



- JANUARY**
Makugihon
- FEBRUARY**
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*Maabtik og Masunod sa
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- JULY**
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- AUGUST**
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para sa Uban*
- SEPTEMBER**
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- DECEMBER**
Maalampon

6



SCIENCE

Quarter 3 - Module 2 **Effects of Gravity on the Movement of Objects**



Name of Learner: _____

Grade & Section: _____

Name of School: _____

Science – Grade 6
Support Material for Independent Learning Engagement (SMILE)
Quarter 3 – Module 2: Effects of Gravity on the Movement of Objects
First Edition, 2021

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Printed in the Philippines by

Department of Education – Region IX – Dipolog City Schools Division

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Lesson

1

Effects of Gravity on the Movement of Objects



What I Need to Know

In this module, you will learn to **infer how gravity affects the movement of different objects. (S6FE-IIIa-c-1).**

Specifically, you are expected to:

1. Describe the gravity of the Earth.
2. Explain about the effects of gravity to the movement of different objects.



What's In

To start, let us take a review about the lesson that you have learned from Module 1 Week 1. Let us try this activity.

Activity 1: Guess the Mystery Word!

Directions: Study the relationships of four pictures below. Identify the word that tells about the common concept drawn from the four pictures. Write your answer in the boxes below. The number of spaces in the box is the same as the number of letter the word has.



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Answer the following questions:

1. Does friction slow down or increase the rate of movement of a moving body?
2. What is the direction of the force exerted by friction to a moving object or body?

Activity 2: Recognize Me!

Directions: Read each statement carefully. Select the type of friction listed in the word bank that is described in each item. Write your answer in the blank space provided.

Word Bank			
rolling friction	static friction	sliding friction	fluid friction

- _____ 1. It acts on objects moving through a liquid or gas.
- _____ 2. It occurs in stationary objects or objects at rest and prevents an object from moving against a surface.
- _____ 3. It occurs when two objects rub against each other or slide against each other.
- _____ 4. It is produced when an object rolls over a surface.
- _____ 5. It occurs in a swimmer swimming in water, a boat travelling in water, or an airplane flying across the sky.



What's New

Activity 3: Going Up and Down

Note: Perform this activity with adult supervision.

Let's Find Out: What force pulls a falling object?

Materials Needed: small rubber ball, coin, crumpled paper, a sheet of bond paper

Procedure:

1. Hold a small ball and a coin. Put them on your left palm. Throw them up. Observe the objects.
2. Drop a sheet of paper and a crumpled paper at the same time. Observe the objects.

Write down your observations.

1. a. What happens when you throw the ball and the coin?

- b. Which of them reached the floor first? Why do you think so?

2. a. What happened when you dropped the crumpled paper and the flat sheet of paper?

- b. Which of the papers reached the floor first? Why?

Share your knowledge:

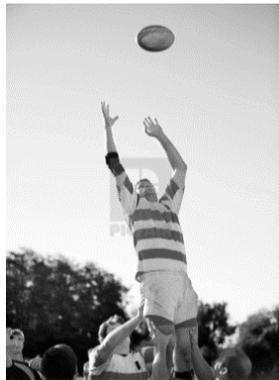
What makes an object fall down?

Source: *Cyber Science.rev 6 Worktext in Science and Technology, REX Bookstore*

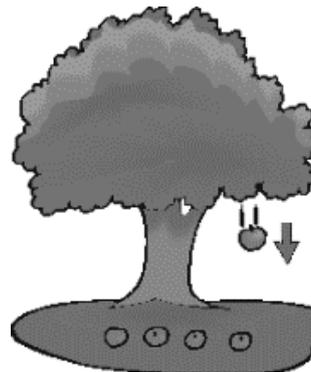


What is it

Anything that is thrown upward falls. This is because of gravity. **Gravity** is the force that pulls objects toward the ground. When an object falls, it moves faster and faster toward the ground. Falling objects are examples of accelerated motion due to the force of gravity.



<https://images.app.goo.gl/tWEgqJBeZm451JcV8>



<https://images.app.goo.gl/paPHkuXuZq8jO3Vv9>

In your activity, the ball and the coin that you have thrown upward fell to the ground at the same time. According to Galileo Galilei, gravity imposes a constant acceleration on all objects. He also found out that all objects are accelerated by gravity in the same way.

But, why is it that a sheet of paper falls more slowly than a crumpled one?

Have you seen a parachute? Describe its movement. Why does a parachute move slowly? How is the sheet of paper similar to a parachute? Are parachutes important? Why?

Your activity on the falling papers shows that **air resistance** affects movement of falling objects. The sheet of paper falls slowly because of air resistance. The surface area of the sheet of paper is greater than the crumpled one and is affected by the air which causes it to drop slowly. The crumpled paper has a smaller surface area which is not affected by air so it moves faster. The greater is the surface area of falling object, the greater is the air resistance that affects its movement.

This concept is similar to the use of parachute. A parachute falls slowly because of air resistance so it gives the assurance that the person using it will land safely. Its umbrella-shaped canopy reduces the speed of a falling object or person. Therefore, parachutes are used as lifesaving devices by skydivers, balloonists, pilots and passengers of aircrafts.

What happens when a falling person does not use parachute?

Without a parachute, the skydiver will move downward at 32 feet (9.75 meters) per second. That is, with each second of fall, the skydiver or any falling object is moving at a velocity of 32 feet per second and at the end of two seconds, 64 feet (19.5 meters) per second, and so on, which is very dangerous. At this rate, do you think the skydiver will survive the fall? The skydiver will need a force of air resistance to drop more slowly. Hence, here a parachute is needed.



<https://images.app.goo.gl/OEoGh8YEjQd9RM9>

Parachute slows down its free fall from the air.

Have you ever ridden a bicycle in going up a hill or mountain? Describe how you pedal. Why do you find difficulty in accelerating when you go up? Compare your rate of movement when you go downhill.

You find it difficult to go upward because you are going against gravity. Gravity is pulling you down and you need to apply greater force for you to move faster. You need to apply great force to pedal the bicycle for you to overcome gravity and be able to go up. But when you go downhill, it will be easy to move faster because gravity is pulling you down. You don't need to pedal to be able to go down. Gravity pulls you downward. You don't have to exert force to move because the wheels of the bicycle automatically roll as they are pulled by the gravity.



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Gravity makes acceleration difficult.



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Gravity makes acceleration easier.

Gravitational Force

On Earth, what goes up comes down. All objects are attracted toward the center of the Earth due to gravity. Gravity was observed by Isaac Newton. He recognized that an apple fell straight down because Earth attracted it. He wondered whether this force might extend beyond the trees, to the clouds, to the moon, and even beyond. He hypothesized that the force on the apple must be proportional to its mass.



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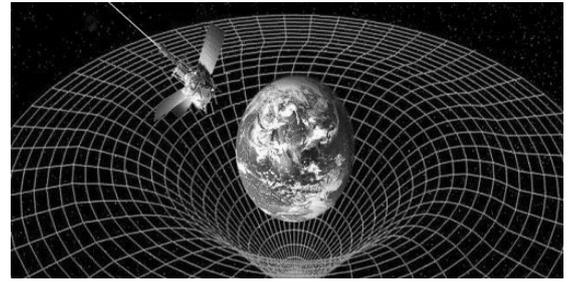
Newton observes that there is a force acting on the falling apple.

Gravitational force is the force of attraction between all masses in the universe, especially the attraction of Earth's mass for bodies near its surface. The more distant the body from the Earth, the less the gravitational force of attraction is.



<https://images.app.goo.gl/VgX8vsB4984oCZK88>

The moon stays on its orbit due to the gravity of Earth. The combination of the moon's inertia and the force of gravity between the moon and Earth keeps the moon orbiting the Earth. The force pulling it inward causes the acceleration. This acceleration is caused by gravity.



<https://images.app.goo.gl/AmfW5sH3iVkfKAD76>

Earth's gravitational force pulls objects toward it.

Would air resistance and mass affect falling objects?

When you drop a plastic ball and metal ball from the same height at the same time, the balls fall to the ground. The force that acts on the objects is gravitational force. You observed that there is a difference in the falling speed between the two balls. The ball with the greater mass falls at a greater speed while the ball with the lesser mass falls with the lesser speed. You concluded that heavy objects fall faster than lighter ones.

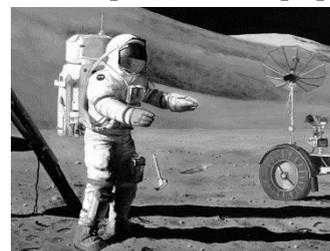
Try to drop two pieces of paper of the same kind and mass--- one is crumpled and the other one is not crumpled. Will it give the same result? You will observe that even the pieces of paper have the same mass, the crumpled paper will land on the ground first.

It is important to realize that objects falling on Earth must pass through air. When you drop the crumpled paper and the plain sheet of paper at the same height, you will notice that the crumpled one lands on the ground first. Air resistance acts against the motion of the plain sheet of paper more than it does against the crumpled paper. As a result, the air slows down the movement of the plain sheet paper more than it does with the crumpled paper.



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The hammer will fall faster than the feather when dropped on earth.



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Hammer and feather fall at the same speed when dropped on the moon due to absence of air resistance.

The speed of falling objects will be different on Earth and on the moon. If the air is removed, the air resistance will disappear. When the hammer and feather is

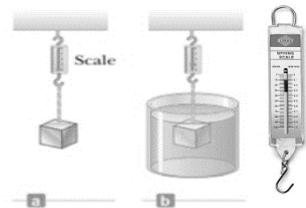
dropped on Earth at the same time, the hammer will fall faster than the feather. Air resistance acts against the feather, which slows down its falling.

But if you drop the feather and the hammer at the same time on the moon, the hammer and the feather will fall at the same speed. The moon has no air; therefore, there is no resistance acting on the falling object.

Scientists have learned that when the effects of air resistance are removed, objects of different weights fall at the same speed. In addition, air resistance may be too small to matter for objects that are fairly compact. Over short distances, such objects fall at the same speed.

When you throw an object upward, you apply force. What you throw up goes down because there is a force that pulls the object to the ground. Gravitational force pulls down anything toward the center of the earth. Objects fall toward the ground because of gravitational pull.

The direction and the amount of force can be measured by a spring scale. A spring scale measures the force of gravity exerted on an object. The amount of force needed to move an object depends on the mass of an object.



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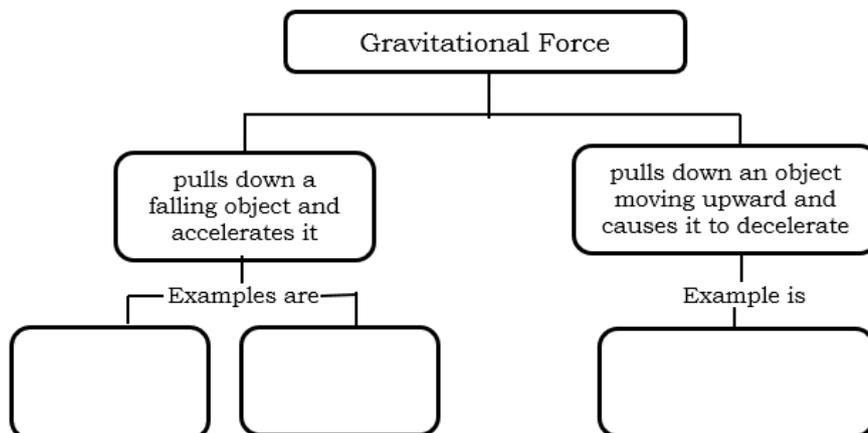
The spring scale attached to an object measures how much force you need to use to lift the object. The force of gravity exerted on an object is called the weight of an object. Weight is measured in newtons. The spring scale shows that the direction of gravity is downward. It also shows that weight is the downward force of gravity on an object.



What's More

Activity 4: Complete Me, Buddy!

Directions: Complete the concept map below. Give examples of activities that show the effect of gravitational force.





What I Have Learned

Now, that you already learned the effect of gravity on the movements of objects.
Let's try to answer this activity to reinforce your knowledge to this lesson.

Activity 5. Fill Me!

Directions: Use the words in the box to complete each statement. Write your answer on the space provided before the number.

gravity lesser faster
center increases farther

- _____ 1. All objects fall toward the _____ of the Earth.
- _____ 2. All objects tend to fall down even when thrown upwards because of the force of _____.
- _____ 3. The _____ you are from the Earth, the lesser is your weight.
- _____ 4. The force of gravity acting on an object decreases as the object's distance to the surface of the Earth _____.
- _____ 5. The nearer the body or object to the center of the Earth, the _____ it falls to the ground.



What I Can Do

Activity 6: Check your Understanding

Directions: Read and analyze each question. Answer in 1-5 sentences. Your points will be based on the given rubrics. Write your answer on the space provided.

1. A skydiver who jumps from a plane quickly falls toward the ground. When he opens his parachute, he begins to slow down. Explain the forces that are acting on it.

2. Earth is attracted to the sun by the force of gravity. Why is it that Earth does not fall into the sun?

3. Why do objects fall toward the center of the Earth?

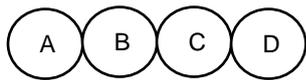
Rubrics:

Points	Description
5	<ul style="list-style-type: none">At least 3 sentences with correct answer/concept is/are written.Subject-verb agreement is evident
4	<ul style="list-style-type: none">At least 2 sentences with correct answer/concept is/are written.With 1-2 errors in grammar
3	<ul style="list-style-type: none">At least 1 sentence with correct answer/concept is written.Concept is not clearWith 3 errors in grammar
2	<ul style="list-style-type: none">Ideas presented are not clear.With more than 3 errors in grammar

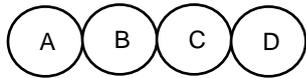


Assessment

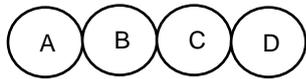
Direction: Read and analyze each statement. Shade the letter of the best answer.



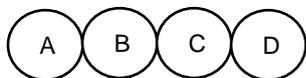
1. What causes falling objects to fall?
A. acceleration B. gravity C. speed D. wind



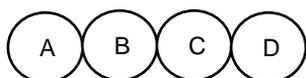
2. Which of the following describes a falling object?
A. It has accelerated motion.
B. It can possibly stop moving.
C. It has decelerated motion.
D. It can go up.



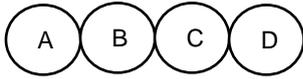
3. What happens when you go against gravity like when you walk up the stairs in going up a building?
A. More force is needed to move faster.
B. Less force must be exerted to move faster.
C. No force is needed to do the task.
D. There is no motion that can be observed.



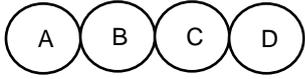
4. Why do you move faster when running down a hill even if you apply the same amount of force?
A. Gravity pulls you down.
B. Gravity pulls you up.
C. Wind pushes you forward.
D. Friction opposes your movement.



5. Why is parachute important to a skydiver?
A. It directs his/her motion.
B. It makes him/her fall faster.
C. It slows down his/her motion to have a safe landing.
D. It makes him/her appear beautiful as he/she falls.



6. Which refers to the force that pulls everything down or attracts a body toward the center of the Earth?
 A. gravity B. friction C. motion D. reaction

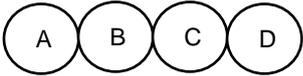


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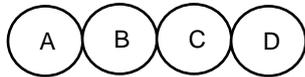
A girl placed the tennis ball along the edge of a table. After sometime, the ball rolls down and falls on the floor.

What force is mainly responsible for the falling of the ball to the floor?

- A. gravitational force C. kinetic force
 B. friction between surfaces D. magnetic force



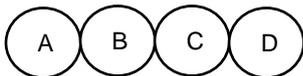
8. Which of the following situation shows a clear presence of gravity?
 A. A ball released on air falls to the ground.
 B. A baseball player catches the ball hit by the player of the other team.
 C. A girl waves her hand and say hello.
 D. A boy strikes the shuttlecock while playing badminton.



9. Look at the diagram below. At which point should a tennis ball be released in order to move it through the greatest distance while considering the effect of gravity?



- A. Point A B. Point B C. Point C D. Point D



10.

A tin can was tied to a garter and was hung on a stick. When a stone was placed in it, the garter stretched to an additional 5 cm length. When another bigger stone was added, the garter stretched again to an additional 9 cm length.

Which of the following describes how the pull of gravity affected the motion of the garter and the tin can used in the experiment?

- A. The mass of the stones in the can was decreased so the pull of gravity also decreased, pulling the garter upward.
 B. The mass of the stones in the can was increased so the pull of gravity also increased, stretching the garter downward.
 C. The tin can with stones became farther from the center of the Earth causing a decrease in gravitational pull.
 D. The tin can with stones became nearer to the center of the Earth causing a decrease in gravitational pull.

Answer Key

<p>Activity 1: Guess the Mystery Word</p> <p>FRICION</p> <p>Activity 2: Recognize Me!</p> <ol style="list-style-type: none"> fluid friction static friction sliding friction rolling friction fluid friction <p>Activity 3: Going Up and Down</p> <ol style="list-style-type: none"> The ball and the coin went down after being thrown upward. The coin reached the floor first because it has lesser weight than the ball. <ol style="list-style-type: none"> The flat sheet of paper dropped more slowly than the crumpled paper. The crumpled paper reached first on the floor because it has a smaller surface area which is not affected by air resistance. <p>Share your knowledge: The object falls down because of the force of gravity which pulls it toward the center of the Earth.</p>	<p>Activity 4: Complete Me, Buddy!</p> <p>Answers may vary.</p> <p>Activity 5: Fill Me!</p> <ol style="list-style-type: none"> center gravity faster increases faster <p>Activity 6: Check your Understanding</p> <ol style="list-style-type: none"> A skydiver who jumps from the plane quickly falls toward the ground but when he/she opens his/her parachute, he/she begin to slow down because its umbrella-shaped canopy reduces the speed of the falling parachute due to the opposite force exerted by air resistance. Earth is attracted to the sun by the force of gravity. Planet Earth doesn't fall into the sun because a centrifugal force acts on it, which pulls Earth outward. Two forces are acting equally, which causes the Earth to move in a circular path. Objects fall toward the center of Earth due to the pull of gravity. <p>Assessment</p> <ol style="list-style-type: none"> B E A A A A A A B
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