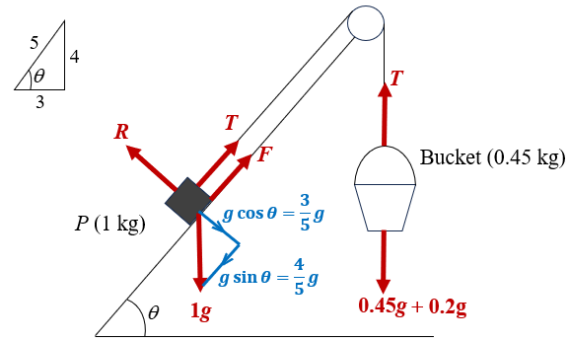
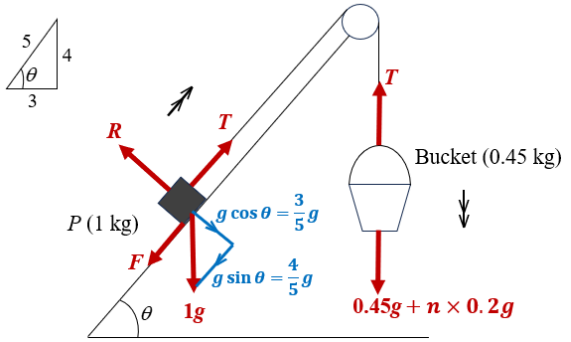
Question Number	Scheme	Marks
	(a) On point of slipping **down** plane  (b) Starts to move **up** the plane  	
7(a)	Method to form an equation in F only.	M1
	Either whole system: $F+0.45g+0.2g=g\sin\theta$ Or two equations and eliminate T	A1
	For P: $T+F=g\sin\theta$ For bucket and block: $T=0.45g+0.2g$	A1
	Perpendicular equilibrium for P	M1
	$R=g\cos\theta \quad \left(=\frac{3}{5}g\right)$	A1
	Use of $F=\mu R$ and correct trig ratios	M1
	$\mu=\frac{1}{4}$*	A1*
		(7)
(b)(i)	Method to form an inequality or equation in n only	M1
	Either whole system: $0.45g+0.2ng>g\sin\theta+F$ Or two inequalities and eliminate T For P: $T>F+g\sin\theta$ For bucket and blocks: $0.45g+0.2ng>T$	A1
	Leads to $n>2.5$ (or n =2.5) so $n=3$	A1
(ii)	Method using N2L to form an equation in a only	M1
	Either whole system: $0.45g+0.2(3)g-g\sin\theta-F=(1+0.45+0.2(3))a$ $0.45g+0.6g-\frac{4}{5}g-\frac{3}{20}g=2.05a$	A1
	Or two equations and eliminate T For P: $T-g\sin\theta-F=a$ For bucket and blocks: $0.45g+0.2(3)g-T=(0.45+0.2(3))a$	A1
	$a=0.48$ or 0.478 (m s^{-2})	A1
		(7)

		(14)
	Notes for Question 7	
7(a)		
M1	Complete method to form an equation in F (or μR) only. May use equilibrium or N2L with $a = 0$ (whole system or two equations and eliminate T). Dimensionally correct, correct no of terms, condone sin/cos confusion, condone sign errors. M0 if a is never equal to zero.	
A1	Correct unsimplified equation in F with at most one error (or μR)	
A1	Correct unsimplified equation in F (or μR)	
M1	Perpendicular equilibrium to find an expression for R, condone sin/cos confusion.	
A1	Correct unsimplified expression for R	
M1	Use of $F = \mu R$ and correct trig ratios. Must use μR with their R in an attempt at N2L ($a = 0$ or $a \neq 0$)	
A1*	Obtain given answer from complete and correct working. Must see sufficient working with the equilibrium equation and the given answer. Must have clear use of $a = 0$ if using N2L. A0* for $\mu = 0.25$	
7(b) (i)	Marks parts (i) and (ii) together if required	
M1	Complete method to form an equation/inequality in n only. May use equilibrium or N2L (whole system to two equations and eliminate T). Dimensionally correct, correct no of terms, condone sin/cos confusion, condone sign errors. Accept method using $(0.45g + 0.2ng)$ or $(0.65g + 0.2ng)$ Accept a systematic method adding blocks ($n = 2$ and 3). In each trial, must make a comparison. $\left(\text{useful values: } g\sin\theta + F = \frac{19}{20}g \text{ and } F = \frac{3}{20}g = 1.47\right)$	
A1	Correct unsimplified equation or inequality.	
A1	Correct value of n	
7(b)(ii)		
M1	Use of N2L to form an equation in a only (whole system or two equations and eliminate T). Dimensionally correct, correct no of terms, condone sin/cos confusion, condone sign errors. Allow with their calculated n if used consistently on both sides.	
A1	Correct unsimplified equation with at most one error. Note: repeated use of incorrect n is one error eg n =2, 2.5, 4 and use of $n = 3$ from an incorrect method is one error (fortuitous)	
A1	Correct unsimplified equation.	
A1	Accept $\frac{2g}{41}$	