

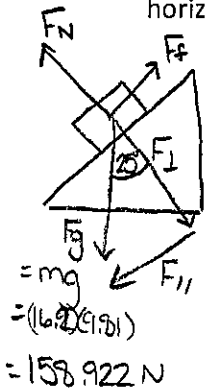
Key.

Physics 20

Inclined Planes

$$F_{\text{net}} = 0 \text{ N}$$

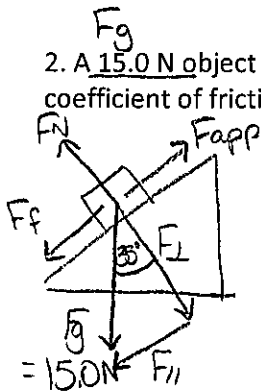
1. A 16.2 kg object is at rest on an inclined plane. If the inclined plane makes an angle with the horizontal of  $25.0^\circ$ , what is the normal force acting on the object?



$$F_{\text{net}_y} = F_N - F_{\perp}$$
$$0 = F_N - 158.922 \cos 25^\circ$$

$$F_N = 144 \text{ N}$$

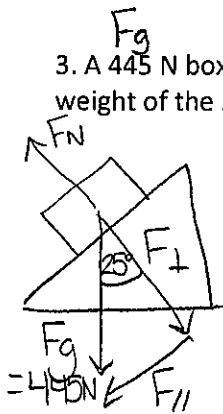
2. A 15.0 N object is pulled up an inclined plane. If the angle of the inclined plane is  $35.0^\circ$ , and the coefficient of friction is 0.300, what is the force of friction?



$$F_f = \mu F_N$$
$$= \mu |F_{\perp}|$$
$$= \mu |F_g \cos 35^\circ|$$
$$= (0.300)(15.0 \text{ N}) \cos 35^\circ$$

$$= 3.69 \text{ N [down the inclined plane]}$$

3. A 445 N box is sliding down a frictionless  $25.0^\circ$  inclined plane. Find the parallel component of the weight of the box?

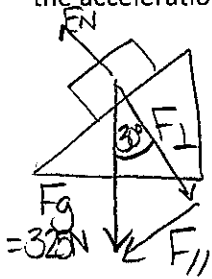


$$F_{||} = 445 \sin 25^\circ$$

$$F_{||} = 188 \text{ N}$$

$$F_g = mg \quad m = \frac{325}{9.81} = 33.129 \text{ kg}$$

4. A 325 N box is sliding down a frictionless inclined plane. If the incline makes an angle of  $30.0^\circ$ , what is the acceleration along the incline?



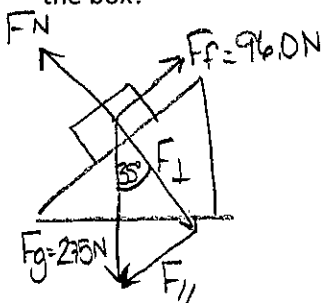
$$F_{\text{net}x} = F_{\parallel}$$

$$ma = 325 \sin 30^\circ$$

$$a = \frac{162.5}{33.129 \dots}$$

$$\vec{a} = 4.91 \text{ m/s}^2 \text{ [down the ramp]}$$

5. A 275 N box is sliding down a  $35.0^\circ$  incline. If the force of friction is 96.0 N, what is the acceleration of the box?



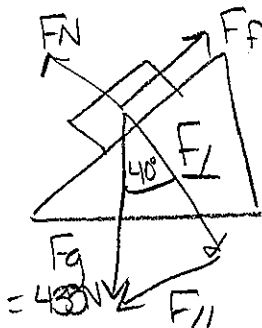
$$F_{\text{net}x} = F_f - F_{\parallel}$$

$$ma = 96.0 - 275 \sin 35^\circ$$

$$\vec{a} = \frac{-61.73352}{\left(\frac{275}{9.81}\right)}$$

$$\vec{a} = -2.20 = 2.20 \text{ m/s}^2 \text{ [down the ramp]}$$

6. A 435 N box is sliding down a  $40.0^\circ$  incline. If the acceleration of the box is  $0.250 \text{ m/s}^2$ , what is the force of friction on the box?



$$F_{\text{net}x} = F_{\parallel} - F_f$$

$$ma = 435 \sin 40^\circ - F_f$$

$$\left(\frac{435}{9.81}\right)(0.250) = 279.6126 \dots - F_f$$

$$\vec{F}_f = 269 \text{ N [up the incline]}$$