

## Lesson 3—Forces in Nature

PRACTICE EXERCISES  
ANSWERS AND SOLUTIONS

$$\begin{aligned}
 1. \quad \vec{F}_g &= m\vec{g} \\
 &= (25.0 \text{ kg})(9.81 \text{ m/s}^2) \\
 &= 245 \text{ N down}
 \end{aligned}$$

2. Magnitude of the weight

$$\begin{aligned}
 F_g &= mg \\
 \text{mass } m &= \frac{F_g}{g} \\
 &= \frac{80.0 \text{ N}}{9.81 \text{ m/s}^2} \\
 &= 8.15 \text{ kg}
 \end{aligned}$$

$$\begin{aligned}
 3. \quad F_g &= mg \\
 g &= \frac{F_g}{m} \\
 &= \frac{36.0 \text{ N}}{22.0 \text{ kg}} \\
 &= 1.64 \text{ m/s}^2
 \end{aligned}$$

$$\begin{aligned}
 4. \quad F_g &= mg \\
 &= (72.0 \text{ kg})(9.81 \text{ m/s}^2) \\
 &= 706 \text{ N}
 \end{aligned}$$

$$\begin{aligned}
 5. \quad F_g &= mg \\
 m &= \frac{F_g}{g} \\
 &= \frac{127 \text{ N}}{9.81 \text{ m/s}^2} \\
 &= 12.9 \text{ kg}
 \end{aligned}$$

## Lesson 4—Force Due to Gravity

PRACTICE EXERCISES  
ANSWERS AND SOLUTIONS

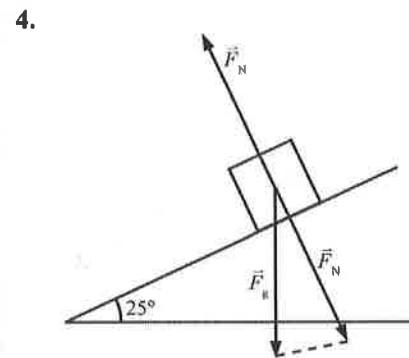
$$\begin{aligned}
 1. \quad F_N &= F_g \\
 &= mg \\
 &= (14.0 \text{ kg})(9.81 \text{ m/s}^2) \\
 &= 137 \text{ N}
 \end{aligned}$$

$$\begin{aligned}
 2. \quad F_N &= mg \\
 &= (9.6 \text{ kg})(9.81 \text{ m/s}^2) \\
 &= 94 \text{ N}
 \end{aligned}$$

Again magnitude of the frictional force is

$$\begin{aligned}
 F_{fr} &= \mu F_N \\
 &= (0.11)(94 \text{ N}) \\
 &= 1.0 \times 10^1 \text{ N}
 \end{aligned}$$

$$\begin{aligned}
 3. \quad F_{fr} &= \mu F_N \\
 \mu &= \frac{F_{fr}}{F_N} \\
 &= \frac{3.0 \text{ N}}{20.0 \text{ N}} \\
 &= 0.15
 \end{aligned}$$



$$\begin{aligned}
 F_N &= F_g \cos 25.0^\circ \\
 &= mg \cos 25.0^\circ \\
 &= (16.2 \text{ kg})(9.81 \text{ m/s}^2)(\cos 25.0^\circ) \\
 &= 144 \text{ N}
 \end{aligned}$$