



## TEACHER GUIDE

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## STUDENT HANDOUTS

### • Reading Comprehension

1. <i>An Introduction to the Universe</i> .....	
2. <i>Measuring Distance in the Universe</i> .....	
3. <i>Nebulae</i> .....	
4. <i>Galaxies</i> .....	
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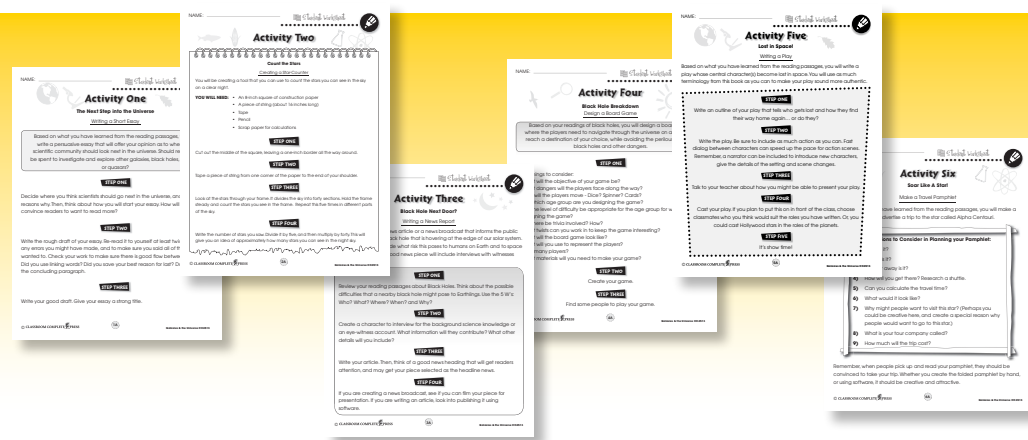
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- Click on item CC4513 – Galaxies & the Universe
- Enter pass code CC4513D





# Gravity

- Think about what you already know about gravity. Write your answers in point-form notes in the "Know" column of the K-W-L Chart included with this section. Try to think of as many things as you can to write in your list.
- Complete each sentence with a word from the list. Use a dictionary to help you.

weightlessness    satellite    asteroid    planets    bigger    magnets

- Gravity is a pull force that holds things onto the Earth. It is when things are attracted to each other, like \_\_\_\_\_.
- Astronauts who fly into space can experience \_\_\_\_\_, which allows them to see what it would feel like to fly.
- Things that are \_\_\_\_\_ have a greater pull on them from gravity.
- Gravity keeps all of the \_\_\_\_\_ in their places as they orbit around the Sun.
- A \_\_\_\_\_ is any object that orbits around another object. For example, the Moon is one because it orbits the Earth.
- An \_\_\_\_\_ is a space rock that is pulled into orbit by a nearby planet. There is a belt of them in our solar system.

- Which two pictures best show gravity at work?

- a)                      b)                      c)                      d)



# Gravity

**D**o you ever wonder why we don't fall off the Earth as it rotates? The reason is **gravity**. Gravity is a force that tries to pull two objects toward each other. Every object that has **mass** (like weight), is pulled by gravity. The bigger the object, the stronger the pull of gravity on it. On Earth, the force of gravity pulls everything toward the inner center of the planet. No matter where you are on Earth, you are being pulled towards the Earth's core.



Gravity is also what keeps the planets in orbit around the Sun. The Sun is such a large object that its gravity keeps all of the planets around it in orbit. Gravity is also what keeps the Moon in orbit around the Earth. Gravity allows a **satellite** (like the Moon or planets) to move in a circular orbit around another object. It is what keeps the Moon on course so that it doesn't crash into the Earth.

**STOP** Pose a Question- At this point, refer back to the K-W-L Chart you are working on and add any questions you have now to the "Wonder" column. What do you still wonder about gravity?

The asteroid belt in between Mars and Jupiter is held in place because of the strong pull of Jupiter's gravity. That is why the asteroids don't just continue on their way. They have been sucked into orbit on their way past. Not all gravitational forces are the same. Jupiter's **gravitational force** is quite strong. The Moon's gravity is not. When astronauts landed on the Moon, they found that their weight was a lot less there than it was on Earth. This is because the force pulling them down and making them feel heavy is weaker. The giant planets all have stronger gravitational forces than the smaller planets.

Isaac Newton was the first to discover that gravity existed. His findings helped people to study space better. Once people understood gravity, they realized that there was a predictable pattern to how the planets and stars move.



# Gravity

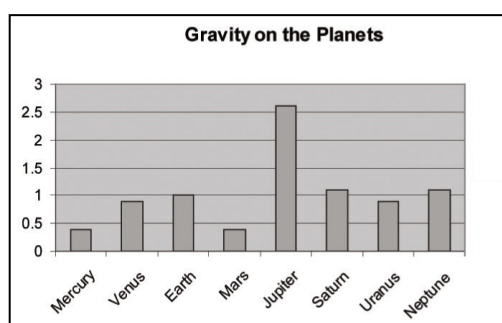
- Complete the last column of your chart, "Learned", adding in what you learned from reading the passage. Make point-form notes of all of the new information that you read.

- Circle the word **TRUE** if the statement is TRUE. Circle the word **FALSE** if it is FALSE.

- A planet is a satellite.  
TRUE                  FALSE
- A little girl flying a kite is a good example of gravity at work.  
TRUE                  FALSE
- A car would have a greater gravitational pull on it than an apartment building.  
TRUE                  FALSE
- Without gravity, the planets might go off their course and crash into each other.  
TRUE                  FALSE
- There is an asteroid belt in between Saturn and Jupiter.  
TRUE                  FALSE
- A little girl playing with a yo-yo is a good example of gravity at work.  
TRUE                  FALSE
- The strength of the gravitational pull is the same on all of the planets.  
TRUE                  FALSE

- Look at the chart to answer these questions.

- Which planet has the greatest gravitational force?
- Which planets have the weakest gravitational force?
- Which planet has the same gravitational force as Mercury?
- Which planet has the same gravitational force as Neptune?
- What is the gravitational force of the Earth?



# Gravity

- Answer each question with a complete sentence.

- Looking back at the chart from question #3, what pattern do you notice about the size of planets compared to their gravitational force?  
\_\_\_\_\_
- Explain why a mountain has a greater gravitational pull on it than a house does?  
\_\_\_\_\_
- What is stopping the asteroids in the asteroid belt from crashing into Earth?  
\_\_\_\_\_

## Research & Extension

Astronauts get to experience a break from gravity weighing them down when they fly in space. This is called *weightlessness*. How does this work? It sounds like a lot of fun, but there are some negative effects on the body too. Research this topic and make notes about what you learn as you go.

- Create an on-the-scene news interview that tells viewers about the experience of astronauts who are currently experiencing the effects of weightlessness in space. You may need to have some people help by playing different roles during your interview.
- Create a model that demonstrates how weightlessness (or "zero g") happens. Orally present your model to the class to explain how weightlessness can be achieved.
- Pretend you are a fitness trainer who is responsible for keeping the astronauts on a mission in top shape. Plan different exercises that could be done so that they can stay in shape while weightless. You may present this as an exercise video, a gym class, a booklet, or other way. Talk to your teacher about your choice.



# Graph It!

## HOW MUCH WOULD YOU WEIGH ON THE MOON?

When you consider the force of gravity with the distance to the center of a planet, you can create equations to figure out how much you would weigh at different places in the universe. What you weigh on Earth is not necessarily what you would weigh on other planets with different gravitational forces. Complete the table below to compare how much you would weigh in the places listed.

Places in the Universe	Your weight on Earth (in lbs)	Math operation	Your new weight
Sun		÷ 0.03	=
Mercury		X 0.4	=
Venus		X 0.9	=
Mars		X 0.4	=
Jupiter		X 2.5	=
Saturn		X 1.1	=
Uranus		X 0.8	=
Neptune		X 1.2	=
Pluto		X 0.01	=
Moon		X 0.17	=

An average male African elephant weighs 15,400 lbs. The female weighs 7,900 lbs. If an elephant could choose which planet they would like to give you an elephant-back ride on, which would it be and why?

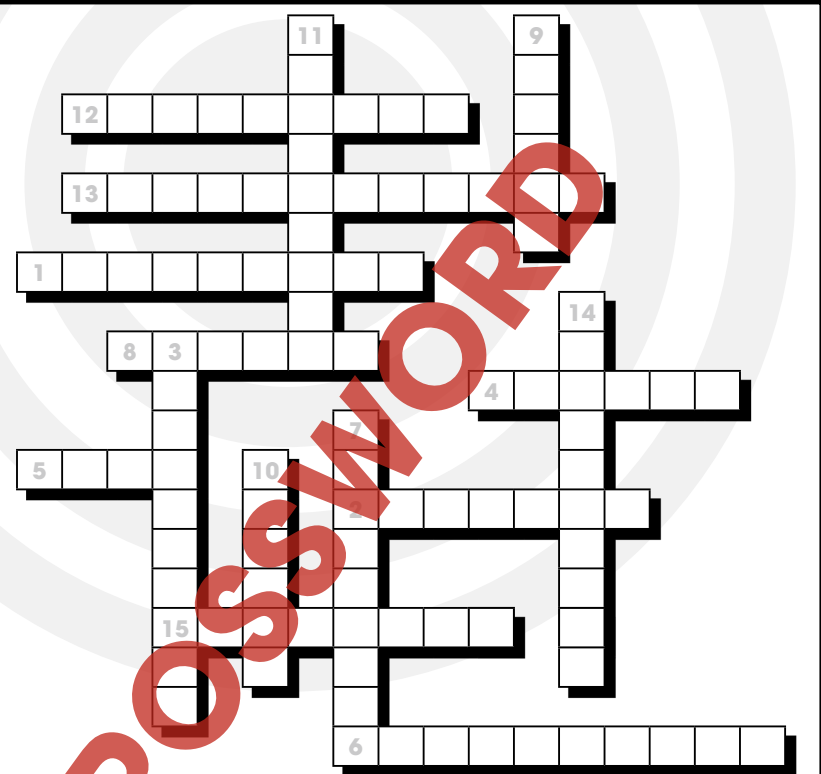
If you had to give an elephant a ride, which planet would you prefer to do it on? Why? How much would the elephant weigh there?



# Crossword Puzzle!

### Word List

- Astronomer
- Black Hole
- Elliptical
- Galaxy
- Gravity
- Interstellar
- Light Year
- Matter
- Milky Way
- Nebula
- Quasar
- Reflection
- Satellite
- Star
- Telescope



### Across

- An object that you cannot really see in space (2 words)
- A force that tries to pull two objects together
- An enormous group of star clusters
- A ball of hot gas
- One of the types of nebulae
- The whole universe is made up of these tiny particles
- The moon is a \_\_\_\_\_ of the Earth because it orbits around it
- The space between stars is called this
- The name of the galaxy that our solar system rotates across (2 words)

### Down

- A scientist who studies the universe
- A unit used to measure distance in space (2 words)
- The most distant objects in the universe that we can see
- A cloud of dust and gas
- A tool used to see objects in space
- One of the shapes that a galaxy may take



# Comprehension Quiz

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### Part A

Circle the word **TRUE** if the statement is TRUE or Circle the word **FALSE** if it is FALSE.

- The solar system consists of the Sun and everything that orbits it.  
**TRUE**      **FALSE**
- Looking out into the universe is like looking back in time.  
**TRUE**      **FALSE**
- A light year is not quite as long as a year. It is only 300 days.  
**TRUE**      **FALSE**
- A nebula is a cloud of dust and gas in space.  
**TRUE**      **FALSE**
- Gravity is a force that pushes two objects away from each other.  
**TRUE**      **FALSE**
- The Sun is a star in the Milky Way galaxy.  
**TRUE**      **FALSE**
- The force of gravity is so weak near black holes that they are invisible.  
**TRUE**      **FALSE**
- Scientists continue to discover new things about the universe.  
**TRUE**      **FALSE**

### Part B

Sort the words in the Word Bank into logical groups by writing each word into a space that makes the best fit. (e.g. PETS: cat, dog, rabbit)

- Quasar:      old      far      a) \_\_\_\_\_
- Galaxies:      elliptical      barred      b) \_\_\_\_\_
- Big Bang:      explosion      fireball      c) \_\_\_\_\_
- Light year:      measure      travel      d) \_\_\_\_\_
- Nebula:      gas      dust      e) \_\_\_\_\_
- Milky Way:      Local Group      stars      f) \_\_\_\_\_

### WORD BANK

- distance
- spiral
- cloud
- galaxy
- bright
- theory

# The Rosette Nebula



NAME: \_\_\_\_\_

After You Read 



# Gravity



## 4. Answer each question with a complete sentence.

a) Looking back at the chart from question #3, what pattern do you notice about the size of planets compared to their gravitational force?

\_\_\_\_\_

\_\_\_\_\_

b) Explain why a mountain has a greater gravitational pull on it than a house does?

\_\_\_\_\_

\_\_\_\_\_

c) What is stopping the asteroids in the asteroid belt from crashing into Earth?

\_\_\_\_\_

\_\_\_\_\_

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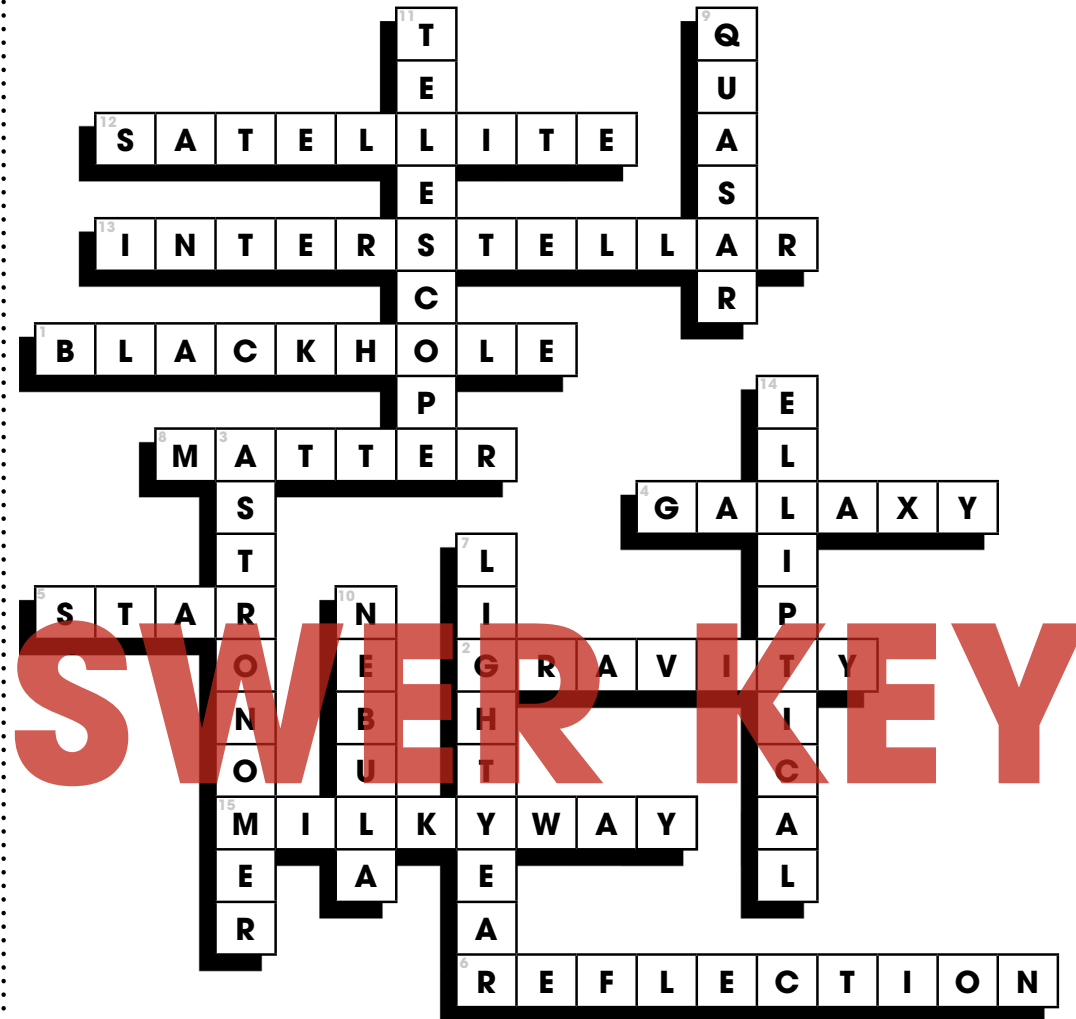
4.

a) The larger planets have more gravitational pull, the smaller planets have less.

b) A mountain has more gravitational pull than a house because the more mass (weight) in an object the gravitational pull would be stronger.

c) The asteroid belt is held in place because of the strong pull of Jupiter's gravity.

## Crossword Puzzle!



EASY MARKING ANSWER KEY

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