

Question		Answer	Marks	AO	Guidance	
11	(a)		M1*	3.1b	Attempt to integrate given expression for v (either one term correct or both powers increased by 1)	Allow t for T
		$(s_P =) 5t + 0.001t^3$	A1	1.1		
		$(s_Q =) 7.08(t - 5)$	B1	3.3	Correct expression for the displacement of Q	
		$5T + 0.001T^3 = 7.08(T - 5)$	M1dep*	1.1	Equate integrated expression from given v and $7.08(t \pm 5)$ only	
		$0.001T^3 - 2.08T + 35.4 = 0$ $\Rightarrow T^3 - 2080T + 35400 = 0$	A1	2.2a	AG - sufficient working must be shown (e.g. at least one line of working from setting correct (un-simplified) expressions equal to each other to obtaining the given answer)	
			[5]			

Question		Answer	Marks	AO	Guidance	
11	(b)	<p>DR</p> $T^3 - 2080T + 35400 = 0$ $\Rightarrow (T - 30)(T^2 + \dots - 1180) = 0$ $T^2 + 30T - 1180$ $T = \frac{-30 \pm \sqrt{30^2 - 4(1)(-1180)}}{2} \Rightarrow T = 22.5$ $(a_P =) 0.006t$ $0.135 \text{ (m s}^{-2}\text{)}$	<p>M1*</p> <p>A1</p> <p>A1</p> <p>B1</p> <p>B1</p> <p>[5]</p>	<p>3.1b</p> <p>1.1</p> <p>3.2a</p> <p>3.4</p> <p>2.2a</p>	<p>Factorising given cubic equation using given linear factor and obtaining a three-term quadratic factor of the form $(T^2 + kT - 1180)$ for some $k \neq 0$</p> <p>Correct quadratic expression</p> <p>Correct value of T (so not the negative value or 30)</p> <p>Correct expression for the acceleration of P at time t</p> <p>awrt 0.135</p>	<p>Or obtains a three-term quadratic from using long division (errors in working may mean the remainder is not zero)</p> <p>Condone lack of explicitly rejecting negative root (-52.48...)</p> <p>0.13489997...</p>