y component of this force

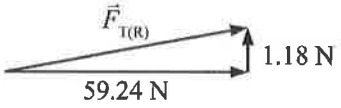
$$\vec{F}_{T2y} = F_{T2}\sin\theta$$
$$= (25.0\text{ N})(\sin 30.0°)$$
$$= 12.50\text{ N south}$$

Vector addition of x components,

$$\sum \vec{F}_{Tx} = 37.59\text{ N east} + 21.65\text{ N east}$$
$$= 59.24\text{ N east}$$

Vector addition of y components

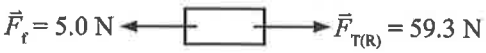
$$\sum \vec{F}_{Ty} = 13.68\text{ N north} + 12.50\text{ N south}$$
$$= 13.68\text{ N north} - 12.50\text{ N north}$$
$$= 1.18\text{ N north}$$



Magnitude of the net force (Using Pythagoras theorem) is

$$F_{T(R)} = \sqrt{(F_{Tx})^2 + (F_{Ty})^2}$$
$$= \sqrt{(59.24\text{ N})^2 + (1.18\text{ N})^2}$$
$$= 59.3\text{ N}$$

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$
$$= \frac{1.18\text{ N}}{59.24\text{ N}}$$
$$\theta = 1.1°\text{ N of E}$$



$$F_{net} = F_{T(R)} - F_{fr}$$
$$= 59.3\text{ N} - 5.0\text{ N}$$
$$= 54.3\text{ N}$$
$$\vec{F}_{net} = 54.3\text{ N at } 1.1°\text{ N of E}$$

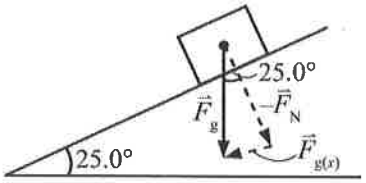
Again

$$\vec{F}_{net} = m\vec{a}$$
$$\vec{a} = \frac{\vec{F}_{net}}{m}$$
$$= \frac{54.3\text{ N at } 1.1°\text{ N of E}}{25.0\text{ kg}}$$
$$= 2.17\text{ m/s}^2\text{ at } 1.1°\text{ N of E}$$

Lesson 6—Physics of an Inclined Plane

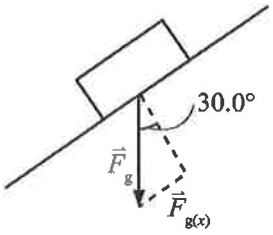
PRACTICE EXERCISES ANSWERS AND SOLUTIONS

1.



$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$
$$\sin 25.0° = \frac{F_{g(x)}}{445\text{ N}}$$
$$F_{g(x)} = (445\text{ N})(\sin 25.0°)$$
$$= 188\text{ N}$$

2.



$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$
$$\sin 30.0° = \frac{F_{g(x)}}{325\text{ N}}$$
$$= 162.5\text{ N}$$
$$F_g = mg$$
$$m = \frac{F_g}{g}$$
$$= \frac{325\text{ N}}{9.81\text{ m/s}^2}$$
$$= 33.13\text{ kg}$$
$$F_{g(x)} = (325\text{ N})(\sin 30.0°)$$
$$= 162.5\text{ N}$$
$$F_{net} = F_{g(x)} = ma$$
$$a = F_{g(x)}$$
$$= \frac{162.5\text{ N}}{33.13\text{ kg}}$$
$$= 4.90\text{ m/s}^2$$

