Apophis Literacy Component

Objectives

- Students will understand vocabulary terms associated with asteroids and Earth science
- Students will compose a fictional story about asteroid Apophis
- Students will compose a story about asteroid Apophis written in the first person
- Students will create a newscast about the asteroid Apophis
- Students will research information on the roles they will play during the newscast
- Students will read a story and answer questions from the story

Suggested Grade Level

5^{th}-8^{th}

Subject Area

Language Arts

Timeline

Four to six class periods

Standards

- Students read a wide range of print and non-print texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works
- Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
- Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
- Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and non-print texts

- Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- Students participate as knowledgeable, reflective, creative, and critical members of a variety of literacy communities
- Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Background

The Apophis literacy unit has been written to create an understanding of the vocabulary that is utilized in the Apophis module. In this unit, students will have the opportunity to study and use the vocabulary terms in various contexts. Students will also be given the opportunity to be creative in their written endeavors. They will also be given the opportunity to create a newscast about the asteroid.

Materials

Apophis literacy pages, pencil, (for the newscast: cameras, microphones, large cardboard boxes, butcher paper, markers or paint)

Lesson

1. A pre-knowledge assessment can be used to assess prior knowledge of the information contained in the Apophis module. A K-W-L assessment is one such tool to assess prior knowledge.
2. At the beginning of the unit, vocabulary terms have been defined. These can be used by the teacher in a number of ways. The following pages (Frayer model vocabulary squares) are to be used for the vocabulary terms. Assessing prior knowledge will allow the teacher to determine which words need to be learned and which ones may only need to be reviewed.
3. In the vocabulary squares, the vocabulary word is placed in the middle box. Each of the adjoining boxes is then filled with the definition of the word, a sentence using the vocabulary word, and a picture of the word. The final box can be used as the teacher's-choice.
4. The word search and the crossword puzzle can be used to increase student understanding of the vocabulary terms as a means of repetitive word practice.
5. The first story gives the students a chance to be creative and write a fictional story about Apophis.

6. The second story gives the students a chance to write a fiction or non-fiction story from the first-person.
7. The newscast gives the students a chance to be creative in other areas. Students can take on roles, do research and present a newscast about the asteroid. The newscast can be realistic in its presentation or take on a very make-believe format. That can be up to the students to decide. If you have groups that want to approach the newscast from differing viewpoints, it gives the opportunity to have two different newscasts.
8. The acrostic poem gives the students another opportunity to be creative in their writing.
9. The final story can be used as an introductory tool to assess student reading comprehension or as a final test grade.

Extensions

Make a brochure about Apophis; create a PowerPoint slideshow about Apophis

Evaluation/Assessment

The teacher may grade the various lessons according to grade level literacy requirements and expectations.

Resources

National Language Arts Standards:
http://www.ncte.org/about/over/standards/110846.htm

NASA: http://www.nasa.gov

Wikipedia: http://www.wikipedia.org

Puzzlemaker: http://www.puzzlemaker.com

Apophis Vocabulary Definitions

5-8 Vocabulary

Asteroid- A small, solid object that orbits the Sun.

Asteroid Belt- The area of space between Mars and Jupiter that contains the most asteroids. It was thought to have been the remains of a planet that never formed due to Jupiter's gravitational pull.

Crater- A circular or oval depression on the surface of an object usually caused by a meteorite.

Comet- A small body of rock and ice that orbits the Sun and occasionally shows a coma or tail.

Density- A measure of mass per unit of volume.

Deposition- The process whereby material is added to a landform by wind, water or ice through the laying down of sediment.

Earth- The third planet from the Sun. The only planet that we know of that has life.

Ejecta- The debris that is ejected due to an impact crater.

Elliptical- Describes the orbit of most solar system objects. It is an elongated circle.

Erosion- The displacement of solids (soil, mud, rock and other particles) by the agents of wind, water and ice.

Mass- The amount of matter or "stuff" in an object. The mass of an object never changes. It is commonly and mistakenly stated as how much something weighs.

Matter- Something that has mass and takes up space. Matter is usually classified as a solid, liquid, or gas.

Meteor- A visible path of a meteoroid that enters Earth's atmosphere, commonly called a shooting star or falling star.

Meteorite- A meteor that survives Earth's atmosphere and impacts the Earth.

Meteoroid- A small fragment of debris (rock) in the solar system.

Moon- Earth's only natural satellite. It is sometimes called Luna.

Orbit- The path one object makes around another object.

Planet- A large mass of matter in orbit around a sun.

Satellite- An object that orbits another object. There are two kinds: natural and man-made.

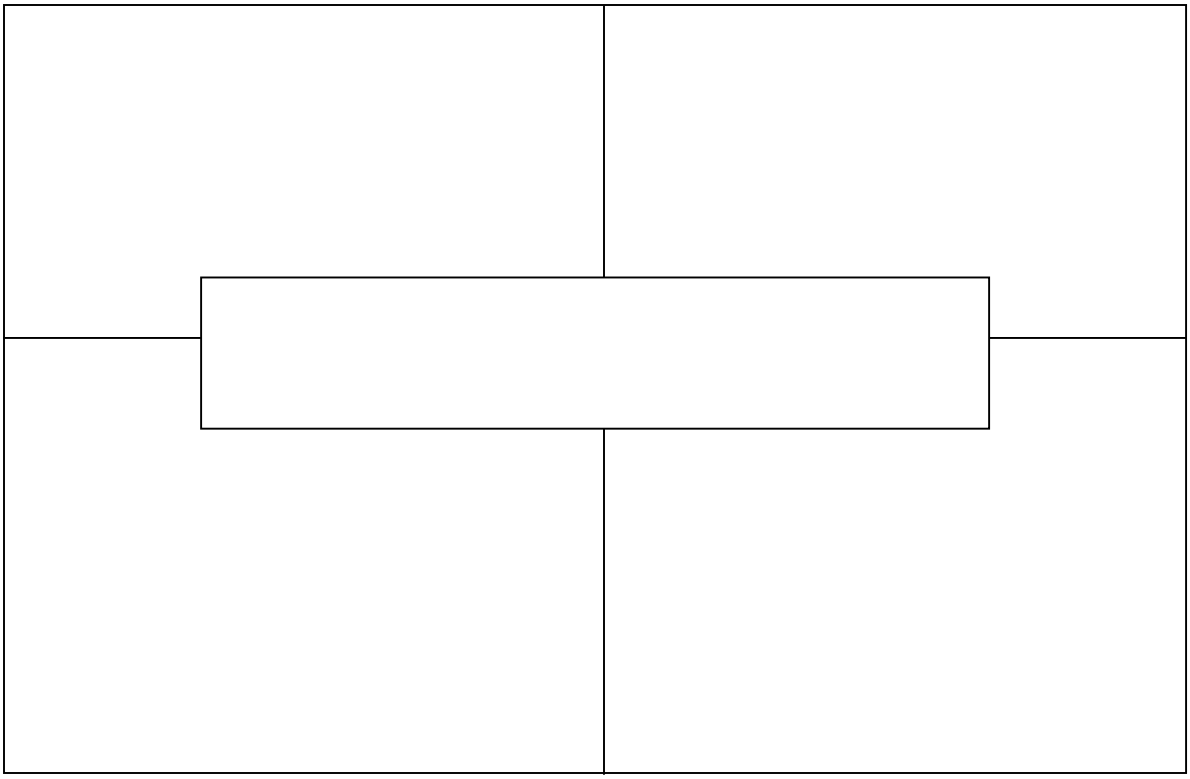
Sun- The star at the center of our solar system.

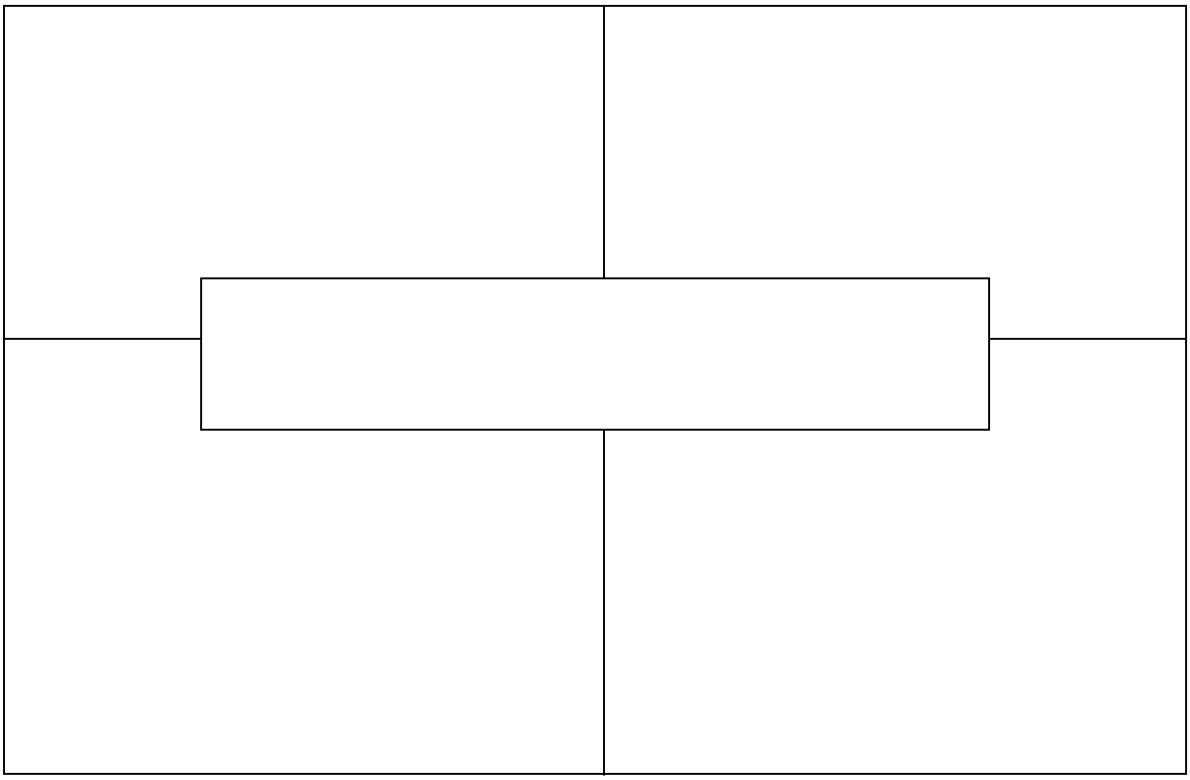
Weathering- The disintegration or breaking up of rocks, soils or other minerals through natural, chemical, or biological processes.

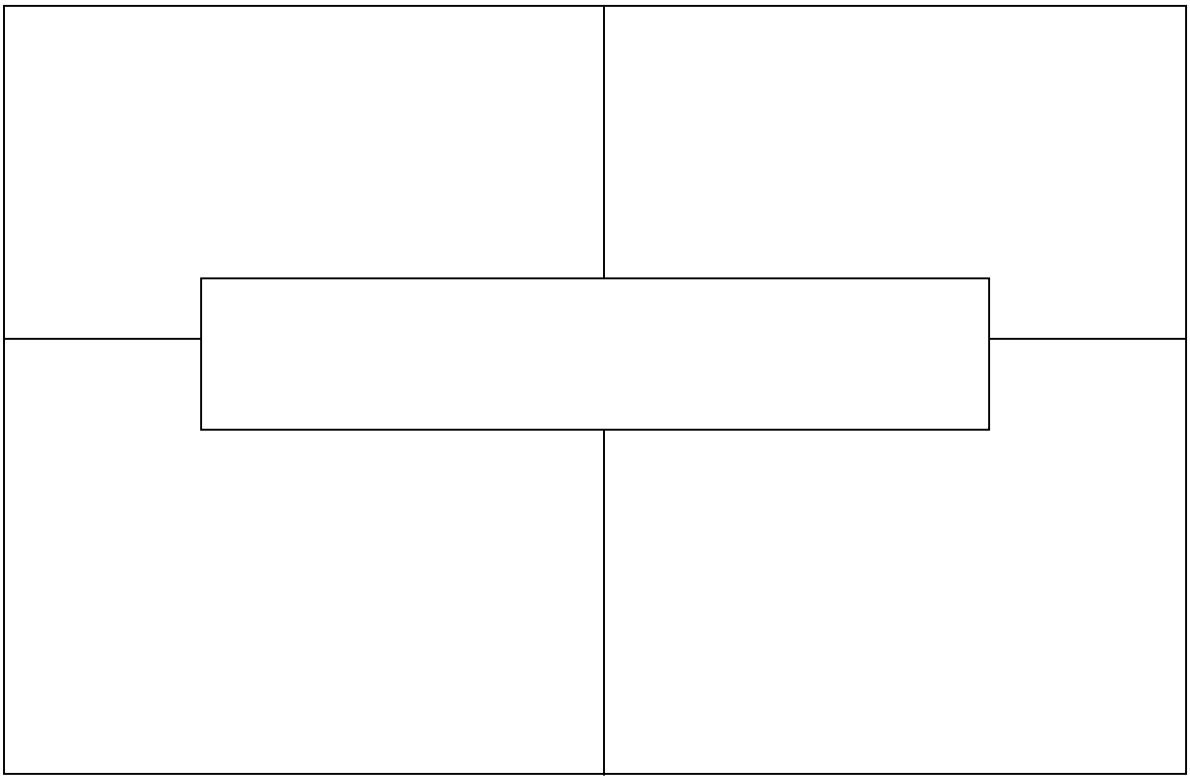
Apophis Vocabulary

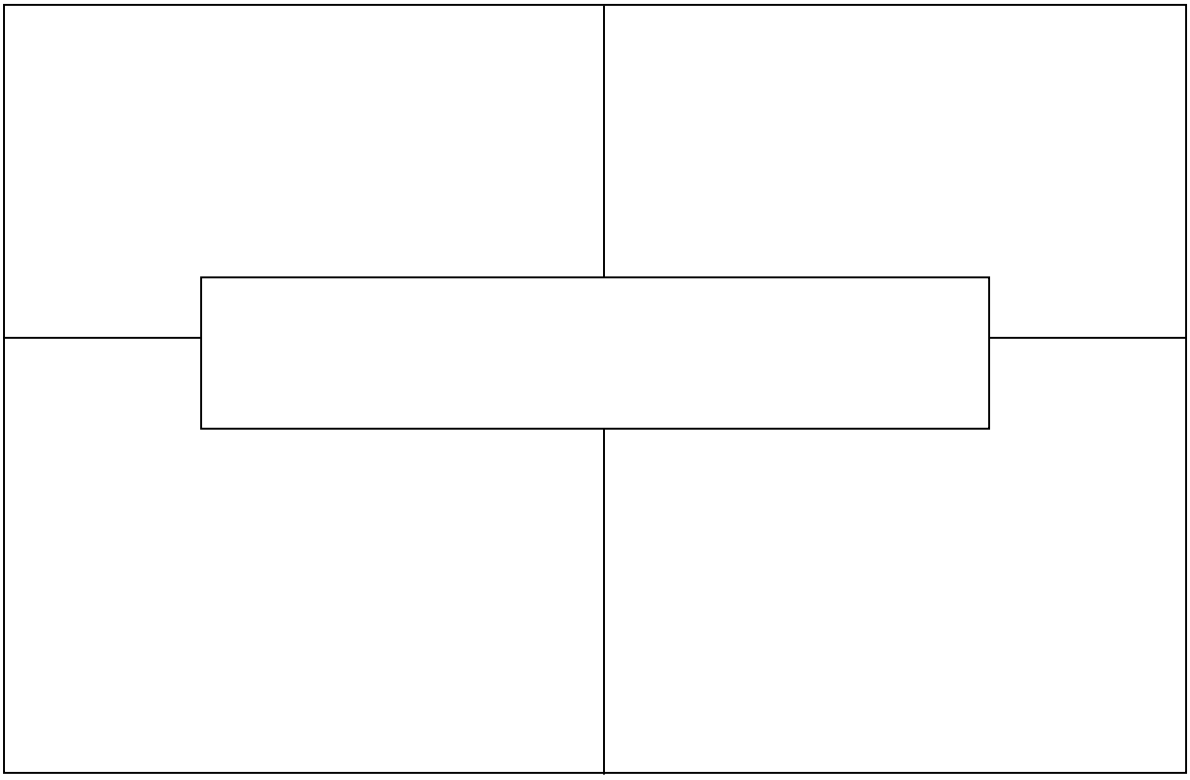
Name _____

Date _____









Apophis Vocabulary Word Search

Name _____

Date _____

Z T M S O L T D J G N S L E E Z V Z C N
G M A E H W G F N U W A A D A R J D O O
I S M K T Y X I S Y Z T C Q T A H J M O
E J V M T E R S M N Z E I K A U U Q E M
M T M E T E O R I T E L T O T Q R N T K
D H O T H Q E R H H T L P P C X J G E E
N V G T S T G B O D K I I Q E P Q W S H
B O A R T S J C V I D T L P J N R D V M
P E I A E W A M J E D E L S E E X F Z Y
W L M T A T Y M N X H X E N O I S O R E
O H A N I I A S M E T E O R T I B R O E
C N F N I S I R O N G E J H Y M H B W A
E M Y E E T O S C Y I Y C Z E A I F A D
F B D A Y T U P J N H B O A Q V I V X A
U N R Z M P U M E R M H S U R E Z K T K
Z T U W O K B U X D B C U R Z F F K W M
H U Y V S H M E M Z T R M N Q O G F Z W
T L E B D I O R E T S A S A E Q U C M H
D B N J L Y Z G M Z K K Y E P U A N A K
S Y K I Z I V Q M R V C E P W M S I D R

ASTEROID BELT
COMET
CRATER
DENSITY
DEPOSITION
EARTH
EJECTA
ELLIPTICAL
EROSION
MASS
MATTER
METEOR
METEORITE
METEOROID
MOON
ORBIT
PLANET
SATELLITE
SUN
WEATHERING

Apophis Vocabulary Word Find Solution

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+ + M + + + + + + G N S L + + + + + C N
+ + + E + + + + + N U + A A + + + + + O O
+ + + + T + + I S + + T C + + + + + M O
+ + + + + E R + + + + E I + A + + + E M
+ + M E T E O R I T E L T + T + + + T +
+ + + + H + E R + + + L P + C + + + + +
N + + T S T + + O + + I I + E + + + + +
+ O A R T S + + + I D T L + J + + + + +
P E I A E + A + + E D E L + E + + + + +
W L M T + T + M N + + + E N O I S O R E
+ + A + I + A S M E T E O R T I B R O +
+ + + N + S I R + + + + + + + + + + + +
+ + + + E T O + C + + + + + + + + + + +
+ + + A Y T + P + + + + + + + + + + + +
+ + R + + + + + E + + + + + + + + + + +
+ T + + + + + + + D + + + + + + + + + +
H + + + + + + + + + + + + + + + + + + +
T L E B D I O R E T S A + + + + + + + +
+ + + + + + + + + + + + + + + + + + + +
+ + + + + + + + + + + + + + + + + + + +
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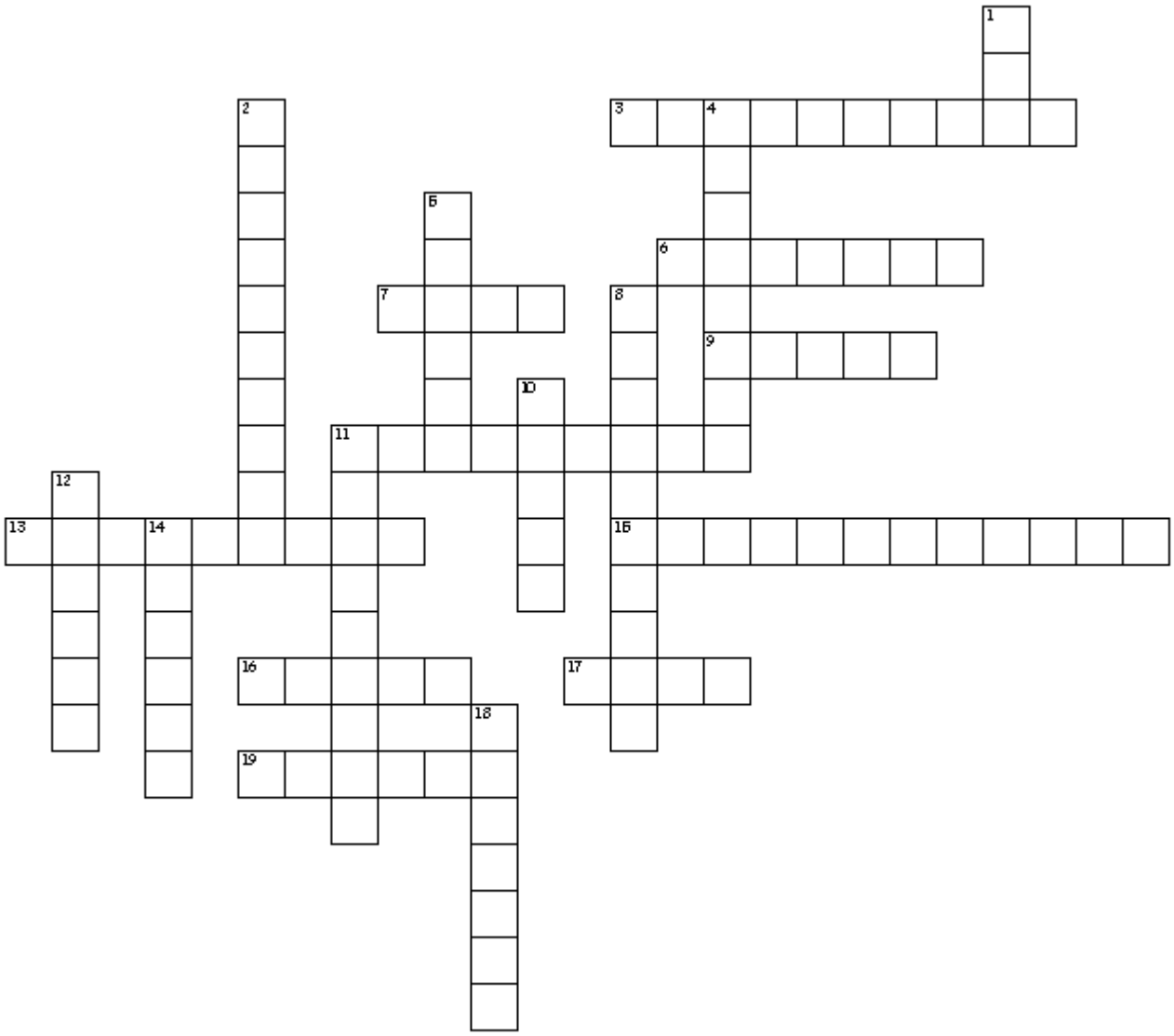
(Over,Down,Direction)
ASTEROIDBELT(12,18,W)
COMET(19,1,S)
CRATER(9,13,NW)
DENSITY(11,8,SW)
DEPOSITION(10,16,NW)
EARTH(5,13,SW)
EJECTA(15,9,N)
ELLIPTICAL(13,10,N)
EROSION(20,10,W)
MASS(8,10,NW)
MATTER(3,10,NE)
METEOR(9,11,E)
METEORITE(3,5,E)
METEOROID(3,1,SE)
MOON(20,4,N)
ORBIT(19,11,W)
PLANET(1,9,SE)
SATELLITE(12,1,S)
SUN(9,3,NE)
WEATHERING(1,10,NE)

Apophis Vocabulary Crossword

Name _____

Date _____



Across
3. The disintegration or breaking up of rocks, soils or other minerals through natural, chemical, or biological processes.
6. A measure of mass per unit of volume.
7. The amount of matter or “stuff” in an object. It is commonly and mistakenly stated as how much something weighs.
9. The path one object makes around another object.
11. A small fragment of debris (rock) in the solar system.
13. An object that orbits another larger object. There are two kinds: natural and man-made.
15. A circular or oval depression on the surface of an object usually caused by a collision with a smaller object.
16. The third planet from the Sun. The only planet that we know of that has life.
17. Earth’s only natural satellite. It is sometimes called Luna.
19. A visible path of a meteoroid that enters Earth’s atmosphere, commonly called a shooting star or falling star.

Down
1. The star at the center of our solar system.
2. Describes the orbit of most solar system objects. It is an elongated circle.
4. A small, solid object that orbits the Sun.
5. A large mass of matter in orbit around a sun.
8. The process whereby material is added to a landform by wind, water or ice through the laying down of sediment.
10. A small body of rock and ice that orbits the Sun and occasionally shows a coma or tail.
11. A meteor that survives Earth’s atmosphere and impacts the Earth.
12. Something that has mass and takes up space. It is usually classified as a solid, liquid, or gas.
14. The debris that is ejected due to an impact crater.
18. The displacement of solids (soil, mud, rock and other particles) by the agents of wind, water and ice.

Visiting Apophis

Name _____

Date _____

Write a fictional story about visiting asteroid Apophis.

My Journey

Name _____

Date _____

Write a story as if you are Apophis and write about everything that you have seen during your journey through the solar system.

Apophis Newscast

With some classmates, design a newscast about asteroid Apophis. Some ideas you might want to include are interviewing Apophis, interviewing some astronomers, reporting about Apophis coming near Earth, reporting the possibility of a collision with Apophis, and interviewing NASA scientists involved with changing Apophis' trajectory.

Some roles you might want to include in your newscast are news anchor, news co-anchor, reporters, astronomers, NASA scientists, Earth, Moon, Sun, Apophis, concerned citizens, members of FEMA (Federal Emergency Management Agency), cameramen, and a producer.

Create a newsroom where a real broadcast can take place. Have the reporters write out questions they will ask the people they are going to interview. Then have the students being interviewed write out what they are going to say when they are interviewed. Have cameras for the cameramen to record the newscast so it can be viewed by everyone after the production. Have the scientists and astronomers do research on Apophis to give scientifically reliable information to the media.

Apophis Acrostic Poem

Name _____

Date _____

Write a word or phrase describing Apophis that starts with each letter of the word Apophis.

A _____

P _____

O _____

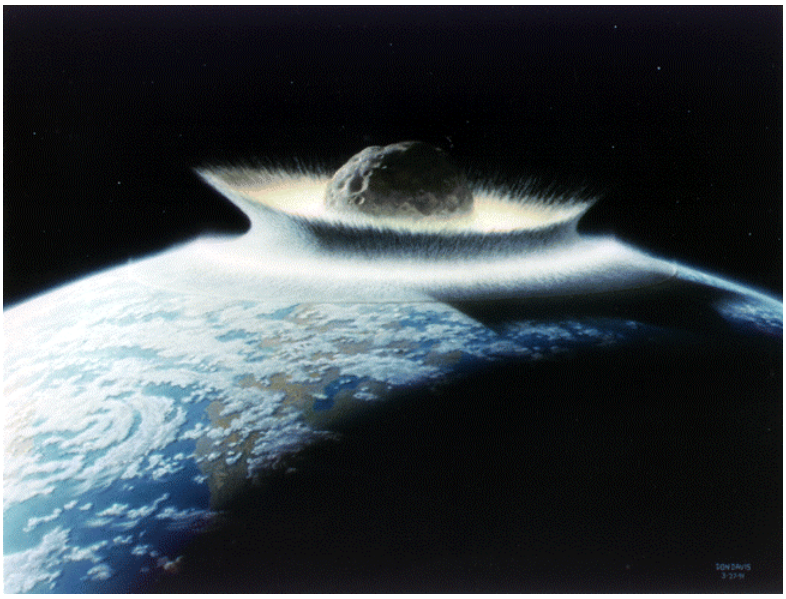
P _____

H _____

I _____

S _____

The Story of Apophis



Tumbling through space are rocks called ***asteroids***. These rocks orbit the sun and are leftovers from the creation of the solar system. They come in various shapes and sizes. The largest, Ceres, is more than 950 km (590 miles) long. The smallest asteroids are as small as the rocks in your driveway.

The first asteroid to be discovered was Ceres. Giuseppe Piazzi discovered Ceres on January 1, 1801. At first, he thought it was a star. As he continued to observe Ceres, he noticed that it moved across the sky. This meant it couldn't be a fixed star. He later concluded that it must be a ***comet***; however, it didn't have the common nebulous of a comet. He then supposed it must be something new. He called it a minor planet.
Later calculations allowed others to find and track Ceres and confirm Piazzi's assumption that it was something new.

Since the first discovery of Ceres, more than 300,000 asteroids have been discovered. The current rate is about 5,000 per month. Most of these asteroids are in the asteroid belt. The asteroid belt is located between the orbits of Mars and Jupiter. Many scientists believe the asteroid belt is a planet that failed to form due to the intense gravitational pull of Jupiter. Some asteroids, though, are not located in the asteroid belt. They can be found orbiting the sun in different locations. One such asteroid is Apophis.

Apophis was discovered on June 19, 2004, by Roy Tucker, David Tholen, and Fabrizio Bernardi. It is an asteroid about 400 m (1,300 ft) long. Apophis is special for two reasons. The first is that it was not found orbiting in the asteroid belt like most asteroids. It was discovered orbiting the sun inside of Earth's orbit. The second reason Apophis is special is that it is considered a near-earth asteroid. This means that it will come very close to the Earth. In fact, when Apophis passes the Earth on April 13, 2029, there is a chance that Earth's gravity could change Apophis's orbit. If this happens, when Apophis comes close to the Earth again on April 13, 2036, it could hit the Earth! The possibility that this will happen is very small, but that is why the discoverers named it Apophis. Apophis is the name of the Ancient Egyptian god Apep, "the Destroyer."

Asteroids like Apophis became important to scientists in 1994. That year scientists watched as comet Shoemaker-Levy 9 slammed into Jupiter. This was

the first time anyone witnessed two objects colliding in our solar system. Scientists thought that if this could happen to Jupiter, it could happen to Earth.

Scientists know that the Earth has collided with asteroids in the past. ***Craters*** can be found in many places around the Earth. One such place is Barringer Crater in Arizona. A small asteroid hit the ground there and created a very big ***impact crater***. Scientists also think that a very large asteroid hit in a place called Chixculub in the Yucatan Peninsula. This asteroid is thought to have caused the extinction of the dinosaurs 65 million years ago.

Scientists also looked at the Moon and noticed how many impact craters there were on its surface. If the Moon is that close to the Earth and it has that many impact craters, then the Earth must have been hit many times, too. The reason we can't see most of them is because forces of nature hide the craters. ***Weathering, erosion, deposition***, and ***plate tectonics*** erode the craters so we are unable to see them. Scientists, however, use satellites to see underground and can tell where these craters are.

These concerns made scientists create observation posts around the world that look for Near-Earth asteroids. One such program is the LINEAR Project or the Lincoln Near-Earth Asteroid Research project. This project is located at the Massachusetts Institute of Technology (MIT) Lincoln Laboratory. They spend their time looking into space trying to find the next asteroid that could collide with Earth and what we could do to stop it.

Use the story to answer the following questions.

1. Apophis is a(n) _____.
    a. Comet
    b. Asteroid
    c. Planet
    d. Scientist

2. The name of the first and largest asteroid discovered is _____.
    a. Apophis
    b. Piazzi
    c. Apep
    d. Ceres

3. In paragraph one, the word **asteroids** means _____.
    a. A small, solid object that orbits the Sun.
    b. A circular or oval depression on the surface of an object usually caused by a meteorite.
    c. The debris that is ejected due to an impact crater.
    d. The star at the center of our solar system.

4. What is the main idea of this article?
    a. Scientists became concerned when comet Shoemaker-Levy 9 collided with Jupiter.
    b. Barringer Crater in Arizona was caused by as asteroid.
    c. Apophis, a near-earth asteroid, was discovered in 1994.
    d. Asteroids orbit the sun in our solar system. One such asteroid is Apophis that may collide with Earth in 2036.

5. The author most likely wrote this article to _____.
    a. Entertain the reader.
    b. Tell you a story about Giuseppe Piazzi.
    c. Inform you about near-earth asteroids such as Apophis.
    d. Inform the reader about impact craters.

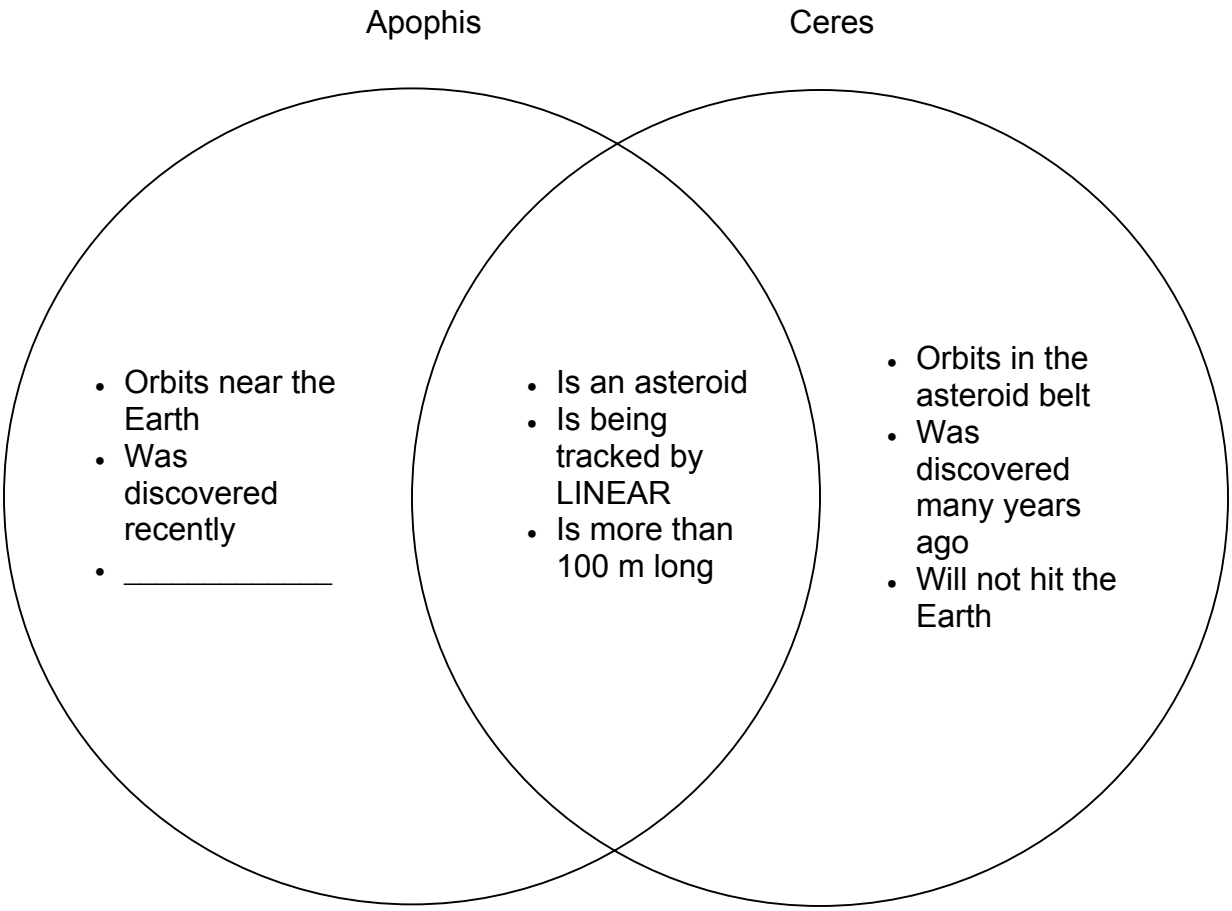
6. Which sentence from the article suggests why scientists are concerned about Apophis?
    a. If this happens, when Apophis comes close to the Earth again on April 13, 2036 it could hit the Earth!
    b. These concerns made scientists create observation posts around the world that look for Near-Earth asteroids.
    c. It is an asteroid about 400 m (248 ft) long.
    d. Since the first discovery of Ceres, more than 300,000 asteroids have been discovered.

7. In paragraph six, the word ***impact crater*** means _____.
    a. A small, solid object that orbits the Sun.
    b. A circular or oval depression on the surface of an object usually caused by a meteorite.
    c. The debris that is ejected due to an impact crater.
    d. The star at the center of our solar system.

8. From the article, the reader can conclude that scientists are concerned about near-earth asteroids because _____.
    a. 5,000 asteroids are discovered each month.
    b. Asteroids orbit the sun.
    c. A collision with an asteroid could wipe out life on Earth.
    d. Most are found in the asteroid belt.

9. Why do you suppose it is difficult to find asteroids?
    a. They travel very fast.
    b. Some asteroids are very small.
    c. You need powerful telescopes to find them.
    d. All of the above.

10. Look at the diagram below.



Which statement belongs in the blank?

a. May hit the Earth
b. Is 400 m long
c. Was discovered in 2004
d. Is a near-earth asteroid