

MyStudyBro - Revision Exercise Tool

This Revision Handout includes the Questions and Answers of a total of 5 exercises!

Chapters:

Kinematics - M1 (Pearson Edexcel)

Page 1	(WME01) 2019 Winter Graph Sketching
Page 2	(WME01) 2019 Winter - Answer Also Includes: Graph Sketching
Page 4	(WME01) 2018 Winter Graph Sketching
Page 5	(WME01) 2018 Winter - Answer Also Includes: Graph Sketching
Page 7	(WME01) 2018 Summer Graph Sketching
Page 8	(WME01) 2018 Summer - Answer Also Includes: Graph Sketching
Page 10	(WME01) 2018 Autumn
Page 11	(WME01) 2018 Autumn - Answer
Page 12	(WME01) 2018 Autumn Graph Sketching
Page 13	(WME01) 2018 Autumn - Answer Also Includes: Graph Sketching

Leave
blank

6. A train travels for a total of 270 s along a straight horizontal track between two stations A and B . The train starts from rest at A and moves with constant acceleration for 60 s until it reaches a speed of $V \text{ m s}^{-1}$. The train then travels at this constant speed $V \text{ m s}^{-1}$ before it moves with constant deceleration for 30 s, coming to rest at B .

(a) Sketch below a speed-time graph for the journey of the train between the two stations A and B .

(2)

Given that the distance between the two stations is 4.5 km,

(b) find the value of V ,

(3)

(c) find how long it takes the train to travel from station A to the point that is exactly halfway between the two stations.

(4)

The train is travelling at speed $\frac{1}{4} V \text{ m s}^{-1}$ at times T_1 seconds and T_2 seconds after leaving station A .

(d) Find the value of T_1 and the value of T_2

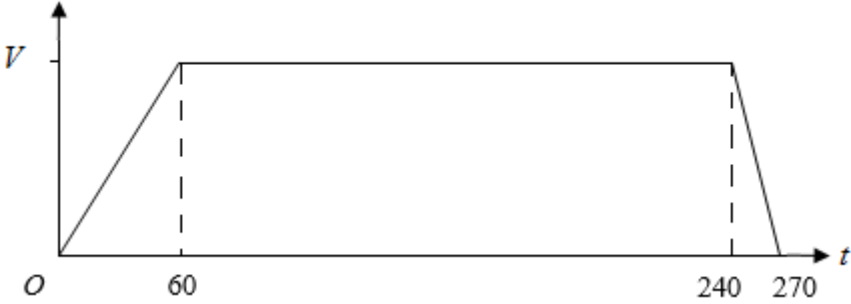
(5)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

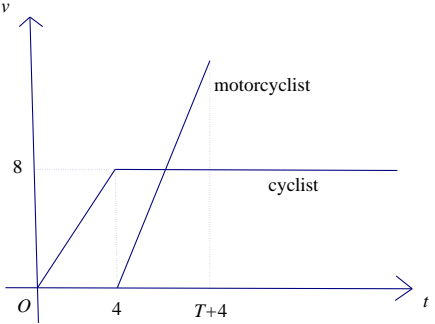


Question Number	Scheme	Marks
6(a)		B1 Shape B1 Figs. and V (2)
(b)	$4500 = \frac{(270+180)}{2}V \quad \text{OR} \quad 4500 = \frac{1}{2}60V + 180V + \frac{1}{2}30V$ $V = 20$	M1 A1 A1 (3)
(c)	$\frac{(T+T-60)}{2} \times 20 = 2250 \quad \text{OR} \quad \frac{1}{2}60.20 + (T-60).20 = 2250$ $T = 142.5 \text{ s}$	M1 A2 ft A1 (4)
(d)	$T_1 = \frac{1}{4} \times 60$ $= 15$ $T_2 = 270 - \left(\frac{1}{4} \times 30\right) \quad \text{OR} \quad 240 + \left(\frac{3}{4} \times 30\right)$ $= 262.5$	M1 A1 M1 A1 A1 (5) 14
Notes		
6(a)	First B1 for a trapezium (not to scale) starting and finishing on the t -axis but B0 if solid vertical lines included	
	Second B1 for 3 figs. (60, 270 and use of 30 with a delineator or 240) and V . 270 can be implied by 3 correct delineators	
6(b)	M1 for a complete method to produce an equation, in V only, with the correct structure i.e. one trapezium or two triangles + rectangle or triangle + trapezium or trapezium + triangle or rectangle – two triangles = 4500 (allow 4.5 for the M mark) (M0 if a single <i>suvat</i> equation is used)	
	First A1 for a correct unsimplified equation	
	Second A1 for $V = 20$	
6(c)	M1 for a complete method to produce an equation, in <i>ONE</i> variable e.g. t where $t = (T - 60)$, with the correct structure i.e. one trapezium or triangle + rectangle or rectangle – triangle = 2250 (allow 2.25 for the M mark) (M0 if a single <i>suvat</i> equation is used)	
	First and second A1's for a correct unsimplified equation ft on their 20 -1 each error	
	Third A1 for 142.5 (s) cao <u>Accept 143.</u>	
6(d)	First M1 for a complete method to give an equation in T_1 only	

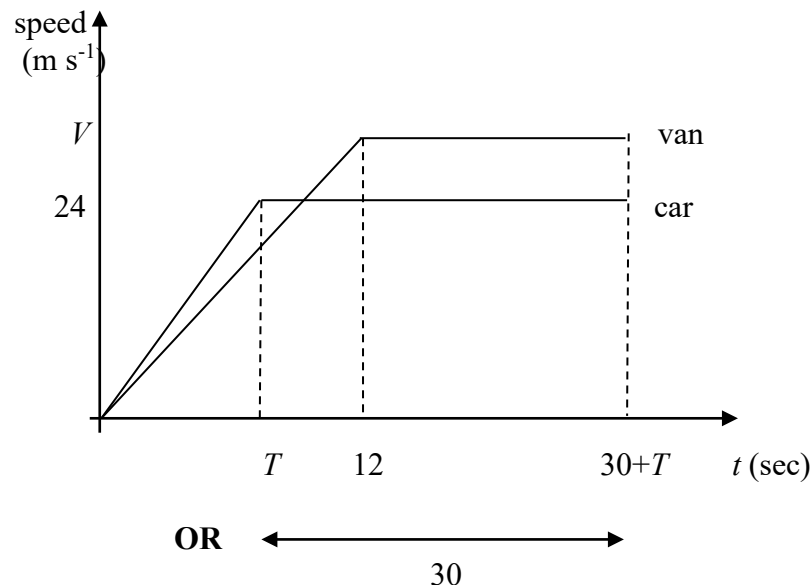
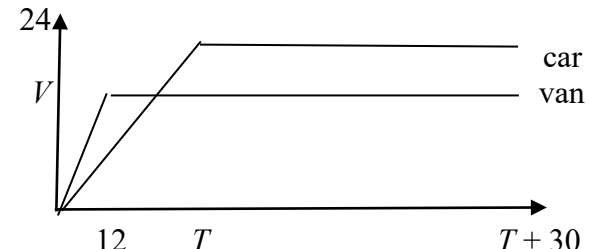
	First A1 for 15 (independent of V so allow even if their V is wrong)	
	Second M1 for a complete method to give an equation in T_2 <i>only</i>	
	Second A1 for a correct equation	
	Third A1 for 262.5 (independent of V so allow even if their V is wrong) Accept 263	
	N.B. Accept $T_1 = 262.5$ and $T_2 = 15$	

Question Number	Scheme	Marks
5a		
	Basic shape 20, 4T and T placed correctly	B1 DB1
		(2)
5b	Use of $v = u + at$: constant speed = $0.6 \times 20 = 12 \text{ (ms}^{-1}\text{)}$ (Speed at end = $12 - 0.3T$)	M1A1
	Using $v-t$ graph: Distance: $705 = \frac{12}{2}(4T + (20 + 4T)) + \frac{T}{2}(12 + (12 - 0.3T))$	M1A2
	$= 48T + 120 + 12T - 0.15T^2 = 60T + 120 - 0.15T^2$	
	Form 3 term quadratic and solve for T: $\Rightarrow 3T^2 - 1200T + 11700 = 0 \quad (T^2 - 400T + 3900 = 0)$	M1
	$\Rightarrow (T - 10)(T - 390) = 0 \quad T = 10 \text{ only}$	A1
		(7)
	Alternative:	
	Use of $v = u + at$: constant speed = $0.6 \times 20 = 12 \text{ (ms}^{-1}\text{)}$	M1A1
	Using $s = ut + \frac{1}{2}at^2$: $705 = (0.3 \times 400) + (4T \times 12) + (12T - 0.15T^2)$	M1A2
	$\Rightarrow 0.15T^2 - 60T + 585 = 0 \quad (T^2 - 400T + 3900 = 0)$	
	$\Rightarrow (T - 10)(T - 390) = 0 \quad T = 10 \text{ only}$	M1A1
		(7)
5c	Extra time: $(2 \times 20) - \text{their } T$ OR $\frac{12 - 0.3 \times \text{their } T}{0.3}$	B1
	Total time: $20 + 5T + 40 - T$ (their T)	M1
	$= 100 \text{ (s)}$	A1
		(3)
	Alternative: Total time to decelerate to rest = $12/0.3 = 40$	B1
	Total time A to C = $20 + 4T + 40 = 100$	M1A1
		[12]

Question Number	Scheme	Marks
	Notes for question 5	
5a	First B1 for basic shape. Allow if ‘extra triangle’ on end included, <u>provided B clearly marked</u>	
	Second DB1 : may use, 20, 20 + 4T, 20 + 5T	
5b	First M1 for attempt to find constant speed ($v = u + at$ or $a = \text{gradient}$) 20 x 0.6	
	First A1 for 12	
	Second (generous) M1 for clear attempt to use $705 = \text{total area under the graph}$ to give an equation in T only but must see $\frac{1}{2}$ used somewhere N.B. M0 if just a trapezium oe is used	
	Second A1 and Third A1: for any correct equation, -1 e.e.o.o.	
	Third M1 for forming and attempt to solve a 3 term quadratic (need <i>evidence</i> of solving e.g. formula or factorising, if T values are incorrect) otherwise this M mark can be implied if they state that $T = 10$ with no working. ($T = 390$ NOT needed)	
	Fourth A1 for $T = 10$.	
	N.B. For total area, could see: Trapezium + Rectangle + Triangle $705 = \frac{12}{2}(4T + (20 + 4T)) + T(12 - 0.3T) + \frac{1}{2}T \times 0.3T$ Triangle + Rectangle + Trapezium $705 = \frac{1}{2}.20.12 + (4T \times 12) + \frac{1}{2}T(12 + 12 - 0.3T)$ Triangle + Rectangle + Rectangle + Triangle $705 = \frac{1}{2}.20.12 + (4T \times 12) + T(12 - 0.3T) + \frac{1}{2}T \times 0.3T$ Triangle + Rectangle + Trapezium (at top) $705 = \frac{1}{2}.20.12 + 5T(12 - 0.3T) + \frac{1}{2}0.3T(5T + 4T)$ Rectangle – triangle– triangle $705 = 12(20 + 5T) - \frac{1}{2}.20.12 - \frac{1}{2}T \times 0.3T$	
5c	B1 for either additional time is $\frac{12}{0.3} - T$ or time to decelerate is $\frac{12}{0.3}$	
	M1 for a correct method to find the total time, using <i>their T</i> $= 20 + 4T + T + \frac{12}{0.3} - T$ or $20 + 4T + \frac{12}{0.3}$	
	A1 for 100 cao	

Question Number	Scheme	Marks	Notes
3a		B1 shape B1 figs B1 shape B1 figs (4)	Correct shape graph for cyclist 4 marked Motorcyclist graph in relatively correct position Must start at $t = 4$ and must continue beyond point of intersection of the graphs $T + 4$ marked Treat two separate graphs as two attempts and award the marks for the better attempt
3b	$\frac{1}{2}T \cdot 4T = \left(\frac{T + T + 4}{2}\right) 8$	M1	Equate distances to form equation in T
		A1	One distance correct
		A1	Both distances correct
	$T^2 - 4T - 8 = 0$	A1	Simplify to 3 term quadratic
	$T = 2 \pm \sqrt{12}$	M1	Solve a 3 term quadratic for T
	$T = 5.5$	A1	Q asks for answer to 1 dp. Must reject negative solution if seen.
		(6)	
		[10]	
			See over

Question Number	Scheme	Marks
3	EITHER: $h = -19.6(t+3) + \frac{1}{2}g(t+3)^2$ and $h = \frac{1}{2}gt^2$	M1A1A1
	OR : $h = -19.6T + \frac{1}{2}gT^2$ and $h = \frac{1}{2}g(T-3)^2$	M1A1A1
	$-19.6T + \frac{1}{2}gT^2 = \frac{1}{2}g(T-3)^2$ OR $-19.6(t+3) + \frac{1}{2}g(t+3)^2 = \frac{1}{2}gt^2$	M1
	(i) $T = 4.5$	A1
	(ii) $h = \frac{1}{2} \times 9.8 \times (T-3)^2$ oe $= 11$ or 11.0	M1 A1
[7]		
Notes for qu 3		
3	First M1 for use of $s = ut + \frac{1}{2}at^2$ (or any other complete method) to produce an equation in h and T only or h and t only for stone 1 or 2, correct no. of terms but condone sign errors	
	First A1 for a correct equation for stone 1 (g does not need to be substituted but if it is, it must be 9.8)	
	Second A1 for a correct equation for stone 2 N.B. Both A marks can be earned if they use s (instead of h or $-h$) in one of the two equations and then use s consistently in the other equation. N.B. When h and T are used in any equation, they must be used correctly (including sign of h) to obtain A marks	
(i)	Second M1 for eliminating h	
	Third A1 for $T = 4.5$	
(ii)	Third M1 for using their T or t value in one of their equations to obtain an h value	
	Fourth A1 for $h = 11$ or 11.0	

Question Number	Scheme	Marks
5(a)	<div style="text-align: center;">  </div> <p>N.B.</p> <div style="text-align: center;">  </div> <p>(b) $\frac{1}{2}(T+30+30) \times 24 = 816$ OR $\frac{1}{2} \times T \times 24 + 30 \times 24 = 816$</p> <p style="text-align: center;">$T = 8$ (s)</p> <p>(c) $\frac{1}{2}((T+30)+(T+18))V = 816$ OR $\frac{1}{2} \times 12V + V(18+T) = 816$</p> <p style="text-align: center;">$V = 25.5$</p> <p>ALT (b) Dist travelled while accelerating = $816 - 720 = 96$ m</p> $s = \frac{u+v}{2}t \Rightarrow \left(\frac{0+24}{2}\right)T = 96$ <p style="text-align: center;">$T = 8$ (s)</p>	<p>B1 shape of either B1 shape of second (must cross first and end at the same t value) B1 $V, 24, 12,$ $T, T+30$ oe with delineator B0 if vertical solid lines (3)</p> <p>This graph can score all 3 marks.</p> <p>M1A1</p> <p>A1 (3)</p> <p>M1A1 ft</p> <p>A1 (3) [9]</p> <p>M1A1</p> <p>A1</p>

