Name: _____ Date: _____ #___

Seeing Stars

NASA
Scientists recently determined that the number of visible stars in the universe is 70 sextillion.

1. Read and track your thinking with meaningful and thoughtful thinking.
EOG Practice

Have you ever gazed at the night sky and guessed that it held thousands of stars? Well, think again! Scientists recently determined that the number of visible stars in the universe is 70 **sextillion**. (That's 7 followed by 21 zeros!) According to scientists, there are ten times more stars in the universe than grains of sand on all the deserts and beaches in the world.

Luckily for the scientists, they did not have to count each star. They used powerful **telescopes** to count the stars located in one section of sky. A telescope is a device used to observe distant objects. The scientists then estimated the number of sections of sky in the entire universe and multiplied that number by the number of stars in the counted section.

The recent study found seven times more stars than had been calculated previously. "Even for an astronomer used to dealing in monster numbers, this is mind-boggling," said one scientist.

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1. What did scientists recently determine?

- **A** Scientists recently determined that the number of visible stars in the universe is 70 sextillion.
- **B** Scientists recently determined the number of grains of sand on all the deserts and beaches in the world.
- **C** Scientists recently determined the number of visible moons in the universe.
- **D** Scientists recently determined that they had overestimated the number of visible stars in the universe.

2. The text describes the process by which scientists counted the visible stars in the universe. What was the first step in that process?

- **A** Scientists estimated the number of sections of sky in the entire universe.
- **B** Scientists multiplied the number of sections of sky in the universe by the number of stars in one of those sections.
- **C** Scientists counted each star one by one.
- **D** Scientists used telescopes to count the stars in one section of the sky.

3. Read these sentences from the text.

"According to scientists, there are ten times more stars in the universe than grains of sand on all the deserts and beaches in the world.

"Luckily for the scientists, they did not have to count each star. They used powerful telescopes to count the stars located in one section of sky. A telescope is a device used to observe distant objects. The scientists then estimated the number of sections of sky in the entire universe and multiplied that number by the number of stars in the counted section."

Based on this information, why might scientists not have counted each star?

- **A** Scientists prefer doing things slowly to doing things quickly.
- **B** Scientists like doing multiplication more than addition.
- **C** Counting each star would have taken a long time.
- **D** Counting grains of sand is more enjoyable than counting stars.

4. Read this sentence from the text.

"Scientists recently determined that the number of visible stars in the universe is 70 sextillion."

Based on this information, what can you infer about the total number of stars in the universe?

A The total number of stars in the universe might be greater than 70 sextillion if invisible stars were to be counted too.
B There may be fewer than 70 sextillion stars in the universe because scientists were not counting stars one by one.
C Scientists were surprised that the total number of stars in the universe was not higher than 70 sextillion.
D Scientists were surprised that the total number of stars in the universe was not lower than 70 sextillion.

5. What is the main idea of this text?

A There are more stars in the universe than grains of sand on all the deserts and beaches in the world.
B Scientists recently calculated the number of visible stars in the universe.
C The number 70 sextillion is 7 followed by 21 zeros.
D A telescope is a device used to observe distant objects, such as stars.

6. Read these sentences from the text.

"Scientists recently determined that the number of visible stars in the universe is 70 sextillion. (That's 7 followed by 21 zeros!) According to scientists, there are ten times more stars in the universe than grains of sand on all the deserts and beaches in the world."

Why might the author have included the information about grains of sand?

A to help readers comprehend how many stars there are in the universe
B to make clear the importance of protecting the world's deserts and beaches
C to suggest that most people care more about grains of sand than stars
D to prove that counting stars is easier than counting grains of sand

7. Read these sentences from the text.

"Luckily for the scientists, they did not have to count each star. They used powerful telescopes to count the stars located in one section of sky."

How could the second sentence be rewritten to show the relationship between both sentences?

A For example, they used powerful telescopes to count the stars located in one section of the sky.
B In conclusion, they used powerful telescopes to count the stars located in one section of the sky.
C Instead, they used powerful telescopes to count the stars located in one section of the sky.
D Additionally, they used powerful telescopes to count the stars located in one section of the sky.

8. What is a telescope?

2. Answer in complete sentences.

9. What did scientists do after using telescopes to count the stars located in one section of the sky? Include two pieces of information from the text in your answer.

10. Explain whether scientists would have been able to determine the number of visible stars in the universe without using telescopes. Support your answer with evidence from the text.

Satellites and Gravity

By ReadWorks

You may have heard the story of how Isaac Newton discovered gravity. As the legend goes, Newton was sitting under an apple tree when, all of a sudden, an apple dropped from the tree and fell on his head. This incident made him wonder why the apple fell toward the ground and not in any other direction.

Nowadays, it seems quite silly to think that an apple might fall up, or sideways. That's because now we know that Earth's gravity makes everything fall down, toward the planet's center. Gravity is the reason we are able to stand on the earth. Without it, we would all float off into space!

Gravity is also necessary for the operation of satellites. Usually when people talk about satellites, they are referring to manmade objects that have been sent into orbit. However, the moon is also a satellite! A satellite is any object that revolves around a planet in a circular or elliptical path. The path of a satellite is its orbit.

Manmade satellites have all kinds of important applications. Communications satellites, for instance, are satellites that are sent to orbit the earth for the purpose of sending communication signals or messages. Though we might not think about it when we're on the phone, using the Internet, watching television, or listening to the radio, many satellites help make those activities possible for us to enjoy.

Scientists have used observation satellites. These are satellites that have been specifically designed to monitor the earth. Observation satellites are used to keep track of the weather, detect changes in the environment, and create maps of the earth. They can be very useful for scientists in monitoring natural disasters, global warming, pollution, and other changes to the planet. The military also has spy satellites (very similar to observation satellites) that help them to peek in on other people around the world.

If you're ever in the car and need to find directions to go somewhere, you have probably used the Global Positioning System, also known as GPS. This is a network of 24 satellites that people with a GPS receiver can use to determine their location.

These are the main applications of satellites you may have encountered in your everyday life, but of course there are countless others! Satellites are incredibly useful, but how exactly do they stay in orbit?

It might seem strange that gravity doesn't cause satellites to just fall straight down to Earth, like Newton's apple. Why is that? It turns out that the earth's gravitational pull on an object weakens the farther away it is from the planet's surface. Satellites orbit far above the earth's surface at a set speed. Earth has an "escape velocity," which is the minimum speed necessary for an object to escape the earth's gravity entirely and fly off into outer space. Earth's escape velocity is more than 25,000 miles per hour. Engineers don't build satellites that travel faster than that because they don't want their satellites flying off into space.

Satellites are designed to achieve a balance. They revolve around the earth slowly enough to avoid drifting off into space, but fast enough to avoid getting pulled completely down toward the center of the earth by the force of gravity. At the correct velocity, a satellite is pulled by the earth with just enough force to maintain its orbit. The closer a satellite is to the earth's surface, the faster it needs to go in order to stay in orbit. And satellites have a circular or elliptical orbit because they are constantly being pulled toward the earth's surface, which is curved.

Therefore, gravity is an important part of our daily lives, whether it's keeping our feet firmly planted on the planet's surface, or keeping our satellites in orbit to help us communicate with one another and learn more about the world we live in.

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1. What is a satellite?

A) any object affected by Earth's gravitational pull
B) a manmade object that allows us to communicate or observe our environment
C) any object that revolves around a planet in a circular or elliptical path
D) a network of 24 objects in space that help people determine their location

2. What causes satellites to remain in orbit above Earth?

A) Satellites achieve a balance between gravity and their velocity that keeps them in orbit.
B) Satellites reach their escape velocity with the help of scientists and engineers.
C) Satellites have a circular or elliptical orbit.
D) Gravity pulls satellites sideways around Earth's curved surface.

3. We depend on satellites for many of our communication needs.

What evidence from the text supports this conclusion?

A) The military has spy satellites to help them peek in on other people around the world.
B) Satellites allow us to use the phone, Internet, television, and radio.
C) Earth's gravitational pull on an object weakens the farther away it is from the planet's surface.
D) Isaac Newton discovered gravity when an apple fell on his head.

4. Read this sentence from the text.
"Observation satellites are used to keep track of the weather . . . . [and] can be very useful for scientists in monitoring natural disasters, global warming, [and] pollution."

Based on this evidence, what conclusion can be made?

A) Satellites cause a large amount of pollution.
B) Scientists spend lots of money to build and repair satellites.
C) Satellites can help us be aware of potential dangers.
D) Scientists believe satellites can help us change weather patterns.

5. What is the main idea of this text?

A) Satellites allow us to communicate easily and learn more about the world we live in.
B) Earth's gravity allows us to use satellites for communication and observation.
C) Isaac Newton's discovery of gravity has revolutionized the way we think.
D) Earth's escape velocity is more than 25,000 miles per hour.

6. Read these sentences from the text.
"Manmade satellites have all kinds of important applications. Communications satellites, for instance, are satellites that are sent to orbit the Earth for the purpose of sending communication signals or messages."

As used in the text, what does the word "applications" mean?

A) lessons
B) problems
C) mysteries
D) uses

7. Choose the answer that best completes the sentence.
Scientists depend on satellites for many things, _____ information about global warming and pollution.

A) otherwise
B) therefore
C) instead
D) including

8. What is "escape velocity"? (complete sentences)

_____
_____
_____
_____

9. How do engineers keep satellites in orbit around the Earth? (complete sentences)

_____
_____
_____
_____

10. Gravity helps us watch television, talk on the phone, and use the Internet.
(1) Explain whether this statement is true or false.
(2) Support your answer with evidence from the text.

_____
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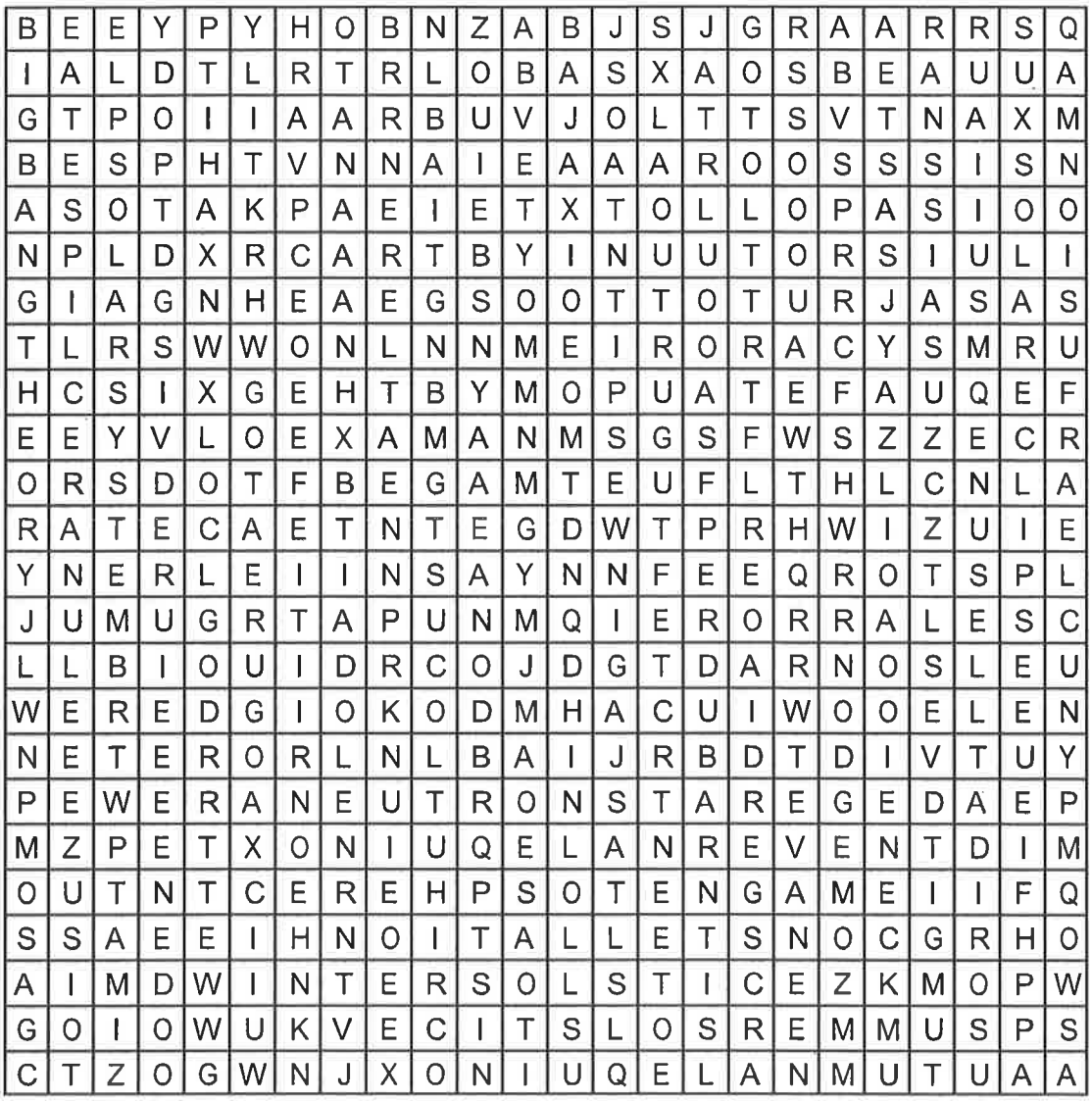
Astronomy



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ABSOLUTE MAGNITUDE
APOGEE
APPARENT MAGNITUDE
ASTEROID
ASTRONOMY
AURORA
AUTUMNAL EQUINOX
AXIS
BIG BANG THEORY
BINARY
BLACK HOLE
BLUE
COMET
CONSTELLATION
EARTH
GALAXY
GIANT
GRAVITY
LUNAR ECLIPSE
MAGNETOSPHERE
METEOR
METEORITE
METEOROID
MOON
NEAP TIDE
NEBULA
NEUTRON STAR
NOVA
NUCLEAR FUSION
ORBIT
PERIGEE
PLANETS
PROTOSTAR
PULSAR
QUASAR
RED
REVOLUTION
ROTATION
SOLAR ECLIPSE
SOLAR SYSTEM
SPRING TIDE
STARS
SUMMER SOLSTICE
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