	School:		**Grade Level:**	**7**
	Teacher:		**Learning Area:**	**Science**
	Teaching Dates and Time:		**Quarter:**	**Fourth**
			Week:	**Week 4-Day 3**

I. CONTENT, STANDARDS AND LEARNING COMPETENCIES		*ANNOTATIONS*
A. CONTENT STANDARDS	The learners learn that the damage or effects on communities depend on the magnitude of and distance from an earthquake.	
B. PERFORMANCE STANDARDS	By the end of the Quarter, learners will appreciate the value of using systems to analyze and explain natural phenomena and demonstrate their understanding of the dynamics of faults and earthquakes. They are confident in identifying and assessing the earthquake risk for their local communities using authentic and reliable secondary data. They use the country's disaster awareness and risk reduction management plans to identify and explain to others what to do in the event of an earthquake. Learners explain the cause and effects of secondary impacts that some coastal communities may experience should a tsunami be produced by either local or distant earthquake activity. Learners use reliable scientific information to identify and explain how solar energy influences the atmosphere and weather systems of the Earth and use such information to appreciate and explain the dominant processes that influence the climate of the Philippines.	

C. LEARNING COMPETENCIES	**Learning Competencies:** Refer to the local disaster readiness plans to demonstrate what to do during and after an earthquake **Learning Competencies:** Describe procedures that the authorities have in place to alert communities of pending tsunamis and what procedures can be implemented should a tsunami impact a community;	
D. LEARNING OBJECTIVES	**Learning Objectives:** 1. Identify the key components of the local disaster readiness plan related to earthquakes; 2. Demonstrate the correct technique for "Drop, Cover, and Hold On" during simulated earthquake drills.; and 3. Increased confidence in their ability to respond effectively during and after an earthquake by following the local disaster readiness plan. **Learning Objectives:** 1. Describe the communication channels through which authorities disseminate tsunami warnings; 2. Demonstrate the ability to follow evacuation procedures in response to a tsunami warning; and 3. Appreciate the importance of preparedness for tsunamis.	
I. CONTENT		
Earthquake and Tsunami Preparedness		
II. LEARNING RESOURCES		
A. REFERENCES	● The San Andreas Fault - VIII. “Magnitude” and “Intensity.” (n.d.). https://pubs.usgs.gov/gip/earthq3/magnitude.html ● Oxford Languages Dictionary ● simulate. (2024). https://dictionary.cambridge.org/dictionary/english/simulate	

	● The Modified Mercalli Intensity Scale | U.S. Geological Survey. (n.d.). https://www.usgs.gov/programs/earthquake-hazards/modified- mercalli-intensity-scale	
B. OTHER LEARNING RESOURCES		
III. TEACHING AND LEARNING PROCEDURE		
BEFORE/PRE-LESSON PROPER		
ACTIVATING PRIOR KNOWLEDGE	**Short Review** Disaster preparedness is the process of getting ready for emergencies to **reduce risks, protect lives, and ensure quick response and recovery**. It involves understanding different hazards, creating emergency plans, and practicing safety drills. Key actions include: ● **Knowing potential disasters** in your area (earthquakes, floods, fires, etc.). ● **Having an emergency kit** with essentials like food, water, medicine, and a flashlight. ● **Creating an evacuation plan** with safe routes and emergency contacts. ● **Practicing safety procedures** like **Drop, Cover, and Hold On** during earthquakes. Being prepared helps individuals, families, and communities **stay safe and respond effectively** in times of disaster.	
LESSON PURPOSE/INTENTION	**Lesson Purpose**	

<table>
<tr>
<td></td>
<td>The purpose of this lesson is to help understand and interpret intensity scales used to measure the effects of earthquakes. Learn how intensity differs from magnitude, how intensity scales (such as the Modified Mercalli Intensity Scale) describe the level of shaking and damage, and why these measurements are important for disaster preparedness. By the end of the lesson, will be able to identify intensity levels based on observations, explain their significance in assessing earthquake impact, and apply this knowledge to real-world scenarios to enhance safety and preparedness.</td>
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<tr>
<td>LESSON LANGUAGE PRACTICE</td>
<td>Unlocking Content Vocabulary

Direction: Match the terms in Column A with their correct definitions in Column B. Write the letter of the correct answer on the blank before each number.

<table>
<tr><th>Column A (Terms)</th><th>Column B (Definitions)</th></tr>
<tr><td>Intensity</td><td>a) The point on the Earth's surface directly above where an earthquake originates.</td></tr>
<tr><td>Magnitude</td><td>b) The measure of an earthquake’s effects on people, buildings, and the environment.</td></tr>
<tr><td>Seismograph</td><td>c) A phenomenon where the ground behaves like a liquid due to intense shaking.</td></tr>
<tr><td>Liquefaction</td><td>d) The measure of the total</td></tr>
</table>
</td>
<td>Answer Key:
1 - b
2 - d
3 - e
4 - c
5 - a</td>
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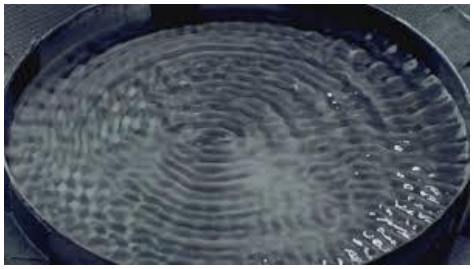
</table>

		energy released by an earthquake.
	Epicenter	e) An instrument that detects and records earthquake waves.

DURING/LESSON PROPER		
READING THE KEY IDEA/STEM	**Intensity Scales** **PHILVOLCS** - Philippine Institute of Volcanology and Seismology **PEIS** - PHILVOLCS Earthquake Intensity Scale **Intensity 1 - Scarcely Perceptible** Delicately balanced objects are disturbed slightly.  Still water in containers oscillates slowly. **Intensity 2 - Slightly Felt**	

Felt by few individuals at rest indoors. Hanging objects swing

slightly.

Intensity 3 - Weak

Vibration is felt like one passing of a light truck.

Dizziness and nausea are experienced by some people.

Intensity 4 - Moderately Strong

Dinner, plates, glasses, windows and doors rattle. Floors and walls of wood framed buildings creak. Standing motor cars may rock

slightly. Rumbling sound may sometimes be heard.

Vibration is felt like a passing of heavy truck. Vibration is felt like a passing of heavy truck.

Intensity 5 – Strong

Strong shaking and rocking felt throughout building. Hanging objects swing violently. Dining utensils clatter and clink; some are broken. Small, light and unstable objects may fall or overturn.

Intensity 7 - Destructive

Big church bells may ring. Some cracks may appear on dikes, road surface, or concrete hollow block walls.

Intensity 8 - Very Destructive

Liquefaction and lateral spreading cause man- made structure to sink, tilt or topple. Numerous landslides and rockfalls occur in mountainous and hilly areas.

Intensity 9 – Devastating

People are forcibly thrown to ground. Many cry and shake with fear. Most buildings are totally damaged. bridges and elevated concrete structures are toppled or destroyed.

Intensity 10 - Completely Devastating

Practically all man-made structures are destroyed. Massive landslides and liquefaction, and liquefaction, large scale subsidence and uplifting of land forms and many ground fissures are observed.

EARTHQUAKE MAGNITUDE AND INTENSITY

- Magnitude is the measurement of the amount of energy released during an earthquake.

- The **Richter scale** is a numerical scale based on the size of the largest seismic waves generated by a quake that is used to describe its magnitude.

- Each successive number in the scale represents an increase in seismic-wave size, or amplitude, of a factor of 10.

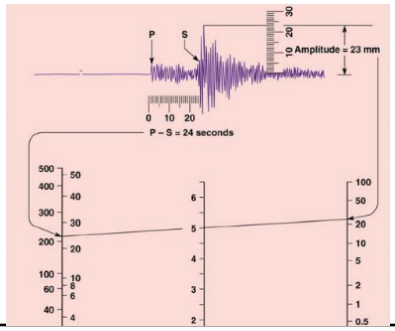
- Each increase in magnitude corresponds to about a 32-fold increase in seismic energy.

HOW ARE THE SIZE AND STRENGTH OF AN EARTHQUAKE MEASURED?

- **Magnitude**

  - **Richter scale** measures total amount of energy released by an earthquake; independent of intensity

  - Amplitude of the largest wave produced by an event is corrected for distance and assigned a value on an open-ended logarithmic scale



EARTHQUAKE MAGNITUDE AND INTENSITY

Modified Mercalli Scale

- The **modified Mercalli scale**, which measures the amount of damage done to the structures involved, is used to determine the **intensity** of an earthquake.
- This scale uses the Roman numerals I to XII to designate the degree of intensity.
- Specific effects or damage correspond to specific numerals; the higher the numeral, the worse the damage.

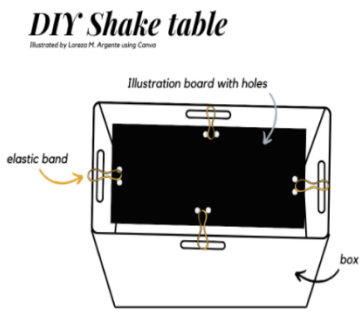
I. Instrumental	Not felt by many people unless in favourable conditions.
II. Weak	Felt only by a few people at best, especially on the upper floors of buildings. Delicately suspended objects may swing.
III. Slight	Felt quite noticeably by people indoors, especially on the upper floors of buildings. Many to do not recognise it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
IV. Moderate	Felt indoors by many people, outdoors by a few people during the day. At night, some awakened.
V. Rather Strong	Felt outside by most, may not be felt by some people in non-favourable conditions. Dishes and windows may break and large bells will ring. Vibrations like train passing close to house.
VI. Strong	Felt by all; many frightened and run outdoors, walk unsteadily. Windows, dishes, glassware broken; books fall off shelves; some heavy furniture moved or overturned; a few instances of fallen plaster. Damage slight.
VII. Very Strong	Difficult to stand; furniture broken; damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by people driving motor cars.
VIII. Destructive	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture moved.
IX. Violent	General panic; damage considerable in poorly designed structures, well designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X. Intense	Some well build wooden structures destroyed; most masonry and frame structures destroyed with foundation. Rails bent.
XI. Extreme	Few, if any masonry structures remain standing. Bridges destroyed. Rails bent greatly.
XII. Cataclysmic	Total destruction – everything is destroyed. Lines of sight and level distorted. Objects thrown into the air. The ground moves in waves or ripples. Large amounts of rock move position. Landscape altered, or leveled by several meters. In some cases, even the routes of rivers are changed.

Depth of Focus

- Earthquake intensity is related to earthquake magnitude.
- The depth of the quake's focus is another factor that

	determines the intensity of an earthquake. - An earthquake can be classified as shallow, intermediate, or deep, depending on the location of the quake's focus. - A deep-focus earthquake produces smaller vibrations at the epicenter than a shallow-focus quake.	
DEVELOPING and DEEPENING UNDERSTANDING OF THE KEY IDEA/STEM	**SUB-TOPIC 1: Intensity Scales** **1. Explicitation** Compare the damage caused by an earthquake. What can you say about the 2 pictures?   **Question**: What is the importance of using intensity scales? **2. Worked Example** **I. Activity No. 4.1:** Shake and Rate (30 mins) **II. Objective(s):** At the end of the activity, you should be able to understand how intensity scales measure earthquake effects by simulating and rating the intensity of shaking using a shake table. **III. Materials Needed:** DIY shake table, Objects of varying sizes and weights (e.g., toy buildings, LEGO structures, small containers filled with sand or rice), intensity scale cards (printed copies of the Modified Mercalli Scale), stopwatch or timer	Let the learners realize that not all earthquake bring the same damage. Ask them to recall the most recent earthquake that they felt.

IV. Instructions:



1. Select an object and place it on the shake table.

2. Start the shake table to simulate an earthquake, gradually increasing the intensity of shaking.

3. As the shake table operates, you should observe the behavior of the object and discuss its movement and stability.

4. After each trial, you should rate the intensity of shaking based on the observed effects using the intensity scale cards.

5. Encourage students to record their observations and intensity ratings in their notepads.

Guide Questions:

1. What factor/s may influence the intensity of shaking experienced by different objects?

2. How can intensity scales assist in measuring earthquake effects?

3. How can the intensity scales assist in earthquake preparedness and safety?

Rubric or Score Guide

Advanced	Proficient (18)	Nearly Proficient	Emerging (14)	Needs

Intensity scales play a crucial role in assessing earthquake effects, comparing earthquakes, assessing risk, raising public awareness, facilitating communication, and advancing scientific research. Their use is essential for effective earthquake preparedness, response, and mitigation efforts.

The first intensity scale of modern times was developed by De Rossi of Italy and Forel of Switzerland in 1880s. This scale, which is still sometimes used in describing damage effect of an earthquake, has values I to X. The 1906 San Francisco earthquake was rated with the Rossi-Forel intensity scale. For description of this scale readers are referred to Richter (1958).

If toy buildings are not available, the learners may create infrastructures using straw, clay, or paper.

(20 points)		(16)		Improvement (12)	
All of the required fields were answered, and the answers to guide questions were well-organized and completely explained in detail.	All of the required fields were answered, and the answers were well-organized and completely explained, but not in detail.	Some of the required fields were answered, and the answers were somewhat organized and explained but not in detail.	Some of the required fields were answered, but the answers we're not organized and not explained in detail.	Few of the required fields were answered, and the answers we're not organized and not explained in detail.	

IV. Extended Activity

Research real-life earthquakes and use intensity scales to assess the effects on buildings and communities, then present your findings to the class. You may refer to https://earthquake.phivolcs.dost.gov.ph/ for the data.

3. Lesson Activity

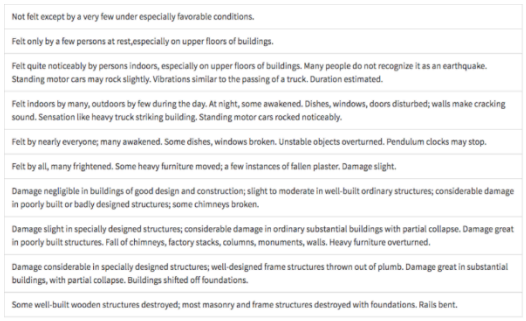
Arrange the following description/damage of the Modified Mercalli Intensity scale based on its

Compare and contrast the intensity ratings given by different groups for similar objects.

Factors may include but not limited to the object's size, weight, and construction.

Intensity scales play a critical role in measuring earthquake effects, assessing seismic hazard and risk, and enhancing earthquake preparedness and safety.

By providing valuable information about the impact of earthquakes on communities and infrastructure, intensity scales help authorities and

	intensity from the weakest to the strongest.  Not felt except by a very few under especially favorable conditions. Felt only by a few persons at rest,especially on upper floors of buildings. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.	individuals make informed decisions and take proactive measures to mitigate earthquake risk and enhance resilience. You may refer to the sample earthquake data below. Allow the learners to identify the damage and or what the mentioned places experience with the intensity that they felt. https://earthquake.phivolcs.dost.gov.ph/ The teacher will prepare cut-outs of the description of the Modified Mercalli Intensity scale and let learners try to arrange them from the weakest to the strongest intensity. The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects experienced at that place.
AFTER AFTER/POST-LESSON		
MAKING GENERALIZATIONS AND ABSTRACTIONS	Worksheet Synthesis/Extended What you have learned In a one sheet of paper write something you understand about the lesson we discussed today.	
EVALUATING LEARNING	**Direction:** Read each question carefully and choose the best answer. Encircle the letter of the correct answer. **1. What does the Modified Mercalli Intensity (MMI) Scale primarily measure?**	**Answers:** 1. B) The intensity of the shaking and its effects on people, buildings, and the earth's surface

	A) The energy released during an earthquake B) The intensity of the shaking and its effects on people, buildings, and the earth's surface C) The speed of seismic waves D) The depth of the earthquake's epicenter **2. On the Richter Scale, an earthquake of magnitude 6 is how many times stronger than an earthquake of magnitude 5?** A) 2 times B) 10 times C) 32 times D) 100 times **3. Which intensity scale is primarily used for measuring the impact of earthquakes on buildings and human experience?** A) Moment Magnitude Scale (Mw) B) Richter Scale C) Modified Mercalli Intensity Scale D) Body-Wave Magnitude Scale **4. What is the main difference between the Moment Magnitude Scale (Mw) and the Richter Scale?** A) Mw measures the depth of the earthquake, while the Richter Scale measures surface shaking. B) Mw provides a more accurate measurement of large earthquakes, while the Richter Scale is for smaller ones. C) Mw measures the intensity of earthquakes, while the Richter Scale measures the magnitude. D) Mw and the Richter Scale are identical in how they measure earthquakes. **5. In which of the following intensity scales does the description of damage to buildings and people's reactions play a key role?**	2. C) 32 times 3. C) Modified Mercalli Intensity Scale 4. B) Mw provides a more accurate measurement of large earthquakes, while the Richter Scale is for smaller ones. 5. D) Modified Mercalli Intensity Scale

	A) Body-Wave Magnitude Scale B) Moment Magnitude Scale C) Richter Scale D) Modified Mercalli Intensity Scale	
ADDITIONAL ACTIVITIES FOR APPLICATION OR REMEDIATION (IF APPLICABLE)		
REMARKS		
REFLECTION		

Prepared by:

_____

Subject Teacher

Reviewed by:

_____

Master Teacher/Head Teacher