At-Home Learning Packet
The Crossroads School
6th Grade Science

Please note:
This packet is meant for students who are unable to access the 6th Science Google Classroom due to Internet or technology limitations. *It is HIGHLY recommended that you access material on the Google Classroom if you are able.*

Directions:
This packet provides you the opportunity to practice and show proficiency on standards (ESS1-2). Completed work from this packet will be turned in upon return to school and graded.

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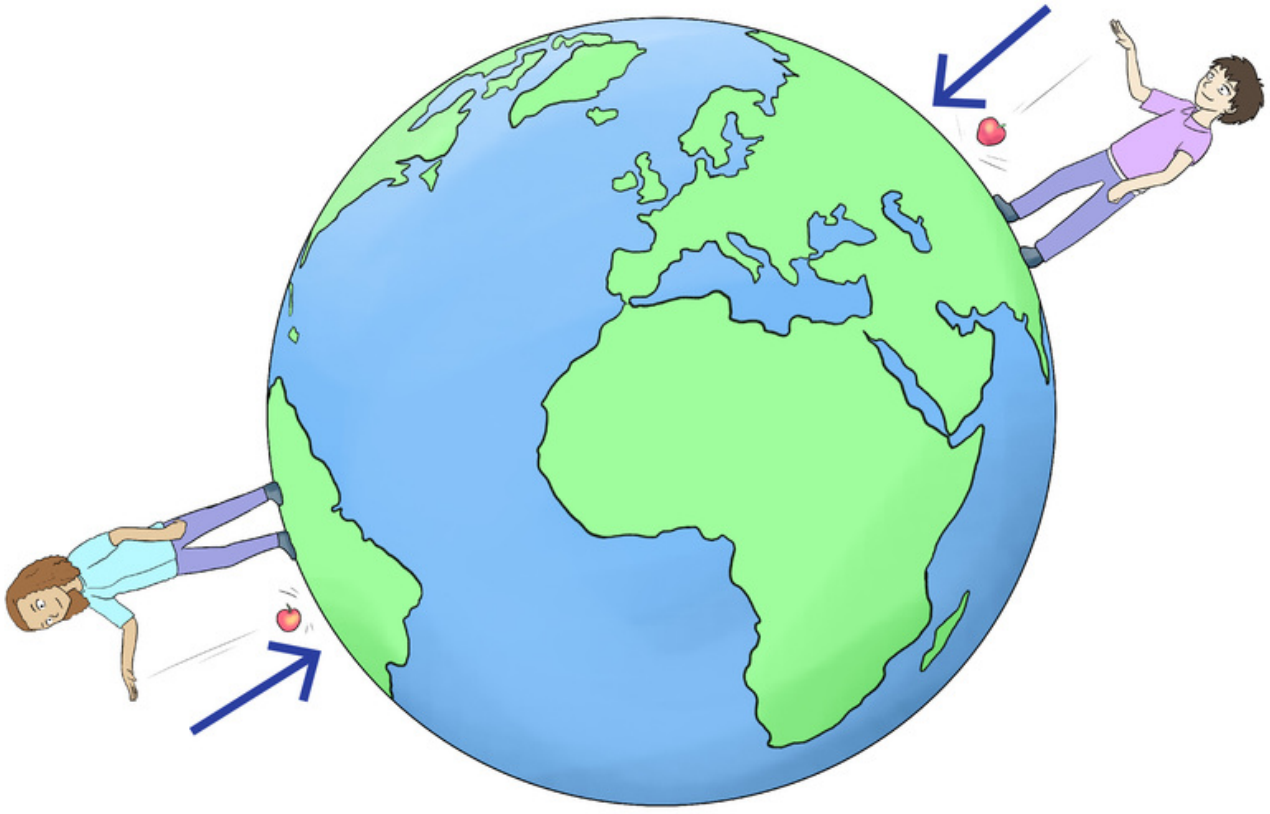
Call between 2pm-3pm weekdays

To Access the Google Classroom
- Log into your BCPSS Clever account
- Click the Google Classroom button
- Accept the Classroom invitation from Mr. Carroll
- Complete the assignments in the order they have been posted

For information about loginng in go to...
https://crossroads323.weebly.com/

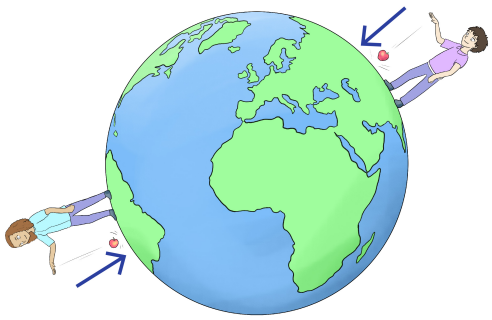
What is gravity?

By Newsela staff on 12.11.19
Word Count **86**
Level **MAX**



Newsela staff

Gravity is a force, which means that it pulls on objects. Everything in the universe, big or small, has its own gravitational force — even you!



Gravity affects all life on Earth. When you jump, you're always forced to come back down to the ground. This is because of Earth's gravity.

How does gravity pull things down to Earth?

By The Conversation, adapted by Newsela staff on 01.16.20
Word Count **458**
Level **560L**

Image 1. Everything in the universe has its own gravitational pull. When you throw an apple into the air, the Earth's gravity pulls it back down. But that's not the only thing that's happening: the gravity of the apple is also pulling on the Earth. Image by: Westend61/Getty Images

Gravity is a pulling force. It pulls objects toward each other. Everything in the universe has its own pull because of gravity. Large objects, such as the Earth, have a pull. So do small objects. You do, too!

Isaac Newton was a scientist. He studied gravity. The legend goes that Newton was sitting under an apple tree. He watched an apple fall to the ground. He wondered why it didn't go up to the sky instead.

After many experiments, Newton realized something: the force of gravity depends on an object's mass. Mass is how much material is in an object. The more mass an object has, the greater its force of gravity.

Newton made another important realization. Gravity doesn't just depend on mass. It also depends on the distance between two objects. The force gets smaller the farther apart the objects are. Let's take a trip around our universe to see how gravity works.

A Soccer Ball Comes Back Down To Earth

We'll start by playing a game of soccer. When you kick the ball into the air, the Earth's gravity pulls it back down. But the soccer ball also has a gravitational force. The gravity of the ball is also pulling on the Earth.

The Earth is much bigger than the soccer ball. It is also much more massive. That means Earth has a stronger gravitational pull than the ball. It is not affected by the pull of the soccer ball. Instead, the ball is affected by the pull of the Earth. This is why it gets pulled back down to Earth.

Why You Can Jump Higher On The Moon

Our next stop is outer space. The sun is much, much bigger than the Earth. It is more massive than the Earth. This means it has a stronger gravitational pull. The sun's gravity helps keep all the planets circling around it.

Now let's take a look at the moon. The moon shows how the pull of gravity is not the same everywhere. Remember that gravity is related to how massive an object is. The moon is smaller than the Earth. It is also less massive than the Earth. This means the force of gravity is stronger on Earth than it is on the moon.

Let's say you're walking on the moon. Your mass stays the same as it was on Earth. But your weight changes. An object's weight depends on its mass. It also depends on the pull of gravity on the object. Gravity does not pull as strongly on you when you're on the moon. That's why you weigh less on the moon than you do on Earth. This also explains why you can jump higher on the moon than you can on Earth.

Quiz

1 Read the section "A Soccer Ball Comes Back Down To Earth."

Select the sentence from the section that explains WHY the soccer ball falls to Earth.

(A) But the soccer ball also has a gravitational force.

(B) The gravity of the ball is also pulling on the Earth.

(C) It is not affected by the pull of the soccer ball.

(D) Instead, the ball is affected by the pull of the Earth.

2 Read the introduction [paragraphs 1 - 4].

Select the paragraph that explains HOW gravity was first discovered.

(A) Gravity is a pulling force. It pulls objects toward each other. Everything in the universe has its own pull because of gravity. Large objects, such as the Earth, have a pull. So do small objects. You do, too!

(B) Isaac Newton was a scientist. He studied gravity. The legend goes that Newton was sitting under an apple tree. He watched an apple fall to the ground. He wondered why it didn't go up to the sky instead.

(C) After many experiments, Newton realized something: the force of gravity depends on an object's mass. Mass is how much material is in an object. The more mass an object has, the greater its force of gravity.

(D) Newton made another important realization. Gravity doesn't just depend on mass. It also depends on the distance between two objects. The force gets smaller the farther apart the objects are. Let's take a trip around our universe to see how gravity works.

3 Read the following sentence from the introduction [paragraphs 1-4].

The legend goes that Newton was sitting under an apple tree.

Which word could replace "legend" WITHOUT changing the meaning of the sentence?

(A) lie

(B) story

(C) riddle

(D) facts

4 Read the following sentence from the section "Why You Can Jump Higher On The Moon."

It also depends on the pull of gravity on the object.

What does the word "object" mean?

(A) thing

(B) aim

(C) person

(D) design

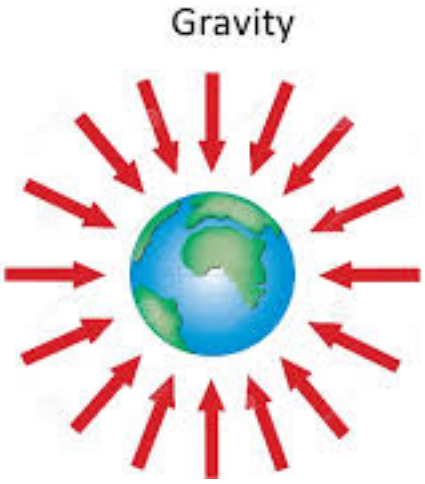
Gravity

Perhaps you have seen an image of the Apollo astronauts playfully "hopping" around on the surface of the moon. It appears almost like the astronauts are floating in slow motion. This is due to the fact that the moon has only 1/6th the gravity of Earth! The Moon has much less gravity because it is a much smaller object.

Gravitational Pull

Gravity is the force of attraction between two objects. For example, the reason you don't fall off Earth is that there is a force of attraction between you and the planet. **Gravitational pull** is based on the objects' ① *masses and* ② *distance between the two objects.* The more mass an object has, the more gravity it has. Also, the closer two objects are to each other, the more gravitational pull there is between them. Therefore, Earth's big mass pulls us (and penguins) towards the center of the planet. Being pulled towards the center of the planet feels like being pulled "down".

This also explains why the Sun doesn't pull us off the Earth. Even though the Sun has MUCH more mass than the Earth, it is so far away that the gravitation pull is very weak.



Gravity Mass and Weight

All objects have mass. **Mass** is a measurement of how much matter (stuff) an object is made of. An object's mass never changes**.**

An object's **weight** on the other hand, is a measure of the force of gravity pulling on it. For example, your weight is based on the gravity of Earth. If you traveled to the Moon you would weigh less and if you traveled to Jupiter you would weight more!

Gravity Notes

Setup Column or Web notes in the space below. Take notes from the reading.

Check In

1) What determines how much gravity an object has?

2) As you move farther from Earth does gravity increase or decrease?

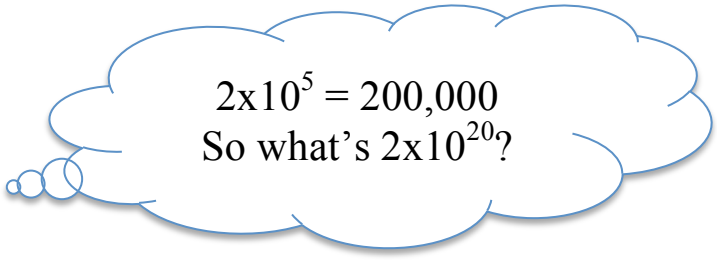
Increase Decrease

3) If you stood on a more massive planet would you feel more gravity or less?

More gravity Less gravity

4) If you stood on an asteroid very far from the Sun, would you feel more gravity or less gravity than here on Earth? Explain.

	Mass
Mercury	3×10^{23} kg
Earth	6×10^{24} kg
Jupiter	2×10^{27} kg



5) Which planet has the most mass?

Mercury Earth Jupiter

6) Which planet would have the most gravity?

Mercury Earth Jupiter

7) **THINK:** Which planet could you jump the highest on? Explain why.

8) Which planet would you weigh the **most** on? Explain.

_____

_____

9) Scientists have just discovered a new planet called Kepler-69c . The planet has the same density (is made of the same stuff) as Earth. Earth's diameter is 7,900km while Kepler-69c's diameter is 24,396 km.

Would you expect to weigh more on Earth or Kepler-69c? Explain

_____

_____

_____

_____

10) The table to the right shows the mass and weight of an object on Earth. Jupiter has nearly 2.5x the amount of gravity as on Earth. What are the approximate mass and weight of the same object on Jupiter? **Circe your answer**

Mass (kg)	Weight (N)
10	100

Mass (kg)	Weight (N)
4	25

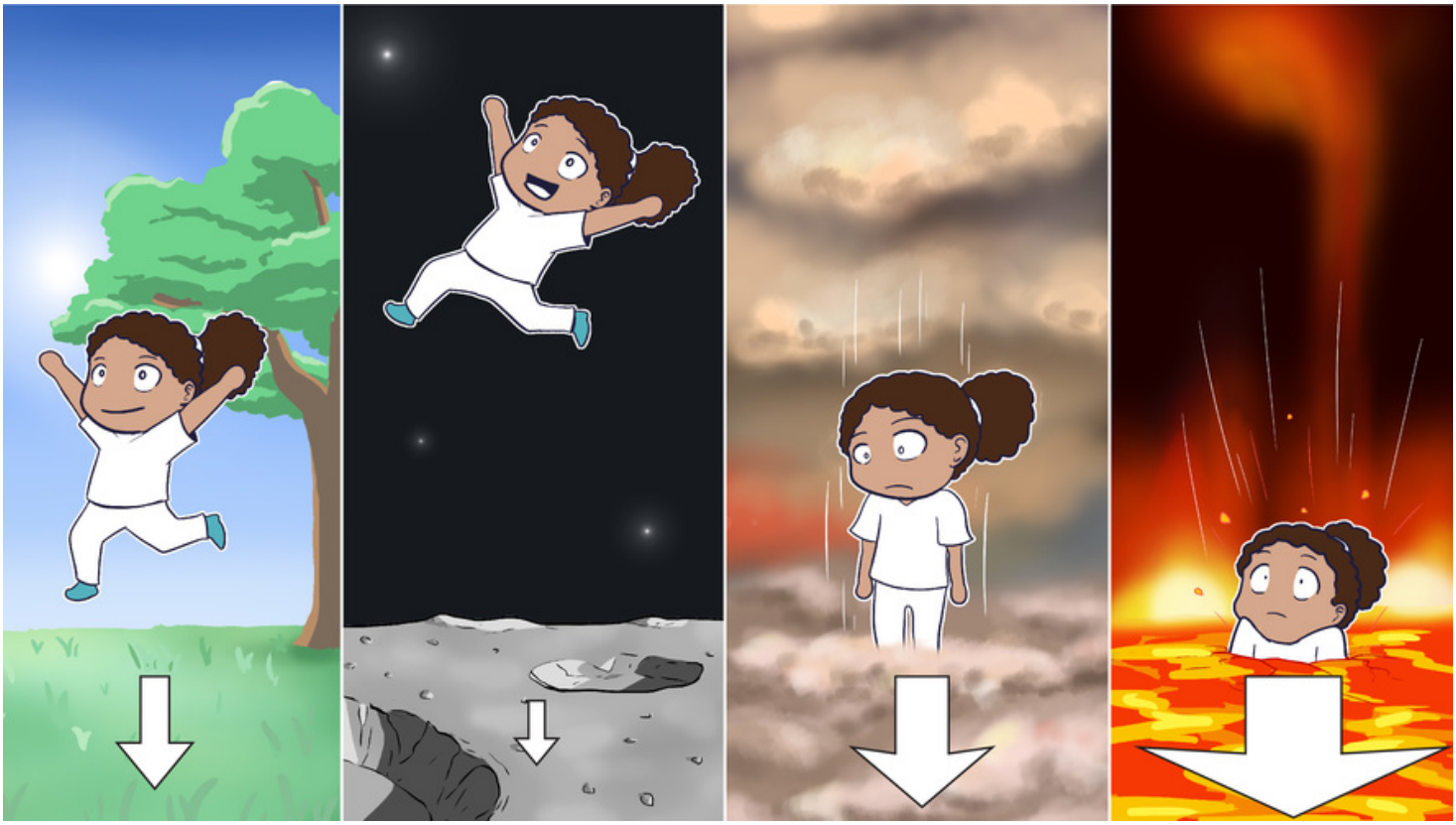
Mass (kg)	Weight (N)
10	250

Mass (kg)	Weight (N)
25	250

Mass (kg)	Weight (N)
10	100

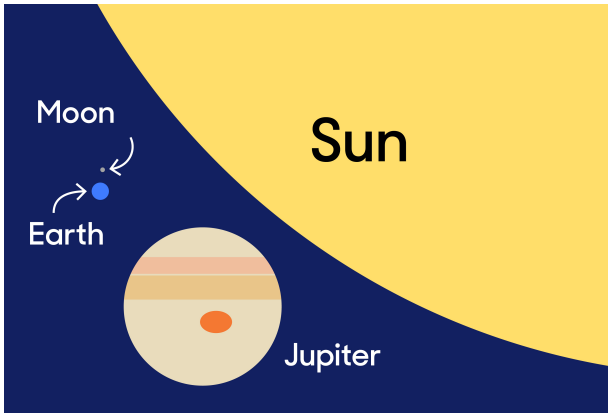
Gravity on different astronomical objects

By Newsela staff on 12.20.19
Word Count **185**
Level **MAX**



Four illustrations of a girl on the Earth, moon, Jupiter and sun. The girl jumps normally on Earth, jumps higher on the moon, can't jump at all on Jupiter, and is being pulled into the sun. Image by Newsela staff Newsela staff

Gravity is a force that pulls on objects. The amount of gravity depends on its mass, or the measure of matter in an object.

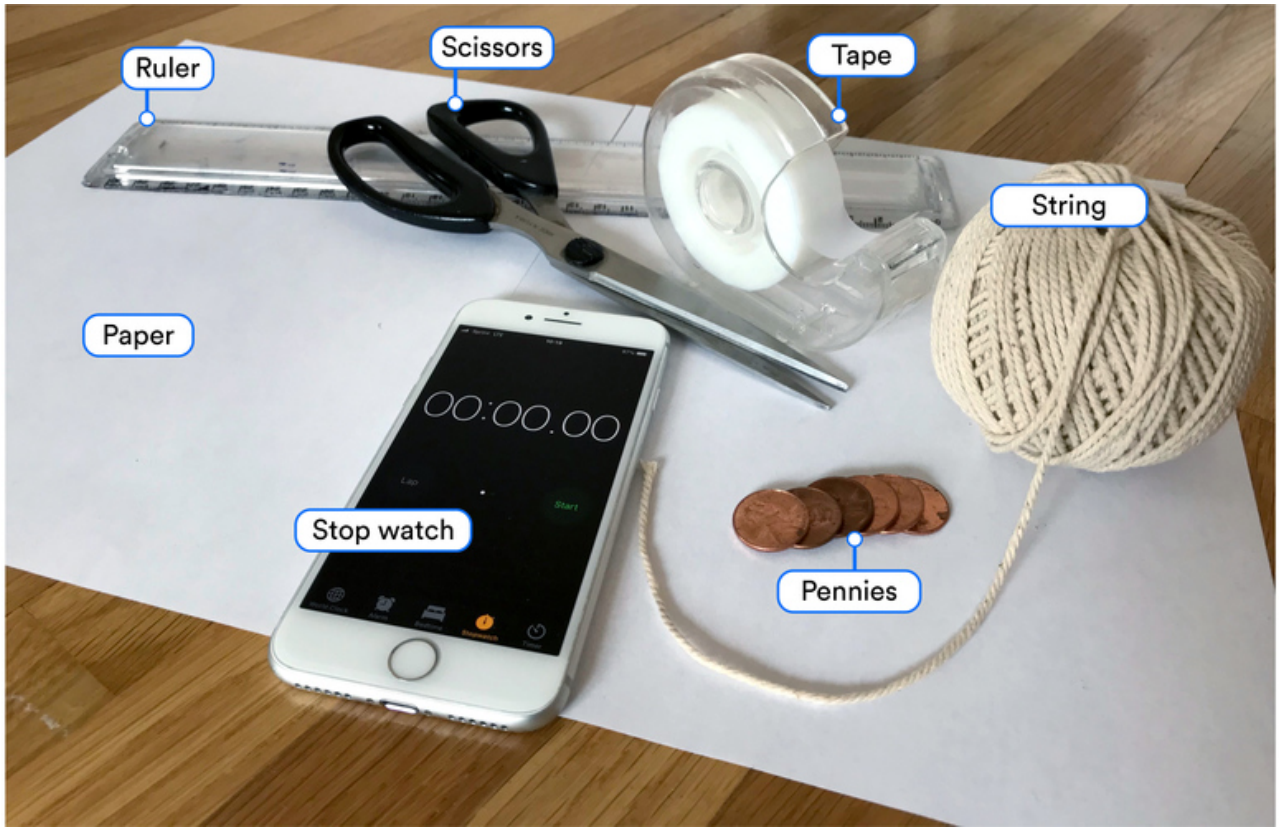


The more massive an object, the stronger its gravitational pull. The sun is the most massive object in our solar system so its gravity is the strongest. Planets like Jupiter and Earth have less mass than the sun, and the moon has even less mass still. This means the force of gravity is different for each.

Weight is a measure of the force of gravity on an object. Your weight would differ depending on where you are in the solar system.

Experiment: Swinging with a pendulum

By Scientific American/Science Buddies on 03.28.20
Word Count **666**
Level **MAX**



Use these items to learn more about how the motion of a pendulum is affected by gravity. Newsela staff

The back-and-forth motion of a playground swing is an example of a pendulum.

But pendulums can do more than provide fun at recess and help tell the time. Among other scientific applications, they can show that the Earth is huge! This is because the swinging motion of a pendulum is due to the force of gravity generated by the Earth's size. Other factors, including a pendulum's length, can also affect its motion. Do this activity to learn more.

Materials

Two identical chairs

String or yarn

Ten metal washers of identical size or six pennies

Strong tape

Measuring stick

Scissors

Stopwatch accurate to 0.1 second

An assistant

Preparation

1. Place the two chairs back-to-back. Space them about 1 meter (about 39 inches) apart. Lay the measuring stick on the backs of the two chairs, centered on the back of each.
2. Cut one piece of string to a length of 70 centimeters (about 28 inches). Cut a second piece of string to a length of 35 centimeters (about 14 inches). Tie one end of both strings to the measuring stick, toward the middle of the stick. Space the strings about 20 to 30 centimeters (about 8 to 12 inches) apart on the measuring stick.
3. Tie five metal washers to the free end of each string. Alternatively, if you are using pennies and tape, securely tape three pennies to the free end of each string. Tip: If the measuring stick does not seem to stably sit on the backs of the chairs, you can try to tape the ends of the stick to the chairs.

Procedure

1. Pull the strings tight (by holding on to the washers or pennies at the ends) and position the strings at the same angle from the measuring stick.
2. Have an assistant ready with a stopwatch. Drop the longer pendulum and, at the same time, have the assistant start the stopwatch. Then have the assistant stop the stopwatch when the pendulum returns back to its original position. If the pendulum hit anything as it swung, such as the wall, readjust your setup and try timing the pendulum again. How long does it take the longer pendulum to swing back to its original position? This is the period of the pendulum.
3. Again, pull the strings tight and hold them at the same angle from the meter stick.
4. Have the assistant reset the stopwatch. Drop the shorter pendulum and, once more, have the assistant time the period of the pendulum. How long does it take the shorter pendulum to swing back to its original position?
5. Time the periods of the shorter and longer pendulums a few more times. Are the periods consistent for each pendulum, or do they vary a lot?
6. Is the period of the longer pendulum longer or shorter than the period of the shorter pendulum? How different are the two periods? Is this what you expected?

Extra: Instead of timing the period of the swing, you could time how long each pendulum swings before it comes to rest. What is the total time that each pendulum swings?

Extra: Instead of changing the length of the string, change the number of weights attached to the string or the initial angle of the string. Do mass or initial angle affect the period of the pendulum? Do they affect the pendulum's total time?

Observations And Results

Did the longer pendulum have a longer period than the shorter pendulum? Was the longer pendulum's period not quite twice as long as the shorter pendulum's period?

A pendulum that is twice as long as another pendulum does not simply have a period that is also twice as long. The exact periods of your longer and shorter pendulums might be slightly less than 1.7 seconds and 1.2 seconds, respectively, because of friction and because their lengths were less than 70 centimeters (about 28 inches) and 35 centimeters (about 14 inches) because of strings being used to tie to attachments.

Record your data and observations below.

Name:_____

Birth of a Star

Where are stars born?

Ever wondered where stars are made? Stars start their lives in a **nebula** and they are basically the nurseries of the Universe.

Nebula

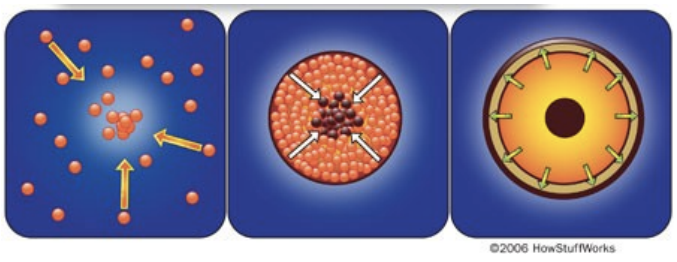
A nebula is a gigantic cloud of dust and gas. A nebular is mainly hydrogen and helium gases. They can be light years across - that's trillions of miles! They normally look quite fuzzy in appearance - pretty much like fluffy clouds or cotton wool in the sky.

Nebulae come in a variety of sizes, and a range of shapes with some of them looking very much like anything from horses (the Horsehead Nebula) to crabs (the Crab Nebula).

How do stars form?

The first step in the birth of a star is to wait. Dust, gas, and other materials sit around in nebulae, and wait for possibly millennia (millions of years) until a passing star, or some other heavy body passes by and stirs things up a bit.

When a heavy body passes near or through the nebula, its gravity causes swirls and ripples in the gas and dust. It would be like spreading marbles out on a trampoline, and then rolling a heavy ball through the middle. The marbles would roll around, and clump together near the path the ball took. It is the same in a nebula when a star passes by. When the marbles gather in places, the dip in the trampoline causes other marbles to gather in the same spot until there are just a few piles of marbles. This process is called "**accretion**".



Name:_____

What is a protostar?

The "piles" of matter continue to group together in the nebula until they are gigantic clumps of dust and gas. At this stage, the clump is called a ***protostar***. As the protostar becomes larger, gravity squeezes it tighter. This causes the protostar to get hotter and more dense. If you have ever pumped a bicycle tire, you know that when the air becomes compressed, it becomes hotter. When the core of the star reaches a temperature of 10 million °C hydrogen fusion starts. **Now, the protostar has become a star**. It shines with its own light. Around the protostar is a **protoplanetary** disk. The disk is made up of all the left over dust and gas that didn't collapse into the star. This left over dust and gas can eventually form planets around the newborn star.

How does gravity form stars and solar systems? Write your answer below.

GRAVITY Name_____(V1)

<u>Part One</u>: Use the Word Bank to answer Questions 1 through 5. Answers may be used more than once.

Word Bank			
a. increases	b. decreases	c. stays the same	d. distance
e. mass	f. volume	g. gravity	

_____1. The gravitational force between 2 objects _____ as the distance between them decreases.

_____2. The gravitational force between two objects _____ as the mass of one or both objects decreases.

_____3. You weigh more on planets with higher surface gravity, but your _____ does not change.

_____4.
_____5. } The two factors (in any order) that affect how strong the force of gravity between two objects are _____ and _____ . (Answers are in word bank.)

<u>Part Two</u>: Read the multiple-choice questions and write the *best* answer on the line.

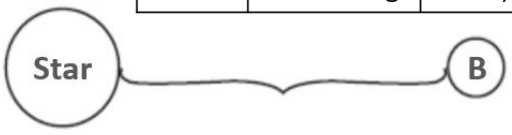
_____6. The pull of gravity on Earth is a direct result of the
a. weight of the Earth's atmosphere.
b. rotation of Earth on its axis.
c. magnetic field of Earth.
d. mass of Earth.

_____7. A person on Pluto's surface would experience a(n) _____ gravitational force compared to on Earth. (Pluto is a very small planet that is very far out in the solar system.)
a. Weaker, because Pluto is further from the Sun.
b. Weaker, because Pluto has less mass than Earth.
c. Equal, because both planets orbit the Sun.
d. Stronger, because Pluto's surface is closer to its core.

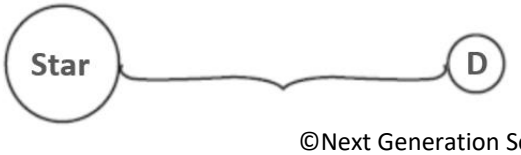
_____8. The diagrams below represent the same star near four different planets. The star has the same mass in each picture. The data table shows the mass of each planet and the distance between the star and the planet. Which combination would have the **greatest** pull of gravity?

Planet	Mass	Distance From Star
A	4×10^{24} kg	150,000,000 km
B	1×10^{24} kg	300,000,000 km
C	10×10^{24} kg	75,000,000 km
D	6×10^{24} kg	200,000,000 km

a. 

b. 

c. 

d. 

_____9. If a spacecraft travels from Earth to the edge of the solar system, what will happen to the gravitational pull between Earth and the spacecraft? (V1)

The gravitational pull between Earth and the spacecraft will _____ .

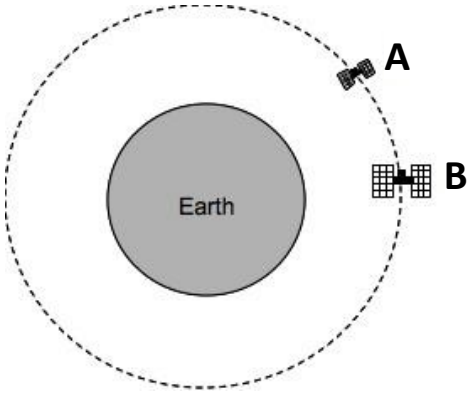
a. increase b. decrease c. remain the same

_____10. How would the properties of a golf ball change if it were moved from Earth to Jupiter, a planet that has a much higher mass than Earth?

a. It would have the same mass, but a different weight.
b. It would have the same weight, but a different mass.
c. It would have the same density, but a different mass.
d. It would have the same mass, but a different density.

_____11. Satellite B has three times more mass than Satellite A.
Which satellite experiences a stronger gravitational attraction with the Earth?

a. Neither, because they are in space.
b. A, because it is easier to move.
c. Neither, since they are at the same distance.
d. B, because it has more mass.
e. Cannot be determined with the given information.



_____12. Which of the following best describes the role of gravity in the formation of stars?

a. Gravity converts solid matter into gases and light energy.
b. Gravity causes gases and dust particles to condense into spheres.
c. Gravity cools gases and liquids until they become one solid mass.
d. Gravity pushes rocks and dust particles outward from a dense center.

_____13. The table to the right shows the mass and weight of an object on Earth. The force of gravity on the Moon is about one-sixth the force of gravity on Earth. What are the approximate mass and the approximate weight of the same object on the Moon?

Mass (kg)	Weight (N)
6.0	60

a.

Mass (kg)	Weight (N)
36.0	360

b.

Mass (kg)	Weight (N)
6.0	360

c.

Mass (kg)	Weight (N)
6.0	10

d.

Mass (kg)	Weight (N)
1.0	10

_____14. One factor responsible for the strength of gravitational attraction between a planet and the Sun is the

a. degree of tilt of the planet's axis
b. how much sunlight reaches the planet
c. how long a planet takes to rotate on its axis
d. distance between the planet and the Sun