

## Ch. 5 Review Questions, pg. 77; 11<sup>th</sup> edition

4. State Newton's third law of motion.

-See the things to know by heart page of this manual.

5 Consider hitting a baseball with a bat. If we call the force on the ball the action force, identify the reaction force.

**Ans.** The reaction force is the backward force on the bat due to the ball.

10. The Earth pulls down on you with a gravitational force that we call your weight. Do you pull up on the Earth with the same amount of force?

**Ans.** Yes. Newton's third law tells us that we do.

11. If the forces that act on a bullet and the recoiling gun from which it is fired are equal in magnitude, why do the bullet and gun have very different accelerations?

**Ans.** They have very different masses. According to Newton's second law of motion, the acceleration of an object is inversely proportional to its mass. Therefore, the small mass bullet, receives a very large acceleration.

14. Can you physically touch another person without that person touching you with the same magnitude of force?

**Ans.** No! No! A thousand times No!

17a. What is a vector quantity? Give three examples.

**Ans.** A vector is something that has magnitude (a number) and direction. Three things that are vectors are displacement, velocity, and acceleration.

17b. What is a scalar quantity? Give three examples.

**Ans.** A scalar quantity has magnitude only. Speed, distance traveled and volume are examples of scalar quantities.

**Extra:** Why do action and reaction pairs of forces never cancel one another?

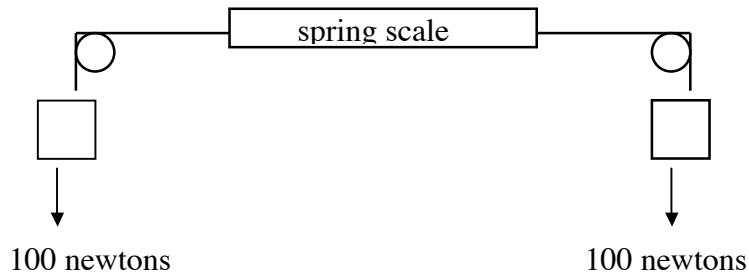
**Ans.** Action - reaction refers to forces that are applied to different objects. Forces can only cancel each other out if they are applied to the same object.

**Extra:** If the forces that act on a bullet and the recoiling gun from which it is fired are equal in magnitude, why do the bullet and gun have very different accelerations?

**Ans.** Because they have different masses. See Newton's Second law.

## Ch. 5 Exercises p. 79; 11<sup>th</sup> edition

13. Two 100 newton weights are attached to a spring scale as shown. Does the scale read 0, 100, or 200 newtons. Hint: Would it read any differently if one of the ropes were tied to the wall instead of to the hanging 100 newton weight?



**Ans.** It reads 100 Newtons. Ask in class if this confuses you.

21. You push a heavy car by hand. The car in turn pushes back on you with a force that is equal in magnitude and opposite in direction to the first force. Why don't the forces cancel each other out making acceleration impossible?

**Ans.** The forces act on different objects so they cannot cancel each other out.

22. The strong man will push the two initially stationary freight cars of equal mass apart before he himself drops to the ground (see diagram pg. 89 in text). Is it possible for him to give either of the cars a greater speed than the other? Why or why not.

**Ans.** Not possible. Ask in class if you don't understand.

24. a) If a Mack truck and a Honda Civic have a head-on collision, upon which vehicle is the impact force greater? Explain your answer.

**Ans.** The forces on the truck and car are equal in magnitude but opposite in direction-Newton's third law of motion.

29. Two people of equal mass attempt a tug-of-war with a 12meter long rope while standing on frictionless ice. When they pull on the rope, they each slide toward each other. How do their accelerations compare, and how far does each person slide before they meet?

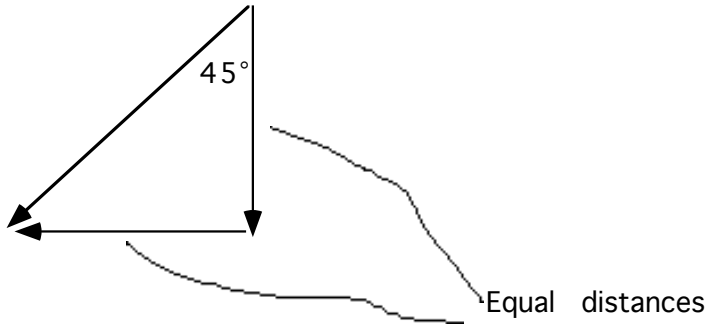
**Ans.** Their accelerations are equal and they meet in the middle. If you don't understand why, please ask in class.

## Ch. 5 Exercises p. 81 continued; 11<sup>th</sup> edition

40. a) Why does vertically falling rain make slanted streaks on the side windows of a moving automobile? b) If the streaks make an angle of  $45^\circ$ , what does this tell you about the relative speed of the car and the falling rain.

**Ans.** a) As the rain moves down the side window, the car moves forward, making the rain flow toward the back of the window.

b) A  $45^\circ$  angle is created only when the vertical distance that the rain falls is equal to the horizontal distance that the car moves. This can only happen if the rain is falling at the same speed that the car is moving.



## Volunteer to help demonstrate problem 31 in class for plus 2.

### Extra Exercises ch. 5

**Extra:** When two vectors sum to zero, how must they be related?

**Ans.** They will be equal in magnitude and opposite in direction.

**Extra:** If you walked at 1 m/s down the aisle of a bus that is moving at 10 m/s along the road, how fast are you moving relative to the road when you walk toward the: a) front of the bus? b) Toward the rear of the bus?

**Ans.** a)  $10 \text{ m/s} + 1 \text{ m/s} = 11 \text{ m/s}$       b)  $10 \text{ m/s} - 1 \text{ m/s} = 9 \text{ m/s}$

**Extra:** An airplane travels 200 km/hr through the air. If it heads directly against a 40 km/hr wind, what is its speed relative to the ground below?

**Ans.** The wind is blowing in the opposite direction of motion. We will label the forward direction as plus and the opposite direction as minus.

$+200 \text{ km/hr} + -40 \text{ km/hr} = 160 \text{ km/hr}$ .

## Chapter 5 problem # 2, pg. 81; 11<sup>th</sup> edition

2a) If you stand next to a wall on a frictionless skateboard and push the wall with a force of 30 N, how hard does the wall push back?

**Ans.** The wall will push back on you with a force of 30 newtons.

b) If your mass is 60 kilograms, what is your acceleration?

**Ans.**  $a = \frac{\sum F}{M} = \frac{30 \text{ newtons}}{60 \text{ kilograms}} = .5 \frac{\text{m}}{\text{s}^2}$