

GCSE Mathematics (1MA1)

Themed papers – Speed Distance Time

Compiled from student-friendly mark schemes

Please note that this mark scheme is not the one used by examiners for making scripts. It is intended more as a guide to good practice, indicating where marks are given for correct answers. As such, it doesn't show follow-through marks (marks that are awarded despite errors being made) or special cases.

It should also be noted that for many questions, there may be alternative methods of finding correct solutions that are not shown here – they will be covered in the formal mark scheme.

NOTES ON MARKING PRINCIPLES

Guidance on the use of codes within this mark scheme

M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect.

P1 – process mark. This mark is generally given for setting up an appropriate process to find a solution in the context of the question.

A1 – accuracy mark. This mark is generally given for a correct answer following correct working.

B1 – working mark. This mark is usually given when working and the answer cannot easily be separated.

C1 – communication mark. This mark is given for explaining your answer or giving a conclusion in context supported by your working.

Some questions require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer).

Question 1 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{3.9 \times 10^7}{3 \times 10^5}$	P1	This mark is given for a process to find how long the signal took to reach Mars
	$= 1.3 \times 10^2$ $= 130$	A1	This mark is given for finding the number of seconds the signal takes to reach Mars
(b)	The signal will take longer to reach Mars	C1	This mark is given for a correct explanation

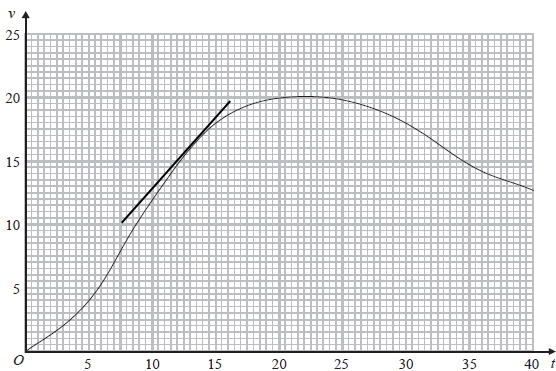
Question 2 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{3000}{15} = 200$	P1	This mark is given for a process to estimate the number of hours Juan cycles
	$\frac{200}{8}$	P1	This mark is given for a process to estimate the number of days Juan cycles
	25	A1	This mark is given for the correct answer only
(b)	The estimated number of days will be fewer than 25	C1	This mark is given for a correct statement

Question 3 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$14\ 48 - 13\ 30 = 1\ \text{hour}\ 18\ \text{minutes}$	P1	This mark is given for a process to find the time taken for Nimer to arrive at the hotel
	$1\ \text{hour}\ 18\ \text{minutes} =$ $1\ \frac{18}{60}\ \text{hours} = 1.3\ \text{hours}$	P1	This mark is given for a process to find the number of hours taken
	$\frac{65}{1.3} =$	P1	This mark is given for a process to find the average speed (distance/time)
	50 (mph)	A1	This mark is given for the correct answer only

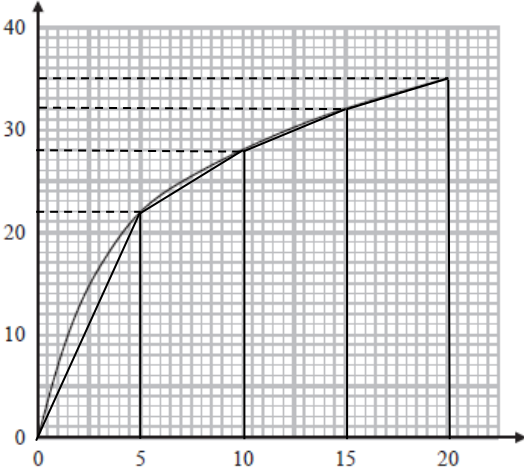
Question 4 (Total 7 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)(i)		B1	This mark is given for a tangent drawn at $t = 15$
	$7.5 \div 9$	M1	This mark is given for a method to use the tangent to find the gradient
	0.83	A1	This mark is given for a correct answer in the range 0.6 – 1
(a)(ii)	Acceleration of the car (the change of speed with respect to time)	C1	This mark is given for a correct description
(b)	$\frac{5 \times 4}{2} + \frac{(4 + 12)}{2} \times 5$ $+ \frac{(12 + 18)}{2} \times 5 + \frac{(18 + 20)}{2} \times 5$	P1	This mark is given for splitting the area in to 4 strips (one triangle, three trapezia)
	$10 + 40 + 75 + 95$	P1	This mark is given for a process to find an estimate for the area under the curve the
	220	A1	This mark is given for a correct answer in the range 215 – 225

Question 5 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$56 + 61 = 117$ miles	P1	This mark is given for a process to find total distance travelled from Liverpool to Sheffield
	$56 \div 70 = 0.8$ hrs (or 48 minutes)	P1	This mark is given for a process to find time taken to travel from Liverpool to Manchester
	$0.8 \text{ hrs} + 1.25 \text{ hrs} = 2.05 \text{ hrs}$	P1	This mark is given for a correct process to find the total time taken to travel from Liverpool to Sheffield
	$117 \div 2.05 = 57.1$ (km/h)	A1	This mark is given for a correct answer (in the range 57 to 57.1)
(b)	The time taken for the two parts of the journey must be the same or The distance from Leeds to York is $\frac{3}{4}$ of the distance from Barnsley to Leeds	C1	This mark is given for a correct explanation

Question 6 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	 $(\frac{1}{2} \times 5 \times (0 + 22)) + (\frac{1}{2} \times 5 \times (22 + 28)) + (\frac{1}{2} \times 5 \times (28 + 32)) + (\frac{1}{2} \times 5 \times (32 + 35))$ $= 55 + 125 + 150 + 167.5$	M1	This mark is given for a method to find the area of one strip using a trapezium (or a triangle)
		M1	This mark is given for a method to find the area under the curve using four trapeziums
	497.5	A1	This mark is given for the correct answer only
(b)	This is an underestimate since there are small areas under the graph not included	C1	This mark is given for a correct statement supported by working

Question 7 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	Between 0 and 20 seconds	1	This mark is given for the correct answer only
	When the gradient of the graph is greatest	1	This mark is given for a correct comment
(b)	$\frac{360}{20} = 18$	1	This mark is given for the correct answer only

Question 8 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$72 \times \frac{18}{60}$	M1	This mark is given for a method to find the distance travelled by the car
	21.6	A1	This mark is given for the correct answer only
(b)	$20 \times \frac{3600}{1000} = 72$	M1	This mark is given for a method to convert 20 m/s to km/h
	David is incorrect; 72 km/h is the same as 20 m/s, not faster	C1	This mark is given for a valid conclusion supported by correct working

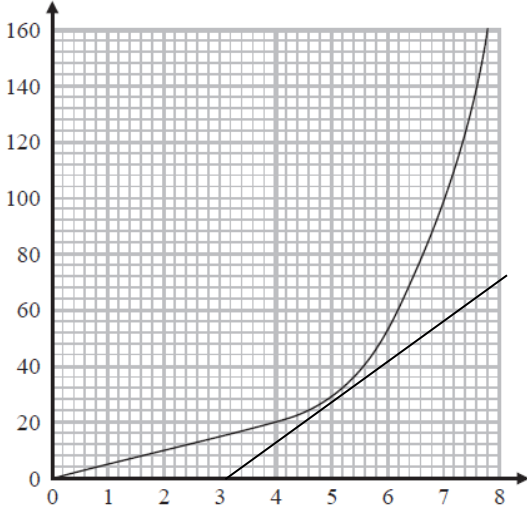
Question 9 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	265 to 275 km 107.5 to 112.5 minutes	P1	This mark is given for finding the range of values for the length of the track and the time taken
	107.5 to 112.5 minutes = 1.791666... to 1.875 hours	P1	This mark is given for a process to work in consistent units of time
	$\frac{265}{1.875}$ to $\frac{275}{1.791666...}$ 141.33... to 153.488... mph	P1	This mark is given for a process to find the range of possible speeds
	No, the greatest speed possible is 153.49 mph	C1	This mark is given for a conclusion supported with correct working
(b)	A shorter track in the same time means the maximum speed would be lower	C1	This mark is given for a correct statement

Question 10 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{1}{200}$	P1	This mark is given for using $\text{time} = \frac{\text{distance}}{\text{speed}}$
	$\frac{1}{200} \times 60 \times 60$	P1	This mark is given for a complete process to find a solution
	18 (seconds)	A1	This mark is given for a correct answer in the range 18–20
(b)	An overestimate, since the plane travels at more than 200 mph	C1	This mark is given for a correct explanation related to the response to part (a)

Question 11 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		P1	This mark is given for drawing a tangent to the curve at time $t = 5$
	$\frac{70-0}{8-3} = \frac{70}{5}$	P1	This mark is given for a process to find the gradient
	14 m/s	A1	This mark is given for answer in the range 11 – 19 m/s

Question 12 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Lower bound for distance = 486.5 km Upper bound for distance = 487.5 km	B1	This mark is given for finding the upper and lower bounds for the distance
	Lower bound for time = 179.5 seconds Upper bound for time = 180.5 seconds	B1	This mark is given for finding the upper and lower bounds for the time
	Upper bound for average speed = $\frac{487.5}{179.5}$ Lower bound for average speed = $\frac{486.5}{180.5}$	P1	This mark is given for a process to find the upper and lower bounds for the average speed
	Upper bound for av speed = 2.7158774... Lower bound for av speed = 2.6952909...	A1	This mark is given for finding correct values for the upper and lower bounds
	Both upper and lower bounds round to 2.7 km per second	C1	This mark is given for the correct answer only

Question 13 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$50 \div 2.5 = 20$	1	This mark is given for finding James' speed
	$15 \div 20 = 0.75 \text{ hrs} = 45 \text{ mins}$	1	This mark is given for finding James' time for 15 km
	$45 - 40 = 40 \text{ mins}$	1	This mark is given for finding Peter's time for 15 km
	$15 \div 0.6666....$	1	This mark is given for finding Peter's speed
	22.5	1	This mark is given for the correct answer only

Question 14 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$x = 10 + 2y$ $(10 + 2y)^2 + y^2 = 20$	1	This mark is given for a method to start the process by finding a value for x in terms of y and substituting
	$(100 + 20y + 20y + 4y^2) + y^2 = 20$ $4y^2 + 20y + 20y = 100$	1	This mark is given for expanding brackets on the expression obtained
	$5y^2 + 40y + 80 = 0$	1	This mark is given for forming a quadratic equation to be solved
	$(5y + 20)(y + 4) = 0$ $y = -4, x = 2$	1	This mark is given for solving the quadratic equation for y and so find the value of x
	The line intersects the circle at only one point $(2, -4)$, so must be a tangent	1	This mark is given for a fully correct statement to conclude the proof

Question 15 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$40 \text{ mph} \times 0.5 \text{ hour} (= 20 \text{ miles})$ or x -axis scaled correctly	M1	This method mark is given for a method to find the distance to the hospital
	40 miles or y -axis scaled correctly	M1	This method mark is given for finding a total distance from home to the hospital
	$40 \text{ miles at } 32 \text{ mph takes } 1.25 \text{ hours}$ or a completed travel graph 	A1	This accuracy mark is given for finding the time of the journey home from the hospital or for a fully a complete travel graph
	Ria arrives home at 16 45	C1	This communication mark is given for a correct conclusion

Question 16 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$0.5 \times 5 \times 2 = 5$ or $0.5 \times 5 \times (2 + 5) = 17.5$ or $0.5 \times 5 \times (5 + 10) = 37.5$ or $0.5 \times 5 \times (10 + 18) = 70$	1	This mark is given for splitting the area into 4 strips and finding the area of one triangle or trapezium
	$5 + 17.5 + 37.5 + 70$	1	This mark is given for a method to find and add up the totals of the four shapes
	130	1	This mark is given for the correct answer only
(b)	My answer to part (a) is an overestimate because the area measured is greater than the area below the curve	1	This mark is given for a correct statement

Mark scheme for 1MA1 Higher themed papers: Speed Distance Time

Performance data:

Q	Taken from			Total Marks available	TOPIC	Spec Ref	AO	% Mean marks	Edexcel mean averages Marks of candidates who achieved grade:										
	Q	Series	Paper						ALL	9	8	7	6	5	4	3	2	1	U
1a	11a	June 2019	3H	2	Ratio	N9, R1, R10, R11	3	88	1.75	1.98	1.94	1.89	1.81	1.66	1.42	1.03	-	-	0.64
1b	11b	June 2019	3H	1	Ratio	R10	3	84	0.84	0.98	0.95	0.92	0.87	0.79	0.66	0.45	-	-	0.25
2a	4a	June 2018	1H	3	Ratio	R11/ N15/ N14	1	71	2.13	2.84	2.64	2.45	2.21	1.94	1.57	1.03	-	-	0.58
2b	4b	June 2018	1H	1	Ratio	R11	3	90	0.9	0.98	0.96	0.95	0.92	0.89	0.82	0.71	-	-	0.51
3	6	Nov 2019	3H	4	Ratio	R1, R11	3	55	2.21	4	3.78	3.59	3.23	2.54	1.89	1.36	-	-	0.85
4ai	14a i	June 2019	2H	3	Algebra	A15, R15	1	49	1.47	2.83	2.62	2.19	1.47	0.70	0.23	0.07	-	-	0.03
4aaii	14a ii	June 2019	2H	1	Algebra	A15, R15	1	41	0.41	0.89	0.72	0.54	0.37	0.23	0.12	0.05	-	-	0.02
4b	14b	June 2019	2H	3	Algebra	A15	1	44	1.33	2.66	2.40	1.98	1.31	0.60	0.17	0.04	-	-	0.01
5a	4a	June 2017	2H	4	Ratio	R1 R11	3	50	1.99	3.66	3.09	2.49	1.92	1.43	1	0.67	-	-	0.44
5b	4b	June 2017	2H	1	Ratio	R11	3	6	0.06	0.14	0.08	0.07	0.06	0.05	0.04	0.02	-	-	0.01
6a	15a	June 2018	3H	3	Algebra	A15	1	51	1.52	2.86	2.63	2.22	1.62	0.93	0.4	0.12	-	-	0.04
6b	15b	June 2018	3H	2	Algebra	A15	3	44	0.44	0.92	0.83	0.67	0.45	0.22	0.07	0.02	-	-	0
7a	10a	Nov 2017	2H	2	Algebra	A14 A15	2	45	0.89	2	1.79	1.68	1.43	1.35	0.98	0.62	-	-	0.4
7b	10b	Nov 2017	2H	1	Algebra	A15	2	41	0.41	0.88	0.94	0.82	0.77	0.68	0.47	0.26	-	-	0.12
8a	9a	Nov 2019	1H	2	Ratio	R1	1	47	0.94	2	1.86	1.55	1.38	1.06	0.78	0.6	-	-	0.38
8b	9b	Nov 2019	1H	2	Ratio	R1	1	25	0.5	1.44	1.92	1.16	0.9	0.65	0.28	0.12	-	-	0.08
9a	17a	June 2017	3H	4	Number	N16	3	34	1.35	3.4	2.72	1.98	1.21	0.59	0.19	0.04	-	-	0.01
9b	17b	June 2017	3H	1	Number	N16	3	36	0.36	0.79	0.61	0.45	0.33	0.23	0.16	0.09	-	-	0.04

10a	5a	Nov 2018	1H	3	Ratio	N14, R1, R11	3	27	0.81	2.7	2.24	1.85	1.39	1.17	0.63	0.29	-	-	0.19
10b	5b	Nov 2018	1H	1	Number	N14, R1, R11	3	6	0.06	0.6	0.3	0.19	0.15	0.07	0.02	0	-	-	0
11	14	June 2018	2H	3	Ratio	R15	2	21	0.63	2.55	1.7	0.87	0.33	0.09	0.02	0.01	-	-	0
12	18	Nov 2018	3H	5	Number	N16, R11	3	16	0.79	4.4	2.56	2.41	1.84	1.13	0.42	0.12	-	-	0.04
13	9	Nov 2017	1H	5	Ratio	R11	3	14	0.69	4.62	3.65	2.68	1.99	1.18	0.61	0.29	-	-	0.12
14	19	Nov 2019	3H	3	Algebra	A15, R15	2	7	0.22	2.00	1.73	1.06	0.43	0.12	0.05	0.01	-	-	0.02
15	6	Mock Set 1	1H	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16a	18a	Nov 2017	3H	3	Algebra	A15	1	4	0.12	2.5	1.71	1.04	0.53	0.18	0.04	0	-	-	0
16b	18b	Nov 2017	3H	1	Algebra	A15	3	3	0.03	0.88	0.56	0.25	0.14	0.06	0.01	0	-	-	0
				68					22.85	55.5	46.93	37.95	29.06	20.54	13.05	8.02	-	-	4.78