

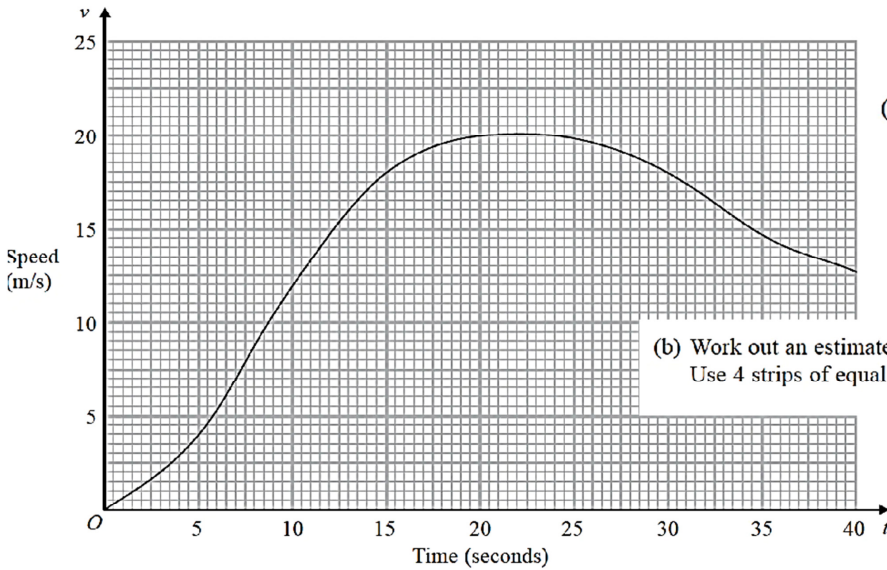


A car moves from rest.

(a) (i) Calculate an estimate of the gradient of the graph at  $t = 15$

The graph gives information about the speed,  $v$  metres per second, of the car  $t$  seconds after it starts to move.

.....  
(3)



(ii) Describe what your answer to part (i) represents.

.....  
(1)

(b) Work out an estimate for the distance the car travels in the first 20 seconds of its journey. Use 4 strips of equal width.

.....m  
(3)

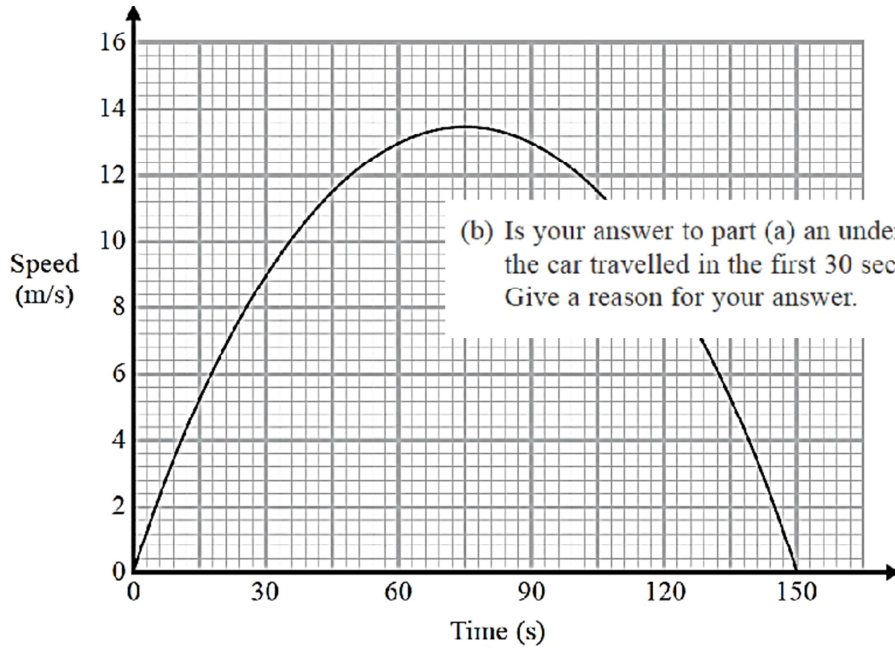
**(Total for Question 14 is 7 marks)**

14	(a)(i)	0.83	B1	for a tangent drawn at $t = 15$	Working: $7.5 \div 9 = 0.83\dots$ No tangent scores 0 marks  This mark can be awarded if the tangent is drawn at $t \neq 15$ Working may be seen on the diagram
			M1	full method to use the tangent to find the gradient (eg $7.5 \div 9$ )	
	(ii)	Statement	A1	for answer in the range 0.6 to 1.0	
			C1	statement <b>Acceptable examples</b> acceleration rate of change of speed increase in speed over time <b>Not acceptable examples</b> rate of change m/s/s increase in speed	
	(b)	220	P1	for splitting the area into strips and correct process to find the area of one strip, eg $\frac{5 \times 4}{2} (=10)$ or $\frac{(4+12)}{2} \times 5 (=40)$ or $\frac{(12+18)}{2} \times 5 (=75)$ or $\frac{(18+20)}{2} \times 5 (=95)$	Working 4, 12, 18, 20
			P1	for a complete process using at least 4 strips to find the area under the curve eg, "10" + "40" + "75" + "95"	Allow one error in the reading of speeds
			A1	for answer in the range 215 to 225 from correct working using at least 4 strips	



Here is a speed-time graph for a car.

(a) Work out an estimate for the distance the car travelled in the first 30 seconds.



..... m  
(2)

129 to 160	(a)
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(b) Is your answer to part (a) an underestimate or an overestimate of the actual distance the car travelled in the first 30 seconds?  
Give a reason for your answer. (1)



Julian used the graph to answer this question.

Work out an estimate for the acceleration of the car at time 60 seconds.
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Here is Julian's working.

$$\begin{aligned} \text{acceleration} &= \text{speed} \div \text{time} \\ &= 13 \div 60 \\ &= 0.21\dot{6} \text{ m/s}^2 \end{aligned}$$

Julian's method does not give a good estimate of the acceleration at time 60 seconds.

(c) Explain why.

(1)

(Total for Question 16 is 4 marks)

(b) underestimate with reason	C1	(dep M1) for "underestimate" and appropriate reason linked to their method, eg area between triangle and curve not included
(c) explanation	C1	for explanation, acceptable examples method gives average acceleration (in first 60 seconds) he has not used/drawn a tangent (at time 60 seconds) he has not worked out the gradient (at time 60 seconds) Not acceptable examples he has not used strips he has calculated it accurately rather than using an estimate the estimate of 13 should be about 4.4 the answer should be approximately 0.073