Name: _____ **Pd**____ **Sci #:** ___ # Day 8: Forces ____/47 pts | 2 pts ec

#2 Forces: Unbalanced forces cause changes in _____.

a. A force has both direction & _____.

b. When an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.

c. When the forces on an object are _____, the motion of the object does not change.

d. Be able to identify separately the two or more forces that are acting on a single _____ object, including gravity, elastic forces due to tension or compression in matter, & friction.

e. When the forces on an object are _____, the object will change its velocity (that is, it will speed up, slow down, or change direction).

f. The greater the _____ of an object, the more _____ is needed to achieve the same rate of change in motion.

g. Know the role of _____ in forming & maintaining the shapes of planets, stars, & the solar system.

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1. Vocabulary: Use the words in the box to fill in the blanks below. Each word will be used only once.

½ pt each ____/ 7.5

1) A _____ is a push or pull.
2) The unit for force is the _____.
3) A force has both _____ and _____.
4) _____ is determined by combining forces.
5) _____ forces produce a change in motion and velocity.
6) _____ forces produce no change in motion.
7) _____ is a force of attraction between objects that is due to their masses.
8) The law of universal gravitation states that all objects in the universe attract each other through _____. The size of the force depends on the masses of the objects and the _____ between them.
9) _____ is the amount of matter in an object.
10) _____ is a measure of gravitational force on an object.
11) Newton's _____ law of motion states that the motion of an object will not change if no unbalanced forces act on it.
12) _____ is the tendency of matter to resist change in motion.
13) Newton's second law of motion states that the _____ of an object depends on its mass and on the force exerted on it.
14) Newton's third law of motion states that whenever one object exerts a force on a second object, the second object exerts a(n) _____ force on the first.
15) _____ is the property of a moving object that depends on its mass and velocity.

Acceleration
Balanced
Direction
Distance
Equal and opposite
First
Force
Gravity
Gravitational force
Inertia
Magnitude
Mass
Momentum
Net Force
Newton
Unbalanced
Weight

2. Newton's 3 Laws of Motion **1 pt each: ____/3 pts**

Newton's Law	Write the law in your own words	Example of the law
The first law		
The second law		
The third law		

3. Applying Newton's Laws: Answer the following questions. **1 pts each: _____/7pts**

a. When Jane drives to work, she always places her pocketbook on the passenger's seat. By the time she gets to work, her pocketbook has fallen on the floor in front of the passenger seat. One day, she asks you to explain why this happens in terms of physical science. What do you say? Which Newton's Law would be the cause?

b. You are waiting in line to use the diving board at your local pool. While watching people dive into the pool from the board, you realize that using a diving board to spring into the air before a dive is a good example of Newton's third law of motion. Explain how a diving board illustrates Newton's third law of motion.

c. You know the mass of an object and the force applied to the object to make it move. Which of Newton's laws of motion will help you calculate the *acceleration* of the object? What is the formula ?

d. Your shopping cart has a mass of 65 kilograms. In order to accelerate the shopping cart down an aisle at 0.3 m/s^2, what force would you need to use or apply to the cart? **SHOW THE FORMULA AND YOUR WORK FOR CREDIT**

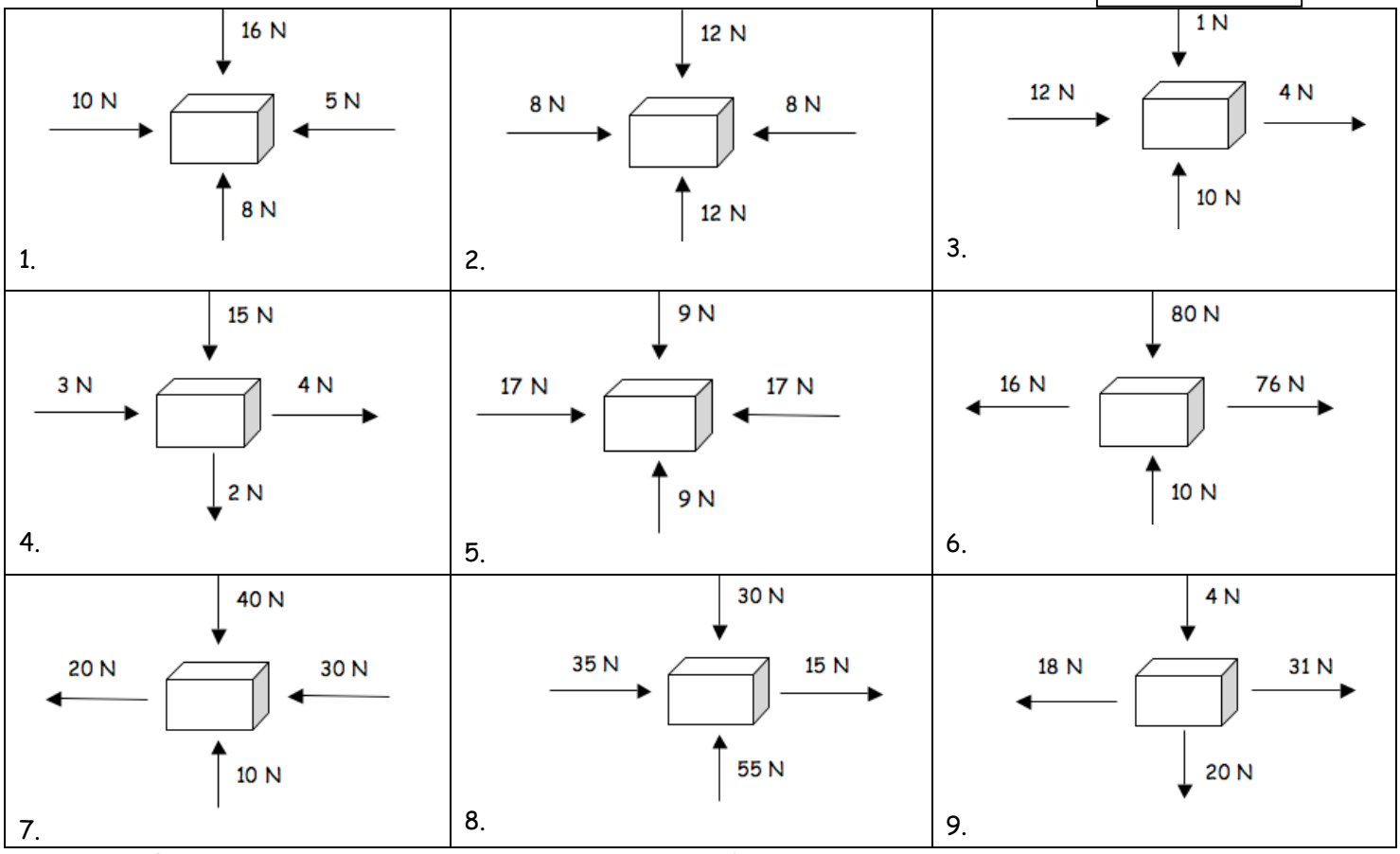
e. A small child has a wagon with a mass of 10 kilograms. The child pulls on the wagon with a force of 2 newtons. What is the acceleration of the wagon? **SHOW THE FORMULA AND YOUR WORK FOR CREDIT**

f. You dribble a basketball while walking on a basketball court. List and describe the pairs of action-reaction forces in this situation.

g. Explain how gravity was the major force responsible for formation of the solar system.

4. Force Diagrams: State whether each box is **balanced** or **unbalanced**.
If unbalanced, write the sizes (magnitude) & directions of the resultant force.

½ pt ea: ____/4.5



5. Newton's Second Law: use Newton's second law to complete the formulas below.

- Force = _____ Acceleration = _____
- Mass = _____ 1 Newton is equivalent to _____

Use the equation to answer the following questions

1. If the same cyclist decelerates to 4 m/s^2 east, what is the new force? _____*As acceleration decreases, force* _____.
2. A car with a mass of 3950 kg accelerates at 25 m/s^2 north. What is its force? _____
3. If the same car had a mass of 5000 kg, what is the new force? _____*as mass increases, force* _____
4. A plane with a mass of 14,056 kg accelerates 112 m/s^2 west. What is its force? _____
5. If the plane increases its acceleration to 200 m/s^2 west, what is the new force? _____
   As acceleration increases, force _____

½ pt ea:
_____/7

6. The Force of Gravity

Forces are not always exerted on objects by direct physical contact, like pushing or pulling. For instance, the Earth exerts the force of gravity on objects even when the objects are not touching the ground. The acceleration on an object due to the force of gravity is **9.8 m/s^2 downward**. In other words, for every second n object is falling, its velocity increases by 9.8 m/s/s downward.

1. A 9 kg bowling ball rolls off a table & strikes the ground. If the ball is in the air for 0.5 seconds, how fast is the ball moving when it hits the ground?

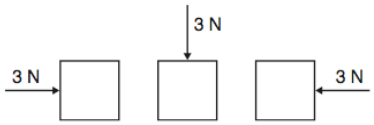
2. Another bowling ball with 1/5 less mass rolls off the same table & strikes the ground. When this ball hits the ground, is it moving faster, slower, or the same speed as the first ball? Explain.

3. A ball is dropped from the top of a tall building. As the ball falls, the upward force of air resistance becomes equal to the downward pull of gravity. When these two forces become equal in magnitude, the ball will

a. flatten due to the forces b. fall at a constant speed c. continue to speed up d. slow to a stop

Forces:

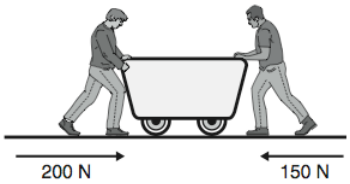
1. A force is acting on each of the objects below.



What can be concluded about these forces?

a. They are the same because they point toward the objects.
b. They are the same because they have the same magnitude.
c. They are different because they have different magnitudes.
d. They are different because they have different directions.

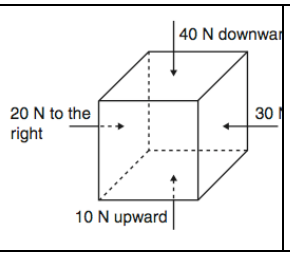
2. Two students are pushing a cart, as shown below.



The cart will move as if it were acted on by a single force with a magnitude of a. 50 N. b. 150 N. c. 200 N. d. 350 N.

3. A ball is dropped from the top of a tall building. As the ball falls, the upward force of air resistance becomes equal to the downward pull of gravity. When these two forces become equal in magnitude, the ball will

a. flatten due to the forces. b. fall at a constant speed.
c. continue to speed up d. slow to a stop.



4. Four forces are acting on a box, as shown below. This box will increase in speed

a. downward and to the left.
b. downward and to the right.
c. upward and to the left.
d. upward and to the right.

5. A force of 5 N is required to increase the speed of a box from a rate of 1.0 m/s to 3.0 m/s within 5 s along a level surface. What change would most likely require additional force to produce the same results?

a. reduce the mass of the box b. increase the mass of the box
c. make the box surfaces smooth d. make the floor surface smooth

6. Which of the following carts will accelerate the least?

A. an empty cart pushed with a hard force
B. a full cart pushed with a hard force
C. an empty cart pushed with a light force
D. a full cart pushed with a light force

7. What is the role of gravity in our solar system?

a. Gravity pushes the planets farther and farther apart.
b. Gravity pulls planets closer and closer to the sun.
c. Gravity keeps the planets in orbit around the sun.
d. Gravity is created by the sun, which attracts the planets.

8. A teenager pulls a rope to the left with a force of 12 N. A child pulls on the other end of the rope to the right with a force of 7 N. The child's friend adds a force of 8 N, also pulling to the right. What will happen?

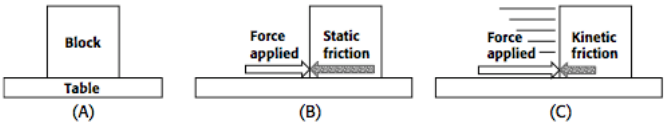
a. net force = 3 N to the right. b. net force = 15 N to the left.
c. net force = 12 N to the right. d. net force = 27 N to the left.

9. The magnitude of the gravitational force between two bodies depends upon

a. the velocity of the bodies and the friction between them.
b. the size of the bodies and their position relative to Earth.
c. the weight of the bodies and how quickly they are moving.
d. the mass of the bodies and the distance between them.

10. What is the best explanation for why this picture is an example of projectile motion?

a. The runner jumps higher than the hurdle.
b. The runner has greater horizontal velocity than vertical velocity.
c. The runner has both horizontal and vertical motion.
d. The runner has both vertical motion and gravity.



11. Look at Figure A. Why does the block not move?

a. because of frictional force b. because no forces are applied
c. because of kinetic friction d. because of surface friction

12. Look at Figure B. What force keeps the block in place?

a. kinetic friction b. force applied
c. force greater than the force of static friction d. static friction

13. Look at Figure C. The block is moving. What force acts against the movement of the block?

a. gravity b. rolling kinetic friction
c. sliding kinetic friction d. static friction

14. Which of the following is a force?

A. inertia B. friction C. velocity D. acceleration

15. Gravitational force between two objects depends on their ___.

A. speed B. masses C. velocities D. shapes

16. _____ acts only between surfaces that are in contact.

A. Inertia B. Friction C. Gravity D. A net force

17. Forces equal in size and opposite in direction are called ____.

A. newtons B. balanced forces C. net forces D. friction

18. In a head-on car crash, passengers not wearing seat belts continue to move forward with the same____ that the car had prior to impact.

A. momentum B. force C. potential energy D. speed

1 pt each:	/18 pts