

1..A 75.0 kg. man hangs from the middle of a tightly stretched rope so that the angle between the rope and the horizontal direction is 5 degrees. Calculate the tension in the rope

$$m := 75$$

$$\theta := 5 \text{ deg}$$

$$g := 9.81$$

$$W_t := m \cdot g$$

$$T := \frac{W_t}{2 \cdot \sin(\theta)}$$

$$T = 4.221 \times 10^3$$

2. A 4500 Nt. sled is pulled along a horizontal surface at uniform speed by means of a rope that makes an angle of 30 degrees above the horizontal. If the tension in the rope is 1000 Nt. , what is the coefficient of friction?

Knowns | Unk

$$W_t := 4500$$

$$P := 1000$$

$$\theta := 30 \text{ deg}$$

$$P_x := P \cdot \cos(\theta)$$

$$P_y := P \cdot \sin(\theta)$$

$$F_f := P_x$$

$$N := W_t - P_y$$

$$\mu := \frac{F_f}{N} \quad \mu = 0.217$$

3. In a drag race, a dragster reaches the quarter mile marker (402 m) with a speed of 80 m/s. What is his acceleration and how long did the run take?

Knowns | Unk

$$d := 402$$

$$v_f := 80$$

$$v_i := 0.0$$

$$a := \frac{v_f^2 - v_i^2}{2 \cdot d} \qquad a = 7.96$$

$$t := \frac{v_f - v_i}{a} \qquad t = 10.05$$

4. With what speed must a ball be thrown directly upward so that it remains in the air for 10 sec? What will be its speed when it hits the ground? How high does the ball rise?

Knowns | Unk

$$t_T := 10$$

$$t_{\text{top}} := 5$$

$$g := -9.81$$

$$v_f := 0.0$$

$$V_i := v_f - g \cdot t_{\text{top}} \qquad V_i = 49.05$$

$$v_{\text{bottom}} := -V_i \qquad v_{\text{bottom}} = -49.05$$

$$h := V_i \cdot t_{\text{top}} + \frac{1}{2} \cdot g \cdot t_{\text{top}}^2 \qquad h = 122.625$$

5. An object of mass 100 g is at rest. A net force of 2 Nt. is applied for 10 sec. What is the final velocity? How far will the object have moved in the 10-sec. interval?

Knowns		Unk
$m_1 := 100$		
$v_i := 0.0$		
$F_{\text{net}} := 2.0$		
$t := 10$		
$\text{mass} := \frac{m_1}{1000}$		
$a := \frac{F_{\text{net}}}{\text{mass}}$		$a = 20$
$v_f := v_i + a \cdot t$		$v_f = 200$
$d := v_i \cdot t + \frac{1}{2} \cdot a \cdot t^2$		$d = 1 \times 10^3$

6. How much work must be done to roll a metal safe {mass 116 kg} a distance of 15.0 m across a level floor? The coefficient of fric on is 0.050.

Knowns		Unk
$m := 116$		
$d := 15.0$		
$\mu := .050$		
$W_t := m \cdot g$		$W_t = -1.138 \times 10^3$
$N := -W_t$		
$F_f := \mu \cdot N$		$F_f = 56.898$
$P := F_f$		
$\text{Work} := P \cdot d$		$\text{Work} = 853.47$

7. A 2kg ball has a potential energy of 6400 J at point A above the ground. What will its velocity be when it strikes the ground after being released from point A? How high is point A above the ground?

Knowns | Unk

$$m := 2.0$$

$$PE := 6400$$

$$g := 9.81$$

$$KE := PE$$

$$v := \sqrt{2 \cdot \frac{KE}{m}} \quad v = 80$$

$$h := \frac{PE}{m \cdot g} \quad h = 326.198$$

