] where 487 < [UB of distance] ≤ 487.5 and 179.5 ≤ [LB of time] < 180 **or** for [lower bound of distance] ÷ [upper bound of time] where 486.5 ≤ [LB of distance] < 487 and 180 < [UB of time] ≤ 180.5	
		A1	(dep on all previous marks) for 2.695(2…) **and** 2.715(8 …) with both values clearly coming from working with correct values	Accept bounds truncated or rounded to at least 4 sig fig
		C1	for 2.7 from 2.695… and 2.715… **and** statement that both LB and UB round to 2.7	

(**Q18 1MA1/3H, Nov 2018**)

Q12.

Question	Answer	Mark	Mark scheme	Additional guidance
	20	B1	stating bound, eg 10.65 **or** 10.55 **or** 31 min 48.5sec **or** 31 min 47.5sec **or** 1908.5sec **or** 1907.5sec	
		P1	(dep on B1) for a correct bound for time in hours, eg 0.5301(38…) **or** 0.5298(61…) **Or** a correct process to find one bound for speed in km per minute eg [UB of S] = [UB of D]÷[LB of T] or [LB of S] = [LB of D]÷[UB of T] **or** a correct process to find one bound for speed in km per second eg [UB of S] = [UB of D]÷[LB of T] or [LB of S] = [LB of D]÷[UB of T]	Bound rounded or truncated to 4 dp Where 10.6 < [UB of D] ≤ 10.65 **and** 31 min 47.5 sec ≤ [LB of T] < 31 min 48 sec **Or** 10.55 ≤ [LB of D] < 10.6 **and** 31 min 48 sec < [UB of T] ≤ 31 min 48.5 sec Where 10.6 < [UB of D] ≤ 10.65 **and** 1907.5 sec ≤ [LB of T] < 1908 sec **Or** 10.55 ≤ [LB of D] < 10.6 **and** 1908 sec < [UB of T] ≤ 1908.5 sec
		P1	(dep on P1) for correct process to find one bound for speed in km per hour, eg [UB of S] = [UB of D]÷ 0.5298(61…) **or** [LB of S] = [LB of D]÷ 0.5301(38…) **OR** Correct process to convert a bound for speed in km per minute to km per hour eg [UB of S] = [UB of D]÷[LB of T] × 60 **or** [LB of S] = [LB of D]÷[UB of T] × 60 **OR** Correct process to convert a bound for speed in km per second to km per hour eg [UB of S] = [UB of D]÷[LB of T] × 60 × 60 **or** [LB of S] = [LB of D]÷[UB of T] × 60 × 60	Time used in hours Where 10.6 < [UB of D] ≤ 10.65 **and** 31 min 47.5 sec ≤ [LB of T] < 31 min 48 sec **Or** 10.55 ≤ [LB of D] < 10.6 **and** 31 min 48 sec < [UB of T] ≤ 31 min 48.5 sec Where 10.6 < [UB of D] ≤ 10.65 **and** 1907.5 sec ≤ [LB of T] < 1908 sec **Or** 10.55 ≤ [LB of D] < 10.6 **and** 1908 sec < [UB of T] ≤ 1908.5 sec
		A1	for both correct bounds from correct working, 20.099… **and** 19.900…	Figures rounded or truncated to 3 sf or better
		C1	for 20 correct to 2 significant figures as both bounds agree.	

(**Q23 1MA1/2H, Nov 2022**)

Q13.

Question	Working	Answer	Mark	Notes
(a)(i)		155 000	B1	cao
(ii)		165 000 or 164 999 or 164 999.99	B1	165 000 or 164 999 or 164 999.99
(b)		200 000	M1	for recognising that 210 000 = 105% or a full method to find the original price eg 210 000 ÷ 1.05 oe (= 200 000)
			A1	cao

(**Q23 1MA1/3F, June 2017**)

Q14.

Question		Working	Answer	Mark	Notes
			$0.455 \leq y < 0.465$	2	B1 for 0.455 or 0.465 B1 cao

(Q23 1MA1/1F/M1, Specimen papers)

Q15.

Question		Working	Answer	Mark	Notes
5	(a)		0.625	B1	cao
	(b)		$9.75 \leq x < 9.85$	B2	for $9.75 \leq x < 9.85$
				[B1	for 9.75 or 9.85 (or $9.84\dot{9}$)]

(Q05 1MA1/3H, Nov 2017)

Q16.

Paper 1MA1: 2H			
Question	**Working**	**Answer**	**Notes**
		1.5	B1 for any correct bound clearly identified, eg. $99.65 \rightarrow x \rightarrow 99.75$ or $66.5 \rightarrow y \rightarrow 67.5$ M1 for method to find UB, eg. "99.75" ÷ "66.5" A1 for 1.5

(Q22 1MA1/2H/S1, Specimen papers)

Q17.

Question	Answer	Mark	Mark scheme	Additional guidance
	1.2, 1.3	B1 B1	for 1.2 in the correct position for 1.3 in the correct position	. Accept 1.29 or 1.299… must be 9 recurring.

(Q12 1MA1/3H, Nov 2022)

Q18.

Question	Answer	Mark	Mark scheme	Additional guidance
	7.15 and 7.25	B1	for 7.15 as the lower bound	
		B1	for 7.25 as the upper bound	Accept 7.24$\dot{9}$ oe or 7.2499… oe

(**Q27 1MA1/1F, Nov 2021**)

Q19.

Question	Answer	Mark	Mark scheme	Additional guidance
	6.35, 6.45	B1	for 6.35 in the correct position	
		B1	for 6.45 in the correct position	Accept 6.44$\dot{9}$ oe or 6.4499… oe

(**Q11 1MA1/3H, Nov 2021**)

Q20.

Question	Answer	Mark	Mark scheme	Additional guidance
	984.(3677853) and 969.(0181643)	B1	stating bound of 51.95 or 52.05 or 1.445 or 1.455	Accept 52.04$\dot{9}$ or 52.0499… for 52.05 Accept 1.454$\dot{9}$ or 1.4549… for 1.455
		P1	for process to rearrange formula to give g as the subject, eg $g=\frac{4\pi^2 l}{T^2}$ oe	Rearrangement may occur after substitution, in this case correct bounds are not needed for this mark
		P1	for process to use LB of l **and** UB of T in formula for g or T **or** process to use UB of l **and** LB of T in formula for g or T eg $\frac{4\pi^2[\text{LB of } l]}{[\text{UB of } T]^2}$ or $\frac{4\pi^2[\text{UB of } l]}{[\text{LB of } T]^2}$	$51.95 \le$ [LB of l] < 52.0 $1.45 <$ [UB of T] ≤ 1.455 $52.0 <$ [UB of l] ≤ 52.05 $1.445 \le$ [LB of T] < 1.45 Rearrangement may not be correct
		A1	for upper bound = 984.(3677853) or 984.(1125639..) **and** lower bound = 969.(0181643) or 968.(7669227..)	NB: correct answer without supportive working gets 0 marks Accept answers rounded or truncated to 3sf or better

(**Q21 1MA1/2H, Nov 2021**)

Q21.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	1.25	B1	for 1.25 or $\frac{5}{4}$ or $1\frac{1}{4}$	
(b)	4650 and 4750	B1	for 4650 in the correct position	
		B1	for 4750 in the correct position	Accept 4749.9 or 4749.99(…)

(**Q25 1MA1/2F, Nov 2022**)

Q22.

Question	Working	Answer	Mark	Notes
(a)		No	P1	for 265 or 275 or 274.999... or 107.5 or 112.5 or 112.4999...
		(supported)	P1	process to find $\frac{d}{t}$ where $270< d \leq 275$ and $107.5\leq t < 110$ oe
			P1	for process to work in consistent units of time eg $\frac{d}{t} \times 60$ or $t \div 60$ where $265\leq d \leq 275$ and $107.5\leq t < 110$ oe or $160 \div 60$ (= 2.666..)
			C1	Conclusion supported with correct figure(s) given eg No and 153(.488..) or No and 2.66 to 2.7 and 2.5(581..) from correct working
(b)		Statement	C1	e.g. Less distance in the same time so (max) speed would drop

(**Q17 1MA1/3H, June 2017**)

Q23.

Paper 1MA1: 2H			
Question	Working	Answer	Notes
		0.229 with explanation	B1 Finding bound of s: 3.465 or 3.475 or 3.474999… or Finding bound of t: 8.1315 or 8.1325 or 8.132499…
			P1 Use of "upper bound" and "lower bound" in equation
			P1 Process of choosing correct bounds eg. $\frac{\sqrt{3.475}}{8.1315}$ or $\frac{\sqrt{3.465}}{8.1325}$
			A1 For 0.2292… and 0.2288… from correct working
			C1 For 0.229 from 0.2292… and 0.2288… since both LB and UB round to 0.229

(**Q18 1MA1/2H/N, Specimen papers**)

Q24.

Question	Working	Answer	Mark	Notes
(a)		120	P1	for $\frac{4\times450}{15}$ **or** $\frac{4}{15}=\frac{x}{450}$ oe
			A1	cao
(b)		$\frac{165}{450}$	P1	5.5 **or** 6.5 **or** 165 **or** $\frac{5\times450}{15}$ (=150) and $\frac{6\times450}{15}$ (=180)
			A1	for $\frac{165}{450}$ oe

(**Q13 1MA1/1H, Nov 2017**)

Q25.

Question	Answer	Mark	Mark scheme	Additional guidance
	1610	B1	for 5.875×10^8 or 5.885×10^8 or 3.55×10^5 or 3.65×10^5 or the digits 5875 or 5885 or 355 or 365	Accept $5.884\dot{9}$ for 5.885 Accept $3.64\dot{9}$ for 3.65
		M1	for method to find lower bound, $\frac{[LB]}{[UB]}$ eg $(5.875 \times 10^8) \div (3.65 \times 10^5)$ oe	$5.875 \times 10^8 \leq [LB] < 5.88 \times 10^8$ $3.6 \times 10^5 < [UB] \leq 3.65 \times 10^5$
		A1	for answer in range 1609 – 1610 from correct working	If an answer is shown in the range in working and then incorrectly rounded award full marks

(**Q19 1MA1/3H, June 2024**)

Q26.

Question		Working	Answer	Mark	Notes
			1.08 and explanation	5	B1 finds a bound of a: 6.425 or 6.435 or 6.434999... or a bound of b: 5.5135 or 5.5145 or 5.5144999.. P1 uses UB and LB in equation P1 process of choosing correct bounds, e.g. $\sqrt{\frac{6.435}{5.5135}}$ or $\sqrt{\frac{6.425}{5.5145}}$ A1 for 1.079... and 1.080... both values must clearly come from correct working C1 for 1.08 from 1.079... and 1.080... and "both LB and UB round to 1.08"

(**Q16 1MA1/3H/M1, Specimen papers**)

Q27.

Question	Working	Answer	Mark	Notes
16		Yes and correct working	B1	for 147.5 or 148.5 or 148.4999... or 11.75 or 11.85 or 11.84999...
			P1	substitutes $11.8 < UB \leq 11.85$ and $147.5 \leq LB < 148$ in the formula to work out petrol consumption
			A1	for 'Yes' and 8.03(3898305...) from correct working

(**Q16 1MA1/3H, Nov 2017**)

Q28.

Question	Answer	Mark	Mark scheme	Additional guidance
	0.43	B1	for one correct bound for mass or length eg 1967.5 **or** 1972.5 **or** 13.15 **or** 15.95 **or** 21.65 **or** 13.25 **or** 16.05 **or** 21.75	Can work in any units
		P1	for a correct process to find a bound for the volume, eg $13.15 \times 15.95 \times 21.65$ (=454(0.925125)) **or** $13.25 \times 16.05 \times 21.75$ (=462(5.409375))	Accept volumes truncated or rounded to at least 3 sig fig
		P1	for a correct process to find a bound for density, eg [mass LB] ÷ "462(5.409375)" (=0.425(367755)) where $1965 \leq$ mass LB < 1970 **or** [mass UB] ÷ "454(0.925125)" (=0.434(3828506)) where $1970 <$ mass UB ≤ 1975	Accept densities truncated or rounded to at least 3 sig fig
		A1	for both correct bounds, 0.425(367755) **and** 0.434(3828506)	Accept bounds truncated or rounded to at least 3 sig fig At this point correct units must be used
		C1	(dep on A1) for a correct statement on degree of accuracy e.g. UB and LB both round to 0.43 to 2 decimal places or 2 significant figures	Must be 0.43 not 0.4

(**Q21 1MA1/2H, June 2018**)

Q29.

Question	Working	Answer	Mark	Notes
		$3.45 \leq x < 3.55$	B2	cao
			(B1)	for 3.45 and 3.55

(**Q20 1MA1/2F/M2, Specimen papers**)