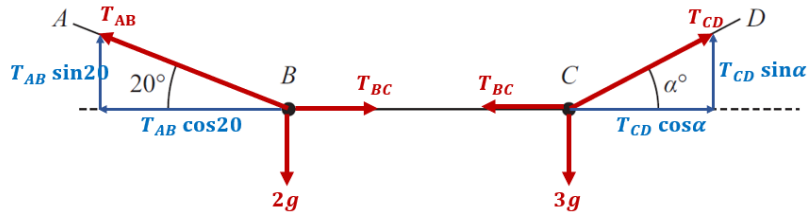
Question Number	Answer	Mark
6.		
6(a)	Form an equation in T_{AB} only E.g. Vert at B $\quad T_{AB}\sin 20° = 2g$	M1
	$T_{AB} = 57$ or 57.3 (N)	A1
		(2)
6(b)	First relevant equation in T_{CD} and α E.g. Vert at C	M1
	$3g = T_{CD}\sin\alpha°$	A1
	Second relevant equation in T_{CD} and α E.g. Horiz whole system	M1
	$T_{AB}\cos 20° = T_{CD}\cos\alpha°$	A1
	Equation in α only: $\tan\alpha° = \frac{3}{2}\tan 20°$	dM1
	$\alpha = 29$ or better	A1
		(6)
6(c)	Correct statement with nothing incorrect and no extras • the tension would vary along the length of AB	B1
		(1)
		(9)
	Notes for Question 6	
6(a)		
M1	Form an equation in T_{AB} only. Resolve vertically at B. Correct no. of terms, dimensionally correct, any forces that should be resolved must be resolved, condone sin/cos confusion.	
A1	Correct tension in AB	
6(b)	**Note: Throughout part (b) the g's cancel.** **Do not withhold 1 mark for use of 9.81 ms^{-2} or 10 ms^{-2}**	
M1	First relevant equation in T_{CD} and α (and T_{AB}). Correct no. of terms, dimensionally correct, any forces that should be resolved must be resolved condone sin/cos confusion to give an equation in T_{AB} , T_{CD} and α only. M0 for **use of** equal tensions e.g. $T_{AB} = T_{CD}$ Allow re-use of T if it clearly represents a new tension.	
A1	Correct unsimplified equation in α, T_{CD} (and T_{AB}) only.	

M1	Second relevant equation in T_{CD} and α (and T_{AB}). To be relevant, it must be possible to combine with the first equation to find α. If an equation in T_{BC} is formed, T_{BC} must be eliminated. Correct no. of terms, dimensionally correct, any forces that should be resolved must be resolved, condone sin/cos confusion to form an equation in T_{CD} and α only. Vert system: $T_{AB}\sin 20° + T_{CD}\sin\alpha = 2g + 3g$ Horiz at *B*: $T_{AB}\cos 20 = T_{BC}$ Horiz at C: $T_{CD}\cos\alpha = T_{BC}$ M0 for **use of** equal tensions e.g. $T_{AB} = T_{CD}$ Allow re-use of *T* if it clearly represents a new tension.	
A1	Correct unsimplified equation in T_{CD} and α only.	
d**M1**	Dependent on both previous method marks. Eliminate T_{AB} and T_{CD} to form an equation in α only	
A1	29 or better (Correct rounding for their choice of accuracy, calculator value gives 28.63256955)	
6(c)		
B1	Correct statement. B0 if incorrect statement seen or irrelevant extras included. Qn: *if the washing line is not modelled as being light, why would it **not** be possible to find the tension in AB* B1 (*singular, consider adding 'in AB' to their sentence*) E.g. The tension will vary at every point along *AB* The tension (in *AB*) will change The tension (in *AB*) would change along the string The tension (in *AB*) would be different at different points on the string. The tension (in *AB*) will not be constant The tension (in *AB*) will increase/decrease along the string The tension (in *AB*) is not the same B0 (*considering more than AB or implication that the tension in AB would have a different value or could be calculated*) E.g. The tensions on the two sides are not the same anymore	

	The tensions will not be constant Tension is not the same at both ends The tension will increase so hard to answer Weight of the line needs to be considered in calculations B0 for any mention of acceleration.	

7. [*In this question* **i** *and* **j** *are horizontal unit vectors directed due east and due north respectively and position vectors are given relative to a fixed origin O.*]

A small boat is modelled as a particle moving with constant velocity.

At time t hours after 2 pm, the position vector of the boat is

$$[(4 - 3t)\mathbf{i} + (2 + t)\mathbf{j}]\,\text{km}$$

(a) Find the speed of the boat.

(3)

The point A has position vector $(2\mathbf{i} - \mathbf{j})\,\text{km}$

(b) Find the time of day when the bearing of the boat from A is 315°

(5)