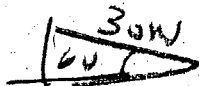


1. Marcie shovels snow after a storm by exerting a force of 30.0 N on her shovel at an angle of 60° to the vertical. What are the horizontal and vertical components of the force exerted by Marcie?



$$\sin 60 = \frac{y}{30} = 26 \text{ N}$$

$$\cos 60 = \frac{x}{30} = 15 \text{ N}$$

2. Ivar pulls a sled loaded with logs to his cabin in the woods. If Ivar pulls with a force of 800 N in a direction 20° above the horizontal, what are the horizontal and vertical components of the force exerted by Ivar?



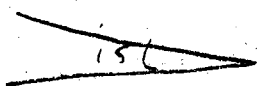
$$\sin 20 = \frac{y}{800} = 27.4 \text{ N}$$

$$\cos 20 = \frac{x}{800} = 75.2 \text{ N}$$

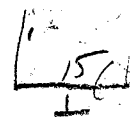
3. Rose is sledding down an ice-covered inclined hill at an angle of 15° with the horizontal. If Rose and the sled have a combined mass of 54.0 kg, what is the force pulling them down the hill?

$$(54.0)(9.8) = 529.2 \text{ N}$$

137 N

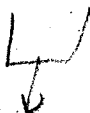


$$\cos 15 = \frac{y}{529.2}$$



$$\sin 15 = \frac{x}{529.2}$$

4. Flip, an exhausted gymnast, hangs from a bar by both arms in an effort to catch his breath. If Flip has a mass of 65.0 kg, what is the tension in each of Flip's arms as he hangs in place?

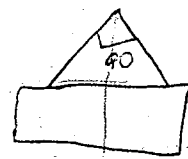
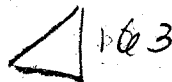


$$(65)(9.8) = 637 \text{ N}$$

$$\underline{318.5 \text{ N}}$$

5. At an art auction, Antoine has acquired a painting that now hangs from a nail on his wall, as shown in the figure. If the painting has a mass of 12.6 kg, what is the tension in each side of the wire supporting the painting?

$$12.6 \times 9.8 = 123.5 \text{ N}$$



$$\underline{287 \text{ N}}$$

$$\cos 45 = \frac{123.5}{x}$$

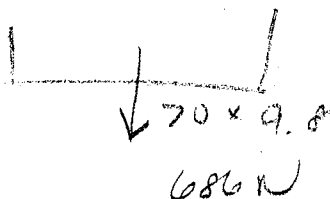
$$.71x = 123.5$$

$$x = 173.9 \text{ N}$$

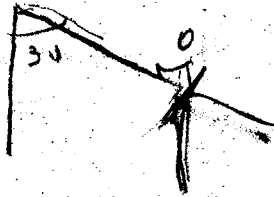
6. To make extra money during the summer, Mr. Lowell, a 66.0 kg physics teacher paints the outside of houses while sitting on a 4.0 kg plank suspended by two vertical cables. What is the tension in each of the two cables?

$$66 + 4 = 70 \text{ kg}$$

$$\underline{343 \text{ N}}$$



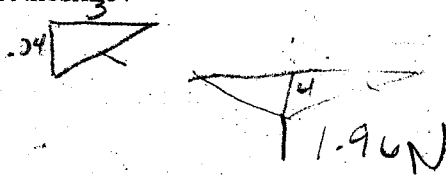
7. Michelle likes to swing on a tire tied to a tree branch in her yard.
 A. If Michelle and the tire have a combined mass of 82.5 kg, and Elwin pulls Michelle back far enough for her to make an angle of 30.0° with the vertical, what is the tension in the rope supporting Michelle and the tire.



$$808.5 \text{ N}$$

$$F = 933 \text{ N}$$

8. After returning home from the beach, Samantha hangs her wet .20 kg bathing suit in the center of the 6.0 m long clothesline to dry. This causes the clothesline to sag 4.0 cm. What is the tension in the clothesline?



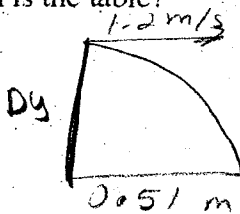
$$\tan \theta = \frac{.04}{3} = .0133$$

$$\theta \approx .76^\circ$$

$$\sin .76 = \frac{.98}{X}$$

$$X \approx 75 \text{ N}$$

9. In her physics lab, Melanie rolls a 10 g marble down a ramp and off the table with a horizontal velocity of 1.2 m/s. The marble falls in a cup placed 0.51 m from the table's edge. How high is the table?



$$D_x = vt \quad D_y = v_i t + \frac{1}{2} a t^2$$

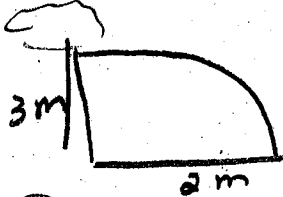
$$0.51 \text{ m} = (1.2) t$$

$$t = 0.425 \text{ s}$$

$$D_y = (0)(0.425) + \frac{1}{2}(-9.8 \text{ m/s}^2)(0.425)^2$$

$$D_y = -0.89 \text{ m}$$

10. Bert is standing on a ladder picking apples in his grandfather's orchard. As he pulls each apple off the tree, he tosses it into a basket that sits on the ground 3.0 m below at a horizontal distance of 2.0 m from Bert. How fast must Bert throw the apples (horizontally) in order for them to land in the basket?



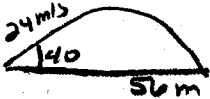
$$D_x = vt \quad 3 \text{ m} = \frac{1}{2} (9.8 \text{ m/s}^2) t^2$$

$$t = .78 \text{ s}$$

$$v = R(.78)$$

$$R = 2.56 \text{ m/s}$$

11. Emanuel Zacchini, the famous cannonball of the Ringling Bros. Circus, was fired out of a cannon with a speed of 24.0 m/s at an angle of 40.0 degrees to the horizontal. If he landed in a net 56.6 m away at the same height from which he was fired, how long was Zacchini in the air?



$$D_x = v_x t$$

$$R_x = (\cos 40) (24)$$

$$56.6 = 18.4 (t)$$

$$18.4 \text{ m/s}$$

$$t = 3.0 \text{ s}$$

Since the 650 kg figure skater slides down a water slide that is inclined at 35° to the horizontal. If coefficient of friction of the slide = 0.2, what is the skater's rate of acceleration? 5.32 m/s^2