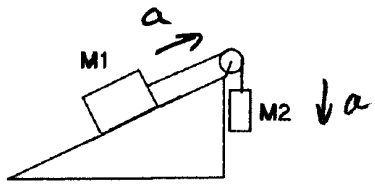
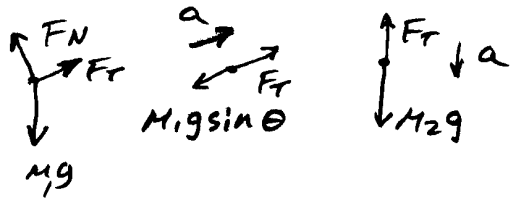


Mass 1 is 7 kg and mass 2 is 8 kg. The angle of the hill is 28°.

1) Draw and label FBDs for each mass.
2) Derive the equation for the acceleration of the masses. Use ΣF = ma.
3) Calculate the numerical value of the acceleration.
4) Bonus: Calculate the tension in the rope.



$$\Sigma F = ma$$

$$F_T - M_1 g \sin\theta = M_1 a$$

$$M_2 g - F_T = M_2 a$$

$$M_2 g - M_1 g \sin\theta = M_1 a + M_2 a$$

$$(M_2 - M_1 \sin\theta) g = (M_1 + M_2) a$$

b) $$\boxed{a = \frac{(M_2 - M_1 \sin\theta) g}{M_1 + M_2}}$$

$$= \frac{(8\,kg - 7\,kg \sin 28°)\, 9.8\,\frac{m}{s^2}}{7\,kg + 8\,kg}$$

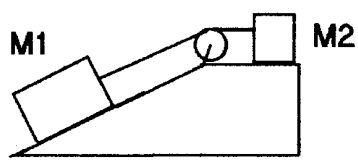
c) $$\boxed{a = 3.08\,\frac{m}{s^2}}$$

$$F_T = M_2 g - M_2 a$$

$$= M_2 (g - a)$$

$$= 8\,kg\,(9.8\,\frac{m}{s^2} - 3.08\,\frac{m}{s^2})$$

d) $$\boxed{F_T = 53.8\,N}$$



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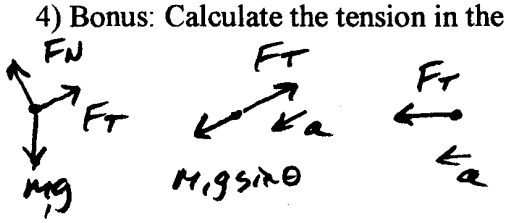

$$\Sigma F = ma$$

$$M_1 g \sin\theta - F_T = M_1 a$$

$$F_T = M_2 a$$

$$M_1 g \sin\theta = (M_1 + M_2) a$$

b) $$\boxed{a = \frac{M_1 g \sin\theta}{M_1 + M_2}}$$

$$= \frac{7\,kg\,(9.8\,\frac{m}{s^2}) \sin 28°}{7\,kg + 8\,kg}$$

c) $$\boxed{a = 2.15\,\frac{m}{s^2}}$$

$$F_T = M_2 a$$

$$= 8\,kg\,(2.15\,\frac{m}{s^2})$$

d) $$\boxed{F_T = 17.2\,N}$$