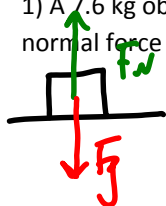


Worksheet 5.3 - Force of Friction

1) A 7.6 kg object is resting on a horizontal surface. What is the normal force on the object?

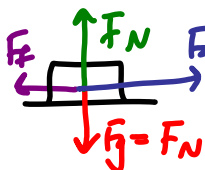


$$F_N = F_g = mg$$

$$= (7.6 \text{ kg})(9.80 \text{ m/s}^2)$$

$$= \underline{74 \text{ N}}$$

2) A 7.6 kg object is pulled along a horizontal surface. If the coefficient of friction is 0.20, what is the force of friction?

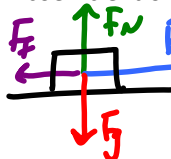


$$F_f = \mu F_N = \mu F_g$$

$$= \mu mg = (0.20)(7.6)(9.80)$$

$$= \underline{15 \text{ N}}$$

4) A 9.6 kg object is pulled along a horizontal surface. If the coefficient of friction is 0.11 what is the force of friction?

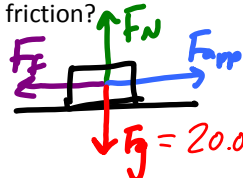


$$F_f = \mu F_N = \mu F_g$$

$$= \mu mg = (0.11)(9.6)(9.80)$$

$$= \underline{10. \text{ N}}$$

5) A 20.0 N object is pulled along a horizontal surface at a constant velocity by a 3.0 N force, what is the coefficient of friction?

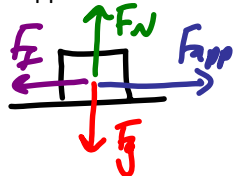


const $v \therefore F_{app} = F_f = 3.0 \text{ N}$

$$F_N = F_g = 20.0 \text{ N}$$

$$F_f = \mu F_N \quad \mu = \frac{F_f}{F_N} = \frac{3.0 \text{ N}}{20.0 \text{ N}} = \underline{0.15}$$

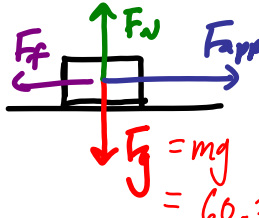
6) A 16.2 kg object is pulled along a frictionless surface by an applied force of 10.2 N, what is the normal force acting on it?



$$F_N = F_g = mg = (16.2)(9.80)$$

$$= \underline{159 \text{ N}}$$

7) A 6.2 kg object is pulled along a horizontal surface by a force of 22.0 N. If its acceleration is 1.1 m/s², what is the coefficient of friction between the two surfaces?



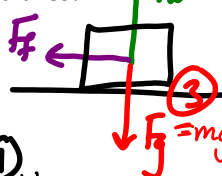
$$F_{net} = F_{app} - F_f = ma$$

$$F_f = F_{app} - ma = 22.0 - (6.2)(1.1)$$

$$= 15.18 \text{ N}$$

$$F_f = \mu F_N \quad \mu = \frac{F_f}{F_N} = \frac{15.18 \text{ N}}{60.76 \text{ N}} = \underline{0.25}$$

8) A 1250 kg car traveling at 60.0 km/h comes to a sudden stop in 35 m. What is the coefficient of friction acting on the brakes?



$$F_{net} = F_f = ma = (1250 \text{ kg})(3.968)$$

$$= 4960 \text{ N}$$

$$F_f = \mu F_N$$

$$\mu = \frac{F_f}{F_N} = \underline{0.40}$$

① $v = 0$

$$v_0 = 60 \text{ km/h} \div 3.6$$

$$= 16.67 \text{ m/s}$$

$$a = ?$$

$$d = 35 \text{ m}$$

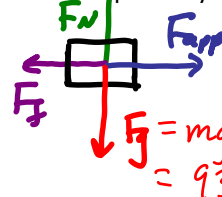
$$t = ?$$

$$v^2 = v_0^2 + 2ad$$

$$a = \frac{-v_0^2}{2d}$$

$$= \frac{-(16.67)^2}{2(35)} = -3.968 \text{ m/s}^2$$

9) A 950 kg car traveling at a constant velocity of 28 m/s, has a coefficient of friction of 0.125 acting on its axle. How much force is required by the engine to maintain its speed?



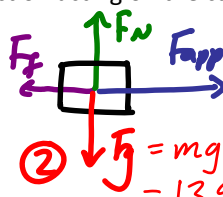
$$F_{app} = F_f = \mu F_N$$

$$= \mu F_g$$

$$= (0.125)(9310 \text{ N})$$

$$= \underline{1200 \text{ N}}$$

10) A 1425 kg dragster exerts 13900 N of force and accelerates from 0 to 100.0 km/h in 3.25 s. What is the coefficient of friction acting on the car?



① $v = 100.0 \text{ km/h} \div 3.6$

$$= 27.78 \text{ m/s}$$

$v_0 = 0$

$$a = ?$$

$v = v_0 + at$

$$a = \frac{v - v_0}{t}$$

$$= \frac{27.78 \text{ m/s}}{3.25 \text{ s}}$$

$$= 8.547 \text{ m/s}^2$$

② $F_g = mg = 13965 \text{ N}$

③ $F_{net} = F_{app} - F_f = ma$

$$F_f = F_{app} - ma$$

$$= 13900 \text{ N} - (1425 \text{ kg})(8.547 \text{ m/s}^2)$$

$$= 1720.5 \text{ N}$$

④ $F_f = \mu F_N$

$$\mu = \frac{F_f}{F_N} = \frac{1720.5 \text{ N}}{13965 \text{ N}}$$

$$= \underline{0.123}$$

- 1) 74 N 2) 15 N 3) 137 N 4) 10. N 5) 0.15 6) 159 N 7) 0.25 8) 0.40 9) 1200 N 10) 0.123