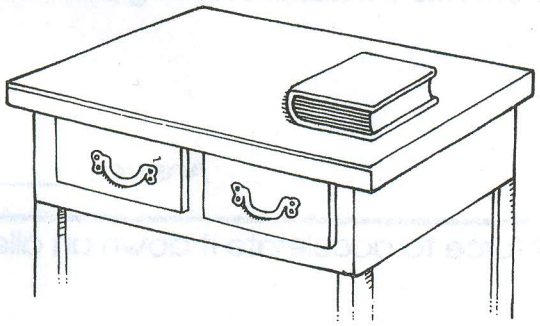
Name _____ Date _____

Balanced and Unbalanced Forces

Forces can be balanced or unbalanced. Use the terms in the word box to label the diagrams. One word is used twice.

gravity	table	rest
balanced	unbalanced	accelerate

1. Forces are _____.

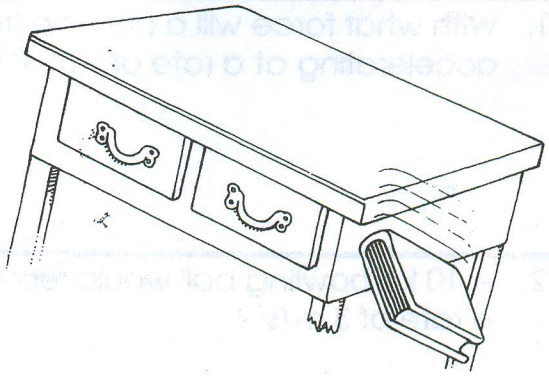


2. _____ pushes down.

3. _____ pushes up.

4. The book remains at _____.

5. Forces are _____.



6. _____ is the greater force.

7. The book will _____ toward the floor.

Match each term in the word box to its definition.

balanced	equilibrium	inertia	state of motion	zero

8. _____ Describes forces working upon an object that are of equal magnitude and come from opposite directions.

9. _____ The tendency of an object to resist changes in its state of motion.

10. _____ An object at rest has this velocity.

11. _____ This describes an object's velocity, or speed with a direction.

12. _____ When all the forces acting upon an object balance each other, the object will be in this state.

FORCE AND ACCELERATION

Name _____

A force is a push or a pull. To calculate force, we use the following formula,

$F = ma$ where F = force in newtons
m = mass in kg
a = acceleration in m/sec^2

Example: With what force will a rubber ball hit the ground if it has a mass of 0.25 kg?

Answer: $F = (0.25\ kg)(9.8\ m/s^2)$
$F = 2.45\ N$

Solve the following problems.

1. With what force will a car hit a tree if the car has a mass of 3,000 kg and it is accelerating at a rate of 2 m/s^2?

   Answer: _____

2. A 10 kg bowling ball would require what force to accelerate it down an alleyway a rate of 3 m/s^2?

   Answer: _____

3. What is the mass of a falling rock if it hits the ground with a force of 147 newtons?

   Answer: _____

4. What is the acceleration of a softball if it has a mass of 0.50 kg and hits the catcher's glove with a force of 25 newtons?

   Answer: _____

5. What is the mass of a truck if it is accelerating at a rate of 5 m/s^2 and hits a parked car with a force of 14,000 newtons?

   Answer: _____

 Name: _____

Pre-Conceptions

Students typically have many pre-conceived notions regarding concepts in Physics. It has always proven useful to bring these ideas to the forefront of your mind and to make an effort to evaluate their correctness. The following statements pertain in one way or another to common notions regarding central concepts of this unit. Identify each statement as being either true (T) or false (F).

Force and Motion - What Do You Believe?

The following statements pertain in one way or another to common notions regarding force and motion. Identify each statement as being either true (T) or false (F).

T or F?		Statement
_____	1.	A force is required to keep an object moving in a given direction.
_____	2.	An upward moving object must be experiencing (or at least usually does experience) an upward force.
_____	3.	A rightward moving object must be experiencing (or at least usually does experience) a rightward force.
_____	4.	A ball is thrown into the air and is moving upwards and rightwards towards its peak. The ball experiences a force which is directed upwards and rightwards.
_____	5.	If a person throws a ball with his hand, then the force of the hand upon the ball is experienced by the ball for at least a little while after the ball leaves the hand.
_____	6.	A cannonball is shot from a cannon at a very high speed. The force of the explosion will be experienced by the cannonball for several seconds (or a least a little while).
_____	7.	If an object is at rest, then there are no forces acting upon the object.

Mass and Weight - What Do You Believe?

The following statements pertain in one way or another to common notions regarding mass and weight. Identify each statement as being either true (T) or false (F).

T or F?		Statement
_____	1.	Objects do NOT weigh anything when placed in a vacuum.
_____	2.	All objects weigh the same amount when placed in a vacuum, regardless of their mass.
_____	3.	An object weighs less on the moon than it does on the Earth.
_____	4.	The mass of an object on the moon is the same as its mass on the Earth.
_____	5.	A high-speed object (say, moving at 200 mi/hr) will weigh less than the same object when at rest.
_____	6.	A high-speed object (say, moving at 200 mi/hr) will possess measurably more mass than the same object when at rest.
_____	7.	Weight is measured in pounds; mass is measured in Newtons.
_____	8.	A free-falling object still has weight.
_____	9.	Weight is the result of air pressure exerted upon an object.

 Name: _____

Mass and Weight

Read from **Lesson 2** of the **Newton's Laws** chapter at **The Physics Classroom**:

http://www.physicsclassroom.com/Class/newtlaws/u2l2b.html#mass

MOP Connection: Newton's Laws: sublevel 6

1. The standard metric unit for mass is _____ and the standard metric unit for weight is _____.

2. An object's mass refers to _____ and an object's weight refers to _____. Fill in each blank.
   a. the amount of space it takes up
   b. the force of gravitational attraction to Earth
   c. how dense an object is
   d. the amount of stuff present in the object

3. Complete the following table showing the relationship between mass and weight.

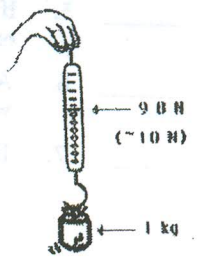
Object	Mass	Approx. Weight
Melon	1 kg	
Apple		~1.0 N
Pat Eatladee	25 kg	

4. Different masses are hung on a spring scale calibrated in Newtons.

   The force exerted by gravity on 1 kg = ~10 N.

   The force exerted by gravity on 5 kg = ~_____ N.

   The force exerted by gravity on 70 kg = ~_____ N.



5. The value of g in the British system is 32 ft/sec^2. The unit of force is pounds. The unit of mass is the slug. Use your weight in pounds to calculate your mass in units of slugs. **PSYW**

6. You might be wondering about your metric weight. Using conversion factors, convert your weight in pounds to units of N. (Use 1 N = 0.22 pounds) **PSYW**

7. What is the mass and weight of a 10-kg object on earth?

   Mass = _____ Weight = _____

   What is the mass and weight of a 10-kg object on the moon where the force of gravity is 1/6-th that of the Earth's?

   Mass = _____ Weight = _____

8. Conclusion: The _____ of an object is independent of the object's location in space.