Chapter 2 HW Answers

Review Questions:

2. Inertia is a property of matter. It is not a force.

5. The planets would follow a straight-line path in the absence of gravity.

14. Acceleration is zero. The object will maintain its velocity for the rest of the fall.

15. The object falling at the greater speed impacts more air molecules and feels more air resistance.

22. The reaction force is the ball pushing back on the bat with the exact same amount of force.

23. The cannon and the cannonball have very different masses, so when each feels the same force they have very different accelerations.

Exercises:

6. Yes the floor pushes upward. The floor exerts exactly your weight in force. You are not move upward by the push of the floor because the forces on you are balanced.

9. You must continue running the engine to balance the car's force against the friction force. Balanced forces means you will not accelerate or decelerate, you will maintain your seed.

15. The acceleration would not be greater for the thrown ball; the speed at each second would be greater but not the rate of acceleration.

For Example

Seconds of fall	Dropped ball speed	Thrown ball speed
0	0 m/s	20 m/s
1	10 m/s	30 m/s
2	20 m/s	40 m/s
3	30 m/s	50 m/s

Each ball experiences the same 10m/s^2 acceleration each seconds,
but the thrown ball is always traveling faster because it had an initial speed.

29. The opposing friction must be 200 N because the crate is moving at a constant velocity and a constant velocity means forces are balanced. Yes, friction is always in the opposite direction of the motion. No, the reaction force to your push on the crate is the crate pushing back on you.

38. The sky diver is not slowing down but rather has less and less increase of speed until the sky diver reaches terminal velocity.

Problems:

1. m = 2000 kg

The weight is found from the weight equation…

$$W = mg = (2000\text{kg})(9.81\ \text{m/s}^2) = \mathbf{19{,}620\ N}$$

Now to change the units…

$$19{,}620\ \text{N} \times \frac{0.2248\ \text{lb}}{1\ \text{N}} = \mathbf{4{,}410\ lbs}$$

10. The wall pushes back on you with exactly the same amount of force (**30 N**), but in the opposite direction.

$$a = \frac{F}{m} = \frac{30\ \text{N}}{60\ \text{kg}} = \frac{30\ \text{kg-m/s}^2}{60\ \text{kg}} = \mathbf{0.5\ m/s^2}$$

Additional:

A. 1st law: Dart at rest stays at rest until fired
Dart flies in a "straight" path until the wall stops it

2nd law: The force of the Nerf gun accelerates the dart
The force of the wall decelerates the dart

3rd law: The Nerf gun pushes on the dart and the dart pushes back the same amount

B. m = 400 kg

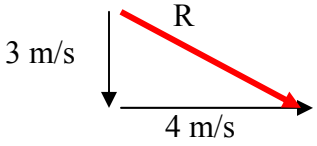
The friction force must exactly equal the weight of the bear because the bear slides down with a constant velocity.

$-F_f$ = weight of bear

$W = mg = (400\ \text{kg})(9.81\ \text{m/s}^2) = 3{,}924\ \text{N}$

$\mathbf{F_f = -3924\ N}$

C.



$R^2 = (3\ \text{m/s})^2 + (4\ \text{m/s})^2 = 25\ \text{m}^2/\text{s}^2$

R = 5 m/s