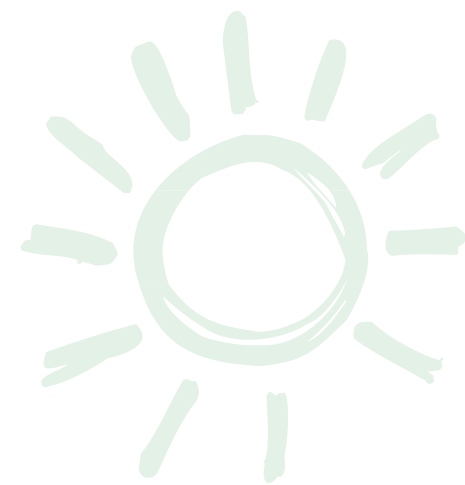




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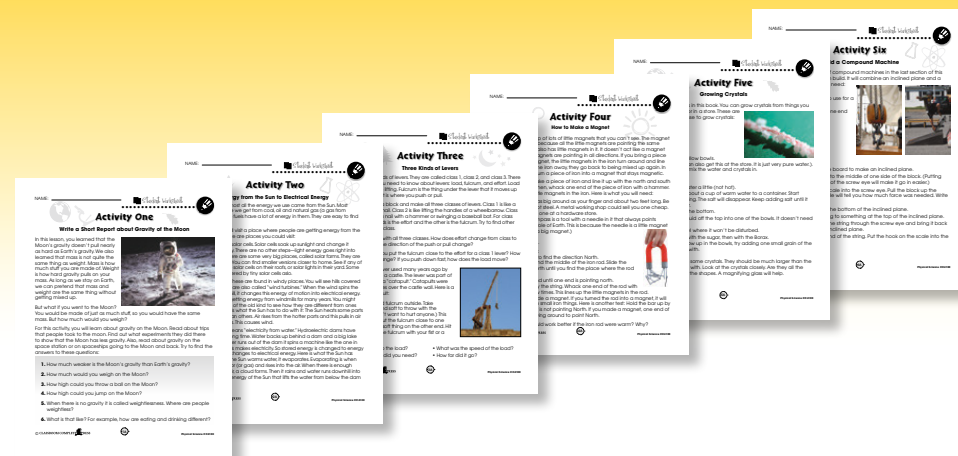
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Force and Motion

1. Circle **T** if the sentence is True or **F** if it is False.

- T F a) Down means the same thing as south.
 T F b) A force is a push or a pull.
 T F c) Solid things do not move.
 T F d) Force is the same thing as energy.
 T F e) Gravity is a force.

2. Put a check mark (✓) next to the answer that is the most right.

a) Which of these keeps you from floating off into space?

- A air
 B electricity
 C gravity
 D magnetism

b) Which way does the force of gravity pull?

- A south
 B down
 C north
 D up

c) An unbalanced force can make a thing do all of these, except _____.

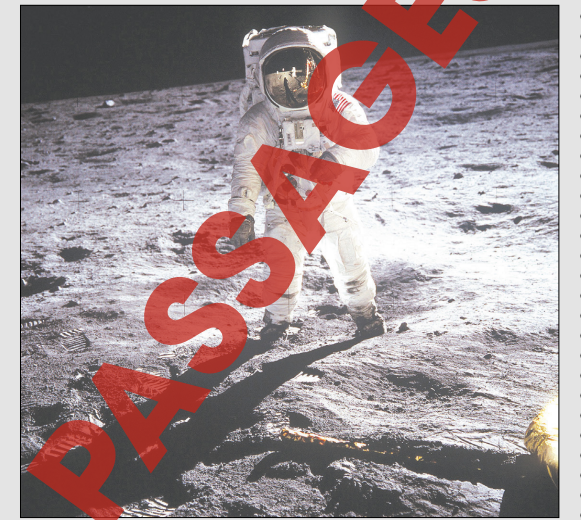
- A sit still
 B slow down
 C move faster
 D change direction



Force and Motion

G ravity is pulling on you, and you aren't moving. That is because another force is balancing gravity. Are you sitting in a chair? Then it is the force of the chair pushing up on you that balances gravity. Can you feel it?

Forces on something can also be **unbalanced**. This changes the way the thing moves. It might go faster, it might slow down, or it might change direction. For example, when something starts to fall it speeds up. This is because the force of gravity is stronger than the forces slowing it down.



The force of gravity is less on the Moon. This is because the Moon is smaller than the Earth.

When you drop a ball, it moves faster and faster until it hits the ground. Are the forces acting on the ball balanced? Explain.



Putting it all together: When forces on a thing are balanced, the thing doesn't change its motion. When forces are unbalanced, the thing changes its motion.



Force and Motion

1. Put a check mark (✓) next to the answer that is the most right.

a) Something is sitting still. What do you know about the forces acting on it?

- A The forces on it are balanced.
 B All the forces are pulling it down.
 C Only the force of gravity is acting on it.
 D Forces are pushing on it from every direction.

b) Something changes the direction an object is moving. What do you know about the forces acting on it?

- A The forces add up to zero.
 B The force of gravity is zero.
 C The forces are unbalanced.
 D The forces are all pushing from one direction.

2. Use the words below to finish each sentence. Use each word once. Some words won't be used.

gravity unbalanced balanced speeding up sitting still

- a) A moving car is slowing down because the forces on it are _____.
- b) As an apple hangs from a tree, the stem is pulling up on it. The force pulling down on it is _____.
- c) An airplane flies through the air without changing its height or its speed. The forces on the plane are _____.
- d) The forces on a rock are balanced. The rock is either moving in one direction at the same speed or it is _____.



Force and Motion

3. Answer the questions in full sentences.

a) Explain how you can be sitting still when there are two forces acting on you.

b) Explain how an unbalanced force can make a moving thing change direction. Give an example.

Extension & Application

4. A skydiver jumps from an airplane. Two forces act on her as she falls. One is gravity and the other is called air resistance. Air resistance is the air pushing up on her. The faster she goes, the harder it pushes. It is the same push you feel when you try to walk into a strong wind. These are the ways her speed changes on the way down:

- 1) First she speeds up.
- 2) Soon the push of air resistance is the same as the pull of gravity. Now her speed stays the same.
- 3) When she opens her parachute, air resistance pushes harder. Now she slows down.
- 4) Again, she reaches a speed that stays the same.
- 5) Near the ground a wind is blowing. Now she drifts to one side.
- 6) She lands on the ground. She sits there and thinks about the fun she had.

Think about each of the six parts of her fall from the airplane to the ground. For each part, tell whether the forces on her were balanced or unbalanced. Describe the forces acting on her in each part. Use the graphic organizer on page 12 to write your answers.



Study of Balanced and Unbalanced Forces

You will study the forces of gravity and air resistance. This is what you will need:

- A rubber balloon
- A feather
- A small ball, like a golf ball, tennis ball, or baseball
- A stepladder
- A stopwatch
- A tape measure

You will see what happens when you drop the balloon, the feather, and the ball from different heights. Work with a friend. Think about these ideas:

- Gravity pulls things to the ground when they fall.
- Air resistance pushes up on falling things.
- The faster something falls, the greater the air resistance is pushing up on it.
- If there were no air resistance, the force of gravity would always be an unbalanced force for falling things.

This is what you do:

1. Work with a friend. One person will drop things. The other will try to measure how long it takes them to hit the ground. Write down your measurements and what you see.
2. Blow up the balloon and tie a knot to keep the air in.
3. Drop the balloon from 4 feet above the floor. Stand on the stepladder and drop it from 8 feet above the floor.
4. Use the stopwatch to time how long it took to fall.
5. Did the balloon speed up all the way to the ground? If it did, the forces were always unbalanced. Did the balloon seem to fall at the same speed after a while? If it did, the forces were balanced after that point.
6. Did it take twice as long to fall 8 feet as it did 4 feet? If it did, the forces were balanced all the way. If it took less than twice as long, the forces were unbalanced all or part of the time.
7. Repeat steps 3, 4, 5, 6 for the feather and the ball.

Explain what happened. Explain what the measurements you took mean. Explain using what you know about balanced and unbalanced forces.



Crossword Puzzle!



Across

1. The head of an axe is one.
5. Make one with a board and a block.
9. Not static electricity—the other kind.
11. A ramp is an _____ plane.
13. Sound _____ come from a ringing bell.
15. It has mass and takes up space.
16. Some of the Sun's energy changes into _____ energy.

Down

2. Some are positive and some are negative.
3. It keeps you from floating off into space.
4. The color of grass is an example of this.
6. This simple machine has a lever that spins all the way around.
7. When light bounces, it is called a _____.
8. This simple machine is like a long ramp going in a circle.
10. The kind of force that makes something change how it is moving.
12. A push or a pull.
14. Light and heat are kinds of _____.



Word List

current electricity	inclined	unbalanced
electric charge	lever	waves
energy	matter	wedge
force	properties	wheel and axle
gravity	reflection	
heat	screw	



Comprehension Quiz

Part A

Circle **T** if the sentence is TRUE or **F** if it is FALSE.

- 1) Gravity only pulls on things sitting on the ground.
- 2) If something is moving in a straight line without changing speed, the forces on it are balanced.
- 3) Light is a kind of energy.
- 4) We cannot see sound waves.
- 5) Light travels faster than sound.
- 6) Lightning is a kind of current electricity.
- 7) Particles in ice can change places with each other.

Part B

Put a check mark (✓) next to the answer that is the most right.

a) Which two simple machines could you make with just a board and a brick?

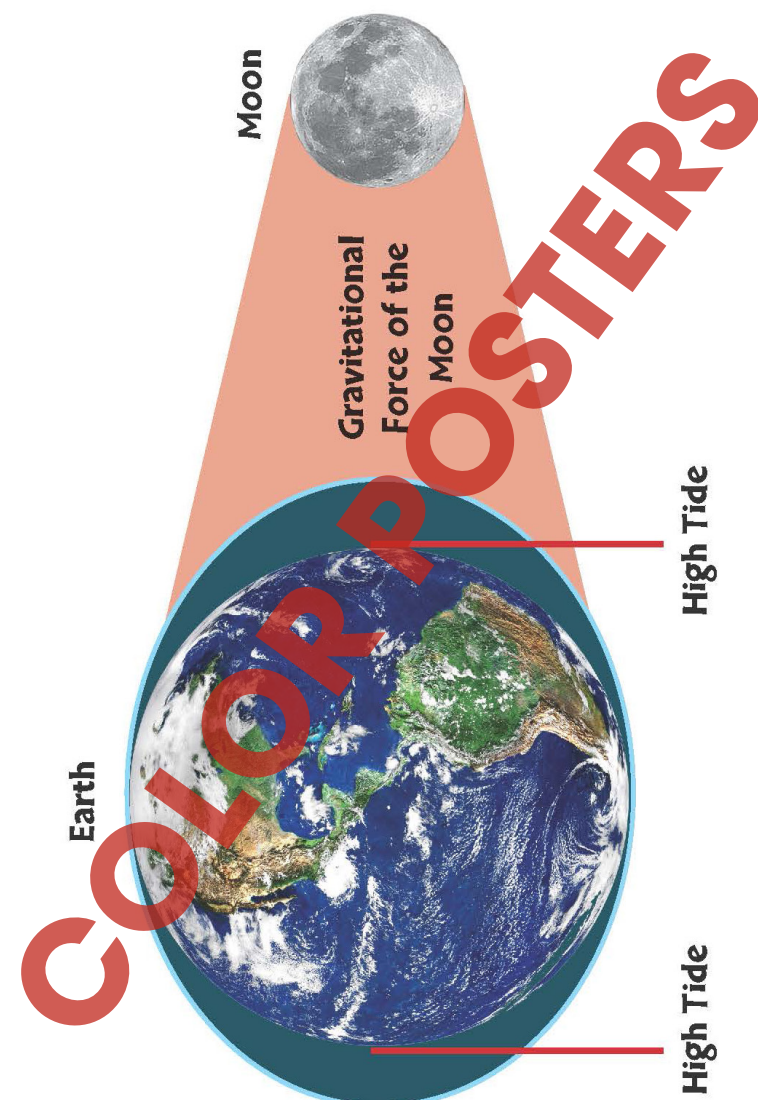
- A A pulley and a lever.
- B A lever and an inclined plane.
- C An inclined plane and a screw.
- D A screw and a wheel and axle.

b) What do we know about the forces acting on something that is falling without changing its speed?

- A No forces are acting on it.
- B Only gravity is acting on it.
- C There is no force of air resistance.
- D The forces acting on it are balanced.

Gravity and Tides

Tides Caused by Gravitational Force of the Moon





Force and Motion

1. Put a check mark (✓) next to the answer that is the most right.

a) Something is sitting still. What do you know about the forces acting on it?

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- C Only the force of gravity is acting on it.
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- c) An airplane flies through the air without changing its height or its speed. The forces on the plane are _____.
- d) The forces on a rock are balanced. The rock is either moving in one direction at the same speed or it is _____.

1.

a) A

b) C

3.

a) Gravity is pulling you down. What you are sitting on is pushing up with an equal force.

b) An unbalanced force means the two forces are different. Like a force from a direction that is not the direction of motion. This can make the thing change direction. Like a change in breeze can change the way a leaf falls.

4.

1. Unbalanced - Gravity is stronger than air resistance. She is speeding up.

2. Balanced - Forces are equal. Speed stays the same.

3. Unbalanced - Air resistance is stronger than gravity. She is slowing down.

4. Balanced - Forces are equal. Her speed stays the same.

5. Unbalanced - The wind changes her direction.

6. Balanced - The force of the ground pushing up is the same as gravity. She is not moving.

2.

a) unbalanced

b) gravity

c) balanced

d) sitting still

10

11

EASY MARKING ANSWER KEY

