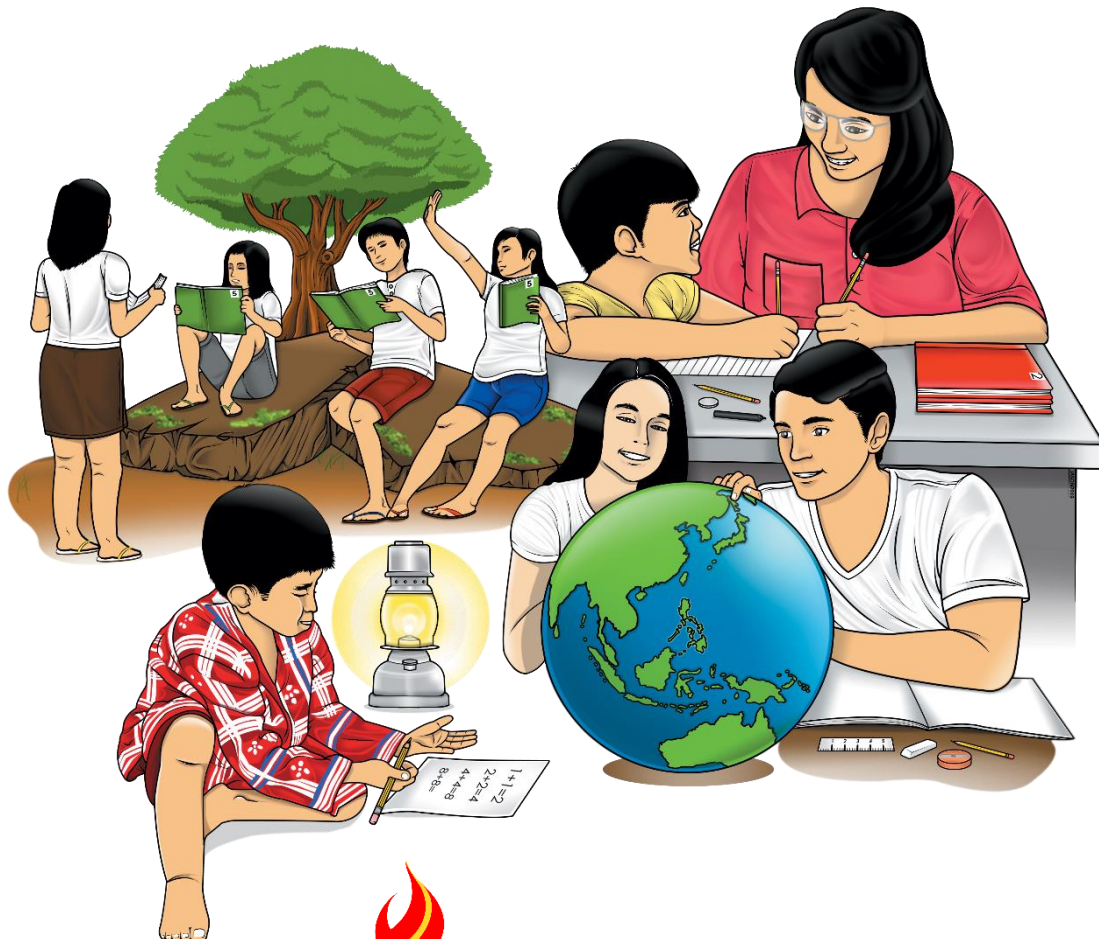


# Science

## Quarter 2 – Module 2: Earthquake's Epicenter and Magnitude



**Science – Grade 8**  
**Alternative Delivery Mode**  
**Quarter 2 – Module 2: Earthquake’s Epicenter and Magnitude**  
**First Edition, 2019**

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**Science**  
**Quarter 2 – Module 2:**  
**Earthquake's Epicenter**  
**and Magnitude**

## **Introductory Message**

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

## Lesson

# 1

## Epicenter vs Focus and Magnitude vs Intensity

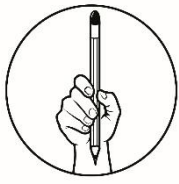


### *What I Need to Know*

This module was designed and written with you in mind. It is here to help you master about epicenter, focus, magnitude, and intensity, active and inactive faults. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the module you are now using.

After going through this module, you are expected to:

Differentiate the epicenter of an earthquake from its focus, intensity of an earthquake from its magnitude; and active and inactive faults. (*S8ES-IIa-15*)

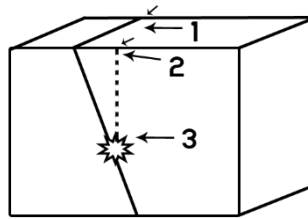


## What I Know

**Directions:** Choose the letter of the correct answer. Write your answers on a separate sheet of paper.

1. Where is the epicenter located in the illustration?

A. 1  
B. 2  
C. 3  
D. 2 and 3



*Illustrated by: Angelo Zaldy C. Francia*

2. What point on Earth's surface is directly above the focus?

A. Epicenter  
B. Fault  
C. Focus  
D. Magnitude

3. What is focus?

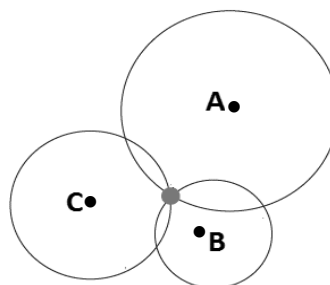
A. center of the earth  
B. end of the seismic waves  
C. surface of the earth where the wave starts  
D. location where an earthquake's waves begin

4. Which of the following describes an active fault?

A. no earthquake occurs  
B. no record of earthquake  
C. expected to generate earthquake  
D. generates earthquake once in a million of years

5. Which point is closest to the epicenter?

A. Point A  
B. Point B  
C. Points A and B  
D. Points B and C



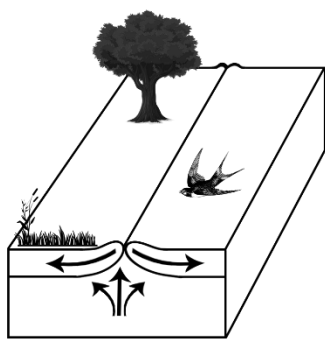
6. What scale measures the magnitude or size of an earthquake?
  - A. Mercalli scale
  - B. Richter scale
  - C. Spring scale
  - D. Weighing scale
7. What is referred to as a measure of the amount of energy released in an earthquake?
  - A. Intensity
  - B. Magnitude
  - C. Stress
  - D. Tension
8. Which of the following statements refers to the magnitude scale?
  - A. It measures the effect of an earthquake on a given area.
  - B. It is a negative impact of the earthquake on surrounding areas.
  - C. It is the devastation caused by an earthquake varies with location.
  - D. It is the quantified value of seismic energy produced during an earthquake.
9. What is the description of a 5.0 – 5.9 magnitude in a Richter scale?
  - A. light
  - B. major
  - C. moderate
  - D. strong
10. In which of these places will an intense earthquake likely happen?
  - A. near a mountain
  - B. along active fault
  - C. near coastal area
  - D. along inactive fault
11. What is the intensity of the earthquake that is felt by few people at rest indoors and hanging objects swing slightly?
  - A. moderately strong
  - B. slightly felt
  - C. strong
  - D. weak
12. What is centered on the portion of the fault that has the greatest movement?
  - A. Epicenter
  - B. Focus
  - C. Ground
  - D. Surface

13. Which of the following statements is TRUE about the epicenter of an earthquake?
- A. The epicenter is where the seismographs are located.
  - B. The epicenter is a place on the fault where it intersects the surface.
  - C. The epicenter is the point on the fault's surface within the Earth where the rupture on the fault began.
  - D. The epicenter is the point on the Earth's surface just above the location where movement on the fault began.
14. What factor determines the strength of an earthquake? The depth of its \_\_\_\_\_.
- A. epicenter
  - B. fault
  - C. focus
  - D. ground
15. Which of the following statements differentiates focus and epicenter?
- A. The focus is the point where the rock first break while the epicenter is the point on the surface above the focus.
  - B. The epicenter is the point where the rock first break while the focus is the point on the surface above the epicenter.
  - C. The focus describes the direction of earthquake wave movement while epicenter tells where the earthquake originated.
  - D. The epicenter describes the direction of earthquake wave movement while focus tells where the earthquake originated.

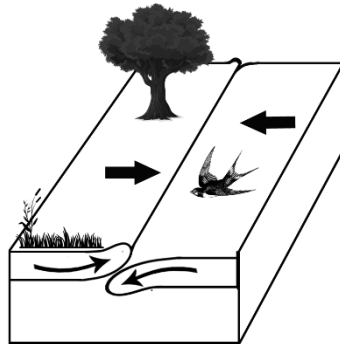


## ***What's In***

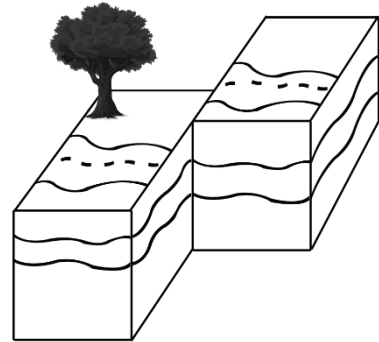
Earthquakes occur as large blocks of the Earth's crust move abruptly past each other at a fault. At the point when the force of plate tectonics makes the bits of the Earth's outside layer move, in some cases, the pieces do not slide easily past each other. There can be grinding along the fault's rough edges that catch the blocks of rocks. This makes it hard for them to move past one another. Sometimes they get stuck together temporarily. At the point when the bits of rocks overcome the snags, energy is released. The release of energy results the shaking of the ground surface.



*Normal Fault*



*Reverse Fault*



*Transform Fault*

*Figure 1: Types of Fault*

*Illustrated by: Angelo Zaldy C. Francia*



## What's New

### Activity 1. Label Me

**Directions:** Label the figure by choosing the correct word from the box below. Write your answers on a separate sheet of paper.

intensity

fault

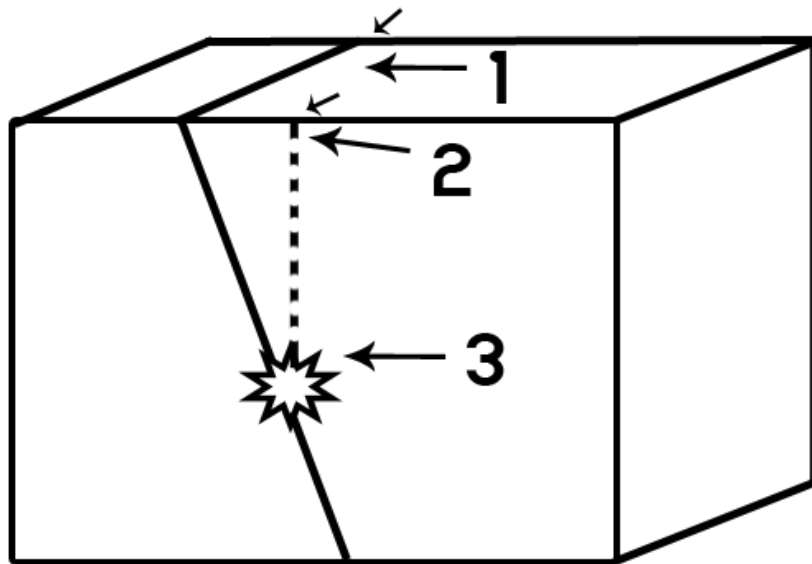
focus

epicenter

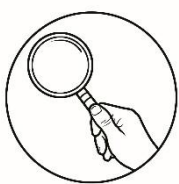
1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_



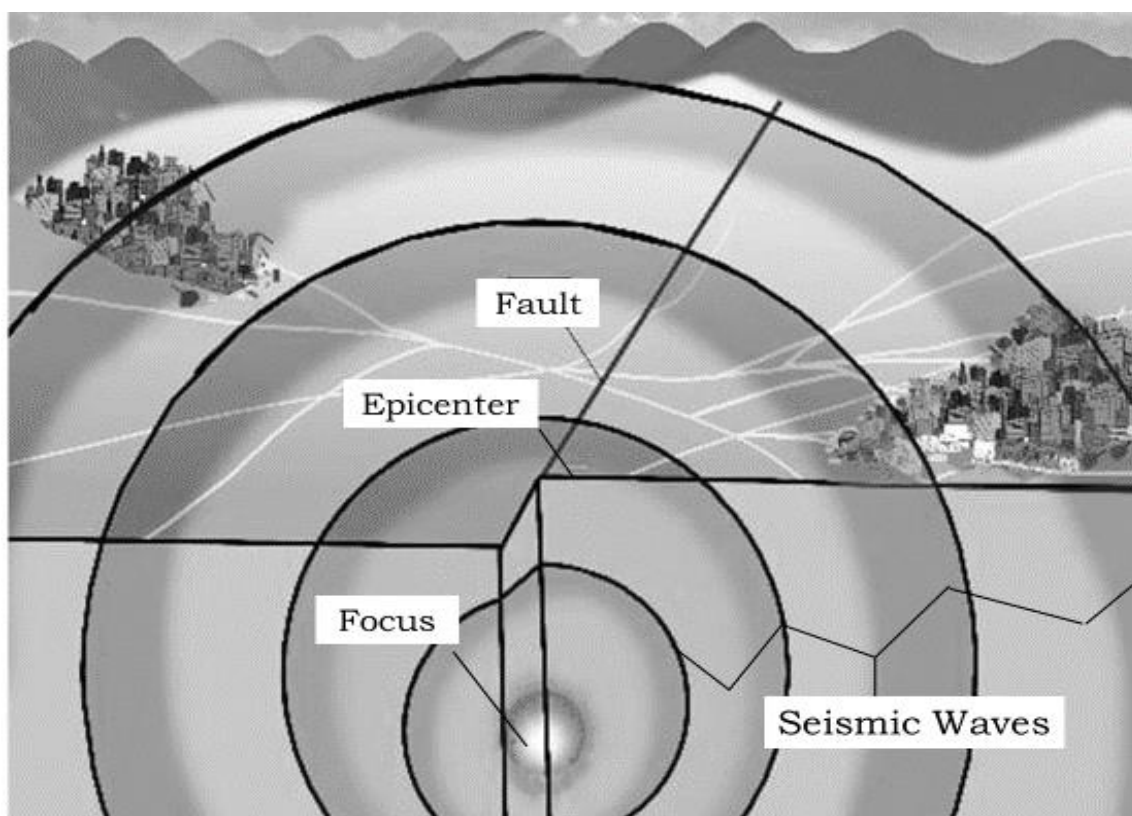
*Figure 2: Cross section of Fault*  
*Illustrated by: Angelo Zaldy C. Francia*



## ***What is It***

### **Focus and Epicenter**

A fault is a weak point in the tectonic plate where the pressure inside the crust is released. The area inside the Earth where an earthquake starts is known as the focal point of the quake or the focus. It is centered on the portion of the fault that has the greatest movement. The point at the Earth's surface directly above the focus is known as the epicenter of the quake. During an earthquake, the strongest shaking occurs at the epicenter. Sometimes, the ground surface breaks along the fault as shown in Figure 3. There are also times the movement is deep underground and the surface does not break. Scientists often name an earthquake after the region that is closest to its epicenter. Generally, if two earthquakes of equal strength originate from the same epicenter, the one with the shallower focus causes more destruction. Seismic waves from a deep-focus earthquake lose more of their energy as they travel farther up to surface.



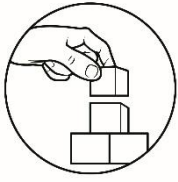
*Figure 3: Cross section of Fault with waves*

## **Magnitude and Intensity**

The earthquake's magnitude and intensity have different characteristics. Magnitude measures the energy being released from the origin of the earthquake. It is measured by an instrument called seismograph. The Richter Magnitude Scale measures the quantity of seismic energy released by an earthquake. Intensity is the strength of the trembling made by the earthquake at a place. The intensity of an earthquake varies relying on where you are and is determined by the Mercalli Scale.

## **Active and Inactive Faults**

Active faults are areas along in which displacement is expected to occur. Since a shallow earthquake produces displacement across a fault, all shallow earthquakes occur on active faults. These are considered to be geologic hazards. Inactive faults are areas that can be identified, but which do not have earthquakes.



## What's More

### Activity 2. Match It

**Directions:** Match the definitions in Column A with the correct term in Column B. Write your answers on a separate sheet of paper.

#### Column A

1. It is the point on the ground directly above the focus.
2. It is a weak point in the tectonic plate where pressure within the crust is released.
3. It is a point where the earthquake begins.

#### Column B

- A. fault
- B. focus
- C. epicenter
- D. magnitude

### Activity 3: Point It Out

**Directions:** Study the figure and answer the following questions below. Write your answers on a separate sheet of paper.

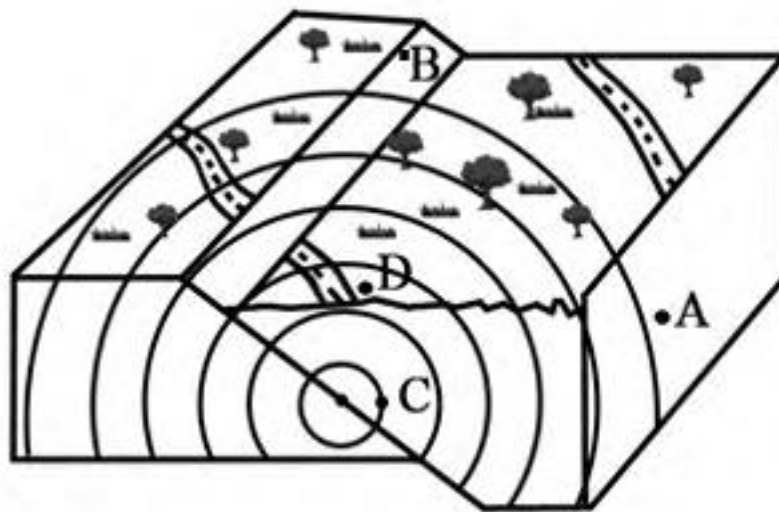


Figure 4: Cross section of Fault with waves and points

Illustrated by: Angelo Zaldy C. Francia

### Questions:

1. Which point is nearest to the focus? \_\_\_\_\_
2. Which point is farthest from the focus? \_\_\_\_\_
3. Which point is nearest to the epicenter? \_\_\_\_\_
4. Which point is farthest from the epicenter? \_\_\_\_\_

#### Activity 4. Let's Scale It

**Directions:** Study the table below about the Richter Magnitude and answer the following questions. Write your answers on a separate sheet of paper.

**Table 1.** Magnitude Scale of an Earthquake

Magnitude	Description	Effects of Earthquakes
< 2.0	micro	micro earthquakes, not felt
2.0 - 2.9	minor	generally not felt, but recorded
3.0 - 3.9	minor	often felt, but rarely causes damage
4.0 - 4.9	light	light, noticeable shaking of indoor things, shaking clamors significant damage is unlikely
5.0 - 5.9	moderate	cause serious harm to ineffectively developed structures over small regions at most slight damage to well-designed buildings
6.0 - 6.9	strong	damaging in areas up to 160 kilometers (100 mi) across in populated areas
7.0 - 7.9	major	cause major damage over larger areas
8.0 - 8.9	great	cause serious damage in places several hundred miles across
9.0 - 9.9	great	devastating in areas several thousand miles across
10.0+	epic	never recorded

#### Questions:

1. What is the lowest magnitude of an earthquake? \_\_\_\_\_
2. What is the highest magnitude of an earthquake? \_\_\_\_\_
3. What is the description of magnitude 5.0 – 5.9 earthquake? \_\_\_\_\_  
\_\_\_\_\_
4. What is the effect of a magnitude 7.0 earthquake? \_\_\_\_\_  
\_\_\_\_\_
5. What scale can cause serious damage in places several hundred miles across? \_\_\_\_\_  
\_\_\_\_\_

### Activity 5. Let's Feel It

**Directions:** Study the table below about Intensity Scale and answer the following questions. Write your answers on a separate sheet of paper.

**Table 2.** Intensity Scale of an Earthquake

<b>Intensity Scale</b>	<b>Shaking</b>	<b>Description</b>
<b>I</b>	Scarcely Perceptible	Perceptible to people under favorable circumstances. Delicately balanced objects are disturbed slightly. Still Water in containers oscillates slowly.
<b>II</b>	Slightly Felt	Felt by few individuals at rest indoors. Hanging objects swing slightly. Still Water in containers oscillates noticeably.
<b>III</b>	Weak	Felt by many people indoors especially in upper floors of buildings. Vibration is felt like one passing of a light truck. Dizziness and nausea are experienced by some people.
<b>IV</b>	Moderately Strong	Felt generally by people indoors and by some people outdoors. Light sleepers are awakened. Vibration is felt like a passing of heavy truck. Hanging objects swing considerably.
<b>V</b>	Strong	Generally felt by most people indoors and outdoors. Many sleeping people are awakened. Some are frightened, some run outdoors. Strong shaking and rocking felt throughout building.
<b>VI</b>	Very Strong	Many people are frightened; many run outdoors. Some people lose their balance. Motorists feel like driving in flat tires.
<b>VII</b>	Destructive	Most people are frightened and run outdoors. People find it difficult to stand in upper floors. Heavy objects and furniture overturn or topple. Big church bells may ring.
<b>VIII</b>	Very Destructive	People are panicky. People find it difficult to stand even outdoors. Many well-built buildings are considerably damaged. Concrete dikes and foundation of bridges are destroyed by ground settling or toppling.
<b>IX</b>	Devastating	People are forcibly thrown to ground. Many cries and shake with fear. Most buildings are totally damaged. Bridges and elevated concrete structures are toppled or destroyed. Numerous utility posts, towers, and monument are tilted, toppled or broken.
<b>X</b>	Completely Devastating	Practically all man-made structures are destroyed. Massive landslides and liquefaction, large scale subsidence and uplifting of landforms and many ground fissures are observed.

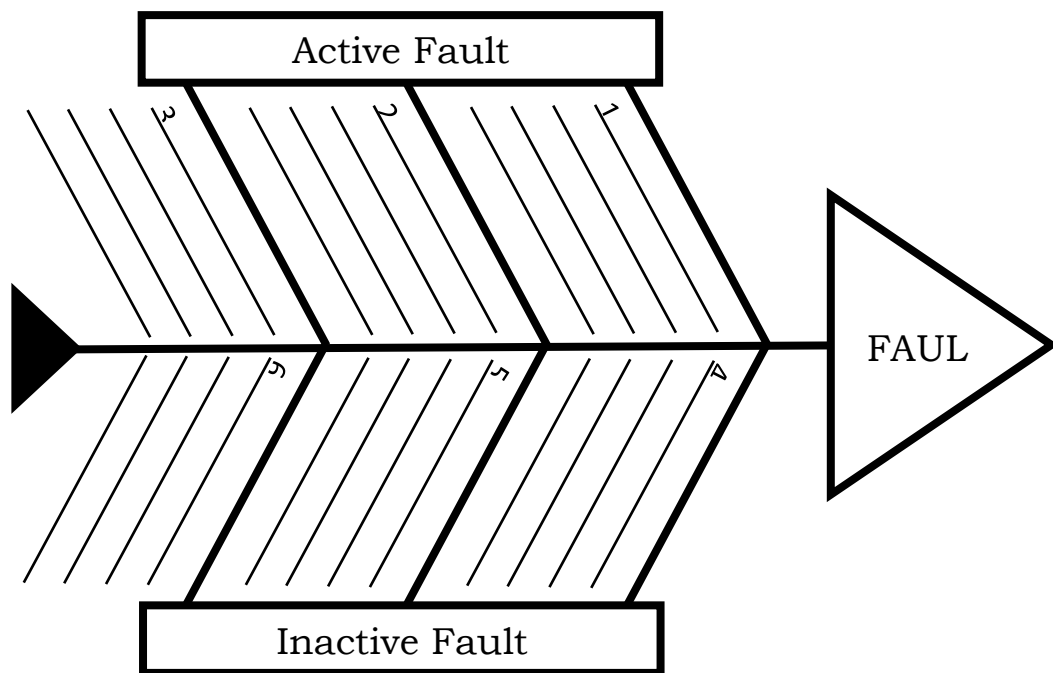
<http://www.phivolcs.dost.gov.ph/index.php/earthquake/earthquake-intensity-scale>

**Questions:**

1. What is the weakest Intensity scale?  
\_\_\_\_\_
2. What is the strongest Intensity scale?  
\_\_\_\_\_
3. What is the description of a destructive intensity?  
\_\_\_\_\_
4. What is the description of a moderately strong intensity?  
\_\_\_\_\_

**Activity 6. Fish Be with You**

**Directions:** Write the correct descriptions of **active** and **inactive** faults in the fish diagram. Choose your answers from the box below.



1. The displacement of its structures are expected to occur.
2. It does not have earthquakes.
3. It does not show signs of generated earthquakes.
4. It will possibly be the cause of another earthquake.
5. It shows evidence of having moved at least once in the past 100,000 years.
6. There is no displacement of geologic structures in an area.



**Notes to the Teacher**

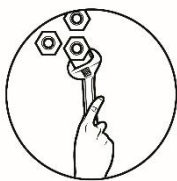
Provide extra copies of this page for students' use.



## ***What I Have Learned***

**Directions:** Fill in the blanks with the correct term/s to complete the statements.  
Write your answers on a separate sheet of paper.

1. \_\_\_\_\_ is the sudden movement of Earth's crust at a fault line.
2. \_\_\_\_\_ is the point where an earthquake begins.
3. An earthquake's most intense shaking is often felt near the \_\_\_\_\_.
4. When the stresses get too large, it results to cracks called \_\_\_\_\_.
5. \_\_\_\_\_ measures the energy being released from the origin of the earthquake.
6. \_\_\_\_\_ is determined by the strength of the trembling made by the earthquake at a place.
7. \_\_\_\_\_ scale measures the quantity of seismic energy released by an earthquake.
8. The intensity of an earthquake is determined by a \_\_\_\_\_ scale.
9. \_\_\_\_\_ fault is one that has moved in the past and is expected to move again.
10. \_\_\_\_\_ fault is a structure that we can identify, but which does not have earthquakes.



## What I Can Do

It is very important to know what to do and where to go in times of natural disaster such as an earthquake. You should find out how to get out of your place and learn to locate the evacuation area.

### Activity 7. Find My Way

**Directions:** Find the evacuation area by completing the earthquake maze below. Use your pencil to trace the correct path, then answer the question that follows in paragraph using the given rubric.

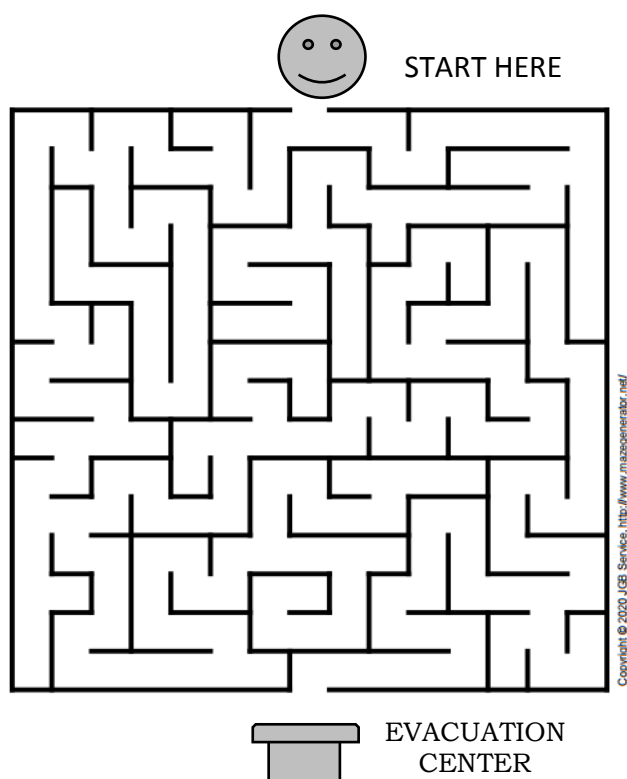


Figure 6: Earthquake Maze



### Notes to the Teacher

Provide extra copies of this page for students' use.

### Question:

What should you do when a natural disaster like an earthquake occur in your place?

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### Rubric

4 points	3 points	2 points	1 point
Answer is well-organized and completely explained the details.	Answer is organized and some details are explained.	Answer is not organized and details are unclear.	Answer does not make sense and shows no details.

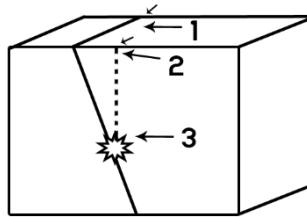


## Assessment

**Directions:** Choose the letter of the best answer. Write your answers on a separate sheet of paper.

1. Where is the focus located in the illustration?

A. 1  
B. 2  
C. 3  
D. 2 and 3

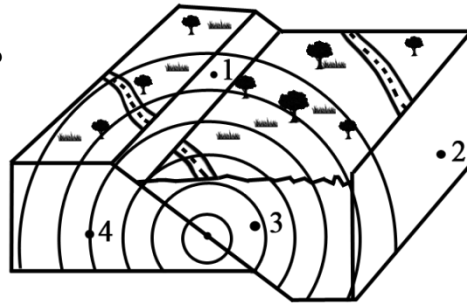


*Illustrated by: Angelo Zaldy C. Francia*

2. At what point along a fault does the first motion of an earthquake occur?
- A. Epicenter  
B. Focus  
C. Intensity  
D. Magnitude
3. Where is the epicenter located?
- A. directly above the focus  
B. at the center of the earth  
C. located in the seismic waves  
D. located underground where the earthquake begins
4. Which instrument determines the amount of damage caused by earthquake?
- A. spring scale  
B. Richter scale  
C. Mercalli scale  
D. weighing scale
5. What is the highest intensity scale of an earthquake?
- A. VIII  
B. IX  
C. X  
D. XI
6. Scientists use different ways to find out if a fault is active. Which one is NOT included?
- A. creating a fault model  
B. observing the surroundings  
C. tracing the country's historical record  
D. studying the past and present vibrations

7. Which point is nearest to the focus?

- A. 1
- B. 2
- C. 3
- D. 4



*Illustrated by: Angelo Zaldy C. Francia*

8. Which of the following locations is directly above the focus?

- A. Core
- B. Epicenter
- C. Fault
- D. Hypocenter

9. What is the magnitude of an earthquake that can cause serious damage in areas across several hundred miles?

- A. 5.0 – 5.9
- B. 6.0 – 6.9
- C. 7.0 – 7.9
- D. 8.0 – 8.9

10. Which of the following is NOT considered an effect when movement of an active fault happens?

- A. ground motion
- B. typhoon formation
- C. surface faulting
- D. land deformation

11. What is a seismograph?

- A. a shock wave released by an earthquake
- B. a scale used to describe energy released during an earthquake
- C. a device used to measure ground motion during an earthquake
- D. the image produced that shows ground vibrations during an earthquake

12. What would you expect to occur from an earthquake that measures 9.0 on the intensity scale?

- A. Hanging objects swing slightly.
- B. Stuff would fall off from the shelves.
- C. Most buildings are totally damaged.
- D. A slight shaking like a truck driving by.

13. Which instrument relies on human observation in measuring earthquake?

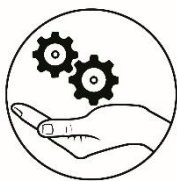
- A. spring scale
- B. Richter scale
- C. Mercalli scale
- D. weighing scale

14. Which does not describe the intensity of an earthquake?

- A. minor
- B. moderate
- C. strong
- D. weak

15. Which is measured by a seismograph?

- A. distance
- B. force
- C. intensity
- D. magnitude



## Additional Activities

### Activity 8. Quake Report

**Directions:** Study the given report about an earthquake that happened in Luzon, then answer the questions that follow. Write your answers on a separate sheet of paper.

Published April 25, 2019 11:08pm

By DONA MAGSINO, GMA News

#### **18 dead, over 280 injured in Central Luzon due to quake — NDRRMC** (An Excerpt)

*The death toll in Central Luzon due to the magnitude 6.1 earthquake that struck Castillejos, Zambales has reached 18, according to the National Disaster Risk Reduction and Management Council (NDRRMC) on Thursday.*

*The NDRRMC situational report showed that aside from the fatalities, 282 were injured and seven are still missing. The Council added that more than 1,230 houses in Bataan and Pampanga were reported to be partially or totally damaged.*

*Over 900 families in Central Luzon, specifically in the provinces of Pampanga and Zambales are temporarily staying in evacuation centers.*

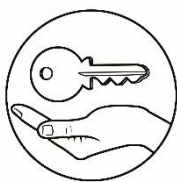
<https://www.gmanetwork.com/news/news/regions/692450/18-dead-over-280-injured-in-central-luzon-due-to-quake-ndrrmc/story/>

### Questions:

1. What is the magnitude of the earthquake that struck Zambales?  
\_\_\_\_\_
2. What is the extent of damages brought by this earthquake?  
\_\_\_\_\_
3. Why is the Province of Pampanga strongly affected by the earthquake even if the epicenter is in Zambales?  
\_\_\_\_\_  
\_\_\_\_\_
4. Does Zambales have active faults? Explain your answer.  
\_\_\_\_\_  
\_\_\_\_\_

### Rubric

4 points	3 points	2 points	1 point
Answer is organized and completely explains the details	Answer is mostly organized, and some details are explained	Answer is not organized and details are unclear	Answer does not make sense and shows no details



# Answer Key

## What I have Learned

1. earthquake
2. focus
3. epicenter
4. fault
5. magnitude
6. intensity
7. Richter
8. Mercalli
9. active
10. inactive

## What's More

### Activity 6

Active Faults (*in no particular order*)

1. The displacement of its structures are expected to occur.
2. It will possibly be the cause of another earthquake soon.
3. It shows evidence of having moved at least once in the past 100,000 years.

Inactive Faults (*in no particular order*)

4. It does not show signs of generated earthquakes.
5. There is no displacement of geologic structures in an area.
6. It does not have earthquakes.

## What's More

### Activity 5

1. Scarcely Perceptible
2. Completely Devastating
3. Most people are frightened and run outdoors
4. Felt by many people indoors especially in upper floors of building

## What's More

### Activity 4

1. <2.0
2. 10.0+
3. Can cause major damage to poorly constructed building.
4. Noticeable shaking of indoor items.

## What's More

### Activity 3

1. C
2. A
3. D
4. B

## What's More

### Activity 2

1. C
2. A
3. B

## What's New

### Activity 1

1. Fault
2. Epicenter
3. Focus

## What I know

- |      |       |       |
|------|-------|-------|
| 1. B | 6. B  | 11. B |
| 2. A | 7. B  | 12. B |
| 3. D | 8. D  | 13. D |
| 4. C | 9. B  | 14. C |
| 5. B | 10. B | 15. A |

<p><b>Additional Activity</b></p> <p><b>Activity 8</b></p> <p>1. magnitude 6.1</p> <p>2. The disaster resulted to a damage of 1230 houses and reached a death toll of 18, 282 were injured and 7 are still missing.</p> <p>3. Because Pampanga is situated on soft sediment and soils deposited by surface water or alluvial soil which weakens the foundation of the structures.</p> <p>4. Yes, Zambales has an active fault because places with active faults are likely to have an earthquake and are a geologic hazard.</p>	<p><b>Assessment</b></p> <p>1. C</p> <p>2. B</p> <p>3. A</p> <p>4. C</p> <p>5. C</p> <p>6. A</p> <p>7. C</p> <p>8. B</p> <p>9. D</p> <p>10. B</p> <p>11. C</p> <p>12. C</p> <p>13. C</p> <p>14. A</p> <p>15. D</p>	<p><b>What can I Do</b></p> <p><b>Activity 7</b></p> <p>Learn the evacuation are in your place. Contact local authorities for some assistance. Make a family evacuation plan.</p>
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## ***References***

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