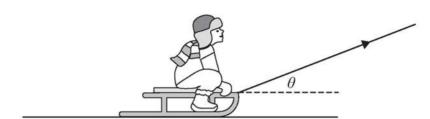**17**   Lizzie is sat securely on a wooden sledge.

The combined mass of Lizzie and the sledge is M kilograms.

The sledge is being pulled forward in a straight line along a horizontal surface by means of a light inextensible rope, which is attached to the front of the sledge.

This rope stays inclined at an acute angle θ above the horizontal and remains taut as the sledge moves forward.

The sledge remains in contact with the surface throughout.

The coefficient of friction between the sledge and the surface is μ and there are no other resistance forces.

Lizzie and the sledge move forward with constant acceleration, $a \, \text{m} \, \text{s}^{-2}$

The tension in the rope is a constant T Newtons.

17 (a)   Show that

$$T = \frac{M(a + \mu g)}{\cos \theta + \mu \sin \theta}$$

[7 marks]

17 (b)   It is known that when $M = 30$, $\theta = 30°$, and $T = 40$, the sledge remains at rest.

Lizzie uses these values with the relationship formed in part **(a)** to find the value for μ

Explain why her value for μ may be incorrect.

[2 marks]