

Question			Answer	Marks	AO	Guidance	
11	(a)			M1*	3.3	Attempt N2L for P or Q	Must include correct number of terms – use of weight for mass is M0
			For P : $40 - T - 8 = 3a$	A1	1.1		
			For Q : $T - 2g = 2a$	A1	1.1		
			$32 - 2g = 5a \Rightarrow a = \dots$	Dep*M1	1.1	Attempt to solve simultaneous equations	
			$a = 2.48 \text{ m s}^{-2}$	A1	2.2a	AG M1 A2 for $40 - 8 - 2g = 5a$ for M1 must have correct number of terms and mass must be 5 not 5g	Must show sufficient working to justify the given answer
				[5]			
11	(b)		$T - 2g = 2(2.48)$	M1	3.4	Substitute given value of a into either equation	Must include correct number of terms – use of weight for mass is M0
			$T = 24.56 \text{ N}$	A1	1.1	cao	Allow 24.6
				[2]			
11	(c)		$v = 2.48(0.5)$	B1	3.4	Speed after 0.5 seconds	1.24
			$s = 0.5(2.48)(0.5)^2$	B1	3.4	Distance travelled in this time	0.31
				M1	3.1b	Applying $s = ut + 0.5at^2$ correctly — allow sign errors	M0 if not using relevant displacement
			$-(2 + 0.31) = 1.24t - 0.5(9.8)t^2$	A1	1.1		
			$t = 0.825 \text{ s}$	A1	2.2a	BC	0.8246986...

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11	(c)		ALT $v = 2.48(0.5)$ $s = 0.5(2.48)(0.5)^2$ $0 = 1.24^2 - 2(9.8)s \Rightarrow s = 0.0784$ $2 + 0.31 + 0.0784 = 0.5(9.8)t_1^2$ $t_1 = 0.698$ $t = 0.825$	B1 B1 M1 A1 A1 [5]		Speed after 0.5 seconds Distance travelled in this time Complete method to calculate the time down Correct value for time down	1.24 0.31
11	(d)		$v^2 = 1.24^2 + 2(-9.8)(-2.31)$ $v = 6.84 \text{ m s}^{-1}$	M1 A1 [2]	3.3 1.1	Applying $v^2 = u^2 + 2as$ correctly with their 1.24 and 2.31 or any other complete method Allow 6.85	M0 if not using total time or relevant displacement 6.8420464...
11	(e)		19.6 N	B1 [1]	3.4	Accept 2g	
11	(f)		e.g. include a more accurate value for g e.g. include a variable resistance in the model rather than a constant e.g. include the dimension of the pulley in the model so that the string is not parallel to the table e.g. include a frictional force at the pulley	B1 [1]	3.5c		