

1	(a)	values 0, 2, 5, 10, 18	130	M1	for starting to find area under the curve, eg $0.5 \times 5 \times 2 (= 5)$
				M1	for a complete method to find the area under the curve using 4 strips of equal width, eg "5" + $0.5 \times 5 \times (2+5) (= 17.5)$ + $0.5 \times 5 \times (5+10) (= 37.5)$ + $0.5 \times 5 \times (10+18) (= 70)$ for 130 or answer in range 130.1 to 132 supported by accurate working
	(b)		overestimate with reason	C1	for "overestimate" and appropriate reason linked to method eg area between trapeziums and curve also included

2	(a)	488 to 507		M1	for method to find area of one strip using trapezia, eg $\frac{1}{2} \times 5 \times 22 (= 55)$ or $\frac{1}{2} \times 5 \times (22 + 28) (= 125)$ or $\frac{1}{2} \times 5 \times (28 + 32) (= 150)$ or $\frac{1}{2} \times 5 \times (32 + 35) (= 167.5)$ OR for a method to find an estimate for the area using rectangles eg 5×22 or 5×28 or 5×32 or 5×35	May use area of triangle + area of rectangle for the second, third and fourth strips – lengths must be correct. May use triangle for first strip, $\frac{1}{2} \times 5 \times 22$
				M1	for complete and correct method to find the area using four strips, eg $\frac{1}{2} \times 5 \times 22 + \frac{1}{2} \times 5 \times (22 + 28) + \frac{1}{2} \times 5 \times (28 + 32) + \frac{1}{2} \times 5 \times (32 + 35)$ or $5 \times 22 + 5 \times 28 + 5 \times 32 + 5 \times 35$	May use triangle for first strip, $\frac{1}{2} \times 5 \times 22$
				A1	for answer in the range 488 to 507 (SC B1 for using area under the curve)	
	(b)	Underestimate (supported)		C1	(dep M1) for underestimate since parts not included below the graph OR fit their method	

3	(a)(i)	0.83		B1	for a tangent drawn at $t = 15$	Working: $7.5 \div 9 = 0.83...$ No tangent scores 0 marks
				M1	full method to use the tangent to find the gradient (eg $7.5 \div 9$)	This mark can be awarded if the tangent is drawn at $t \neq 15$ Working may be seen on the diagram
				A1	for answer in the range 0.6 to 1.0	
	(ii)	Statement		C1	statement Acceptable examples acceleration rate of change of speed increase in speed over time Not acceptable examples 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	

4	(a)	52.5	P1	starts to find area under graph. eg $\frac{30 \times 12}{2}$ (=180) or 50×12 (=600) or $\frac{20 \times 12}{2}$ (=120)	
			P1	complete process to find area under graph. eg $\frac{30 \times 12}{2} + 50 \times 12 + \frac{20 \times 12}{2}$ (= 900)	
			P1	starts process to find half way time. eg $((\text{"900"} \div 2) - 180) \div 12$ (=22.5)	
			A1	52.5 oe	
	(b)	Comparison	C1	acceptable comparison Acceptable (acceleration) during first part is positive but (acceleration) during last part is negative / deceleration (acceleration is) greater during the last part than during the first part gradient is steeper in the last part / longer to speed up than slow down speed / (acceleration) is increasing at start and decreasing at end (acceleration) is slower in the first part (acceleration) is ascending in the first part and descending in the last part 0.4 is the first part and -0.6 in the last part Not acceptable goes down in the last part speed is greater in last part than first part	

5	(a)	19.1	M1	for a method to find an estimate for the area of at least 1 trapezium under the curve eg $0.5 \times 1 \times (4 + 6)$ or $0.5 \times 1 \times (6 + 7.2)$ or $0.5 \times 1 \times (7.2 + 7.8)$	Allow a maximum of 2 errors in y values used Ignore any reference to units If units are given they must be correct
			M1	for a complete method eg $0.5 \times 1 \times (4 + 6) + 0.5 \times 1 \times (6 + 7.2) + 0.5 \times 1 \times (7.2 + 7.8)$ or $0.5 \{(4 + 7.8) + 2(6 + 7.2)\}$	
			A1	cao	
	(b)	Statement	C1	eg distance (travelled)	