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District I – A

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STUDENT's ACTIVITY SHEET FOR GENERAL PHYSICS 1

STUDENT's ACTIVITY SHEET FOR MELC 1(MODULAR MODALITY)

TITLE/LESSON: RANDOM AND SYSTEMATIC ERRORS

OBJECTIVES: At the end of the lesson, you are expected to:
   a. differentiate random and systematic errors;
   b. identify causes of random and systematic errors; and
   c. cite examples of random and systematic errors in real life situations.

A. Content Standard:

The learner demonstrates an understanding of sources and errors.

B. Performance Standard:

The learners shall be able to solve using experimental and theoretical approaches, multi concept, rich-context problems involving measurement.

C. Most Essential Learning Competency/ies:

Differentiate random errors and systematic errors. (STEM_GP12EU-Ia-3)

II: LEARNING RESOURCES

   A.   Materials/IMs Needed
   B.   References
   C.   Additional Materials and Learning Resources

III: TIME FRAME: 50 min or 1 day (30 min will be allotted for the lecture part)

IV: INTRODUCTION/RATIONALE

Random and Systematic Errors

   Errors can be divided into two primary kinds, systematic and random errors. Systematic error, as the name implies, is a consistent, repeatable error that deviates from the true value of measurement by a fixed amount. Systematic error is the one that occurs in the same direction each time due to the fault of the measuring device. On the contrary, any type of error that is inconsistent and does not repeat in the same magnitude or direction except by chance is considered to be a random error. Random errors are sometimes called statistical errors.

What I Need to Know

This activity sheet was designed and written with you in mind. It is here to help you master the Random and Systematic Errors. The scope of this activity sheet permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary of students. The lessons are arranged to follow the standard sequence of the course.

This activity sheet is compromised only of one lesson:

- Random and Systematic Errors

After going through this activity sheet, you are expected to:

1. differentiate random and systematic errors;
2. identify causes of random and systematic errors; and
3. cite examples of random and systematic errors in real life situations.

What I Know

Activity 1.1 Name them ALL!

Directions: Cite examples of different types of errors and their origin. Describe each as a random or a systematic error. (**2 minutes**)

What's In

Activity 1.2 Watch It! Watch Out!

Directions: From the examples below, list at least 3 possible sources of error in measurements. (**2 minutes**)

When weighing yourself on a scale, you position yourself slightly differently each time. When taking a volume reading in a flask, you may read the value from a different angle each time.; Measuring the mass of a sample on an analytical balance may produce different values as air currents affect the balance or as water enters and leaves the specimen.

What's New

Activity 1.3 Brainwave!

Directions: Give your opinion on this: "No matter how careful you are, there is always error in a measurement". (**2 minutes**)

What is It

Random error describes errors that fluctuate due to the unpredictability or uncertainty inherent in your measuring process, or the variation in the quantity you're trying to measure.

A scientist measuring an insect, for example, would try to position the insect at the zero point of a ruler or measuring stick, and read the value at the other end. The ruler itself will probably only measure down to the nearest millimeter, and reading this with precision can be difficult. You may underestimate the true size of the insect or overestimate it, based on how well you read the scale and your judgment as to where the head of the insect stops. The insect might also move ever so slightly from the zero position without you realizing. Repeating the measurement multiple times yields many different results because of this, but they would likely cluster around the true value.

A systematic error is one that results from a persistent issue and leads to a consistent error in your measurements. For example, if your measuring tape has been stretched out, your results will always be lower than the true value. Similarly, if you're using scales that haven't been set to zero beforehand, there will be a systematic error resulting from the mistake in the calibration (e.g., if a true weight of 0 reads as 5 grams, 10 grams will read as 15 and 15 grams will read as 20).
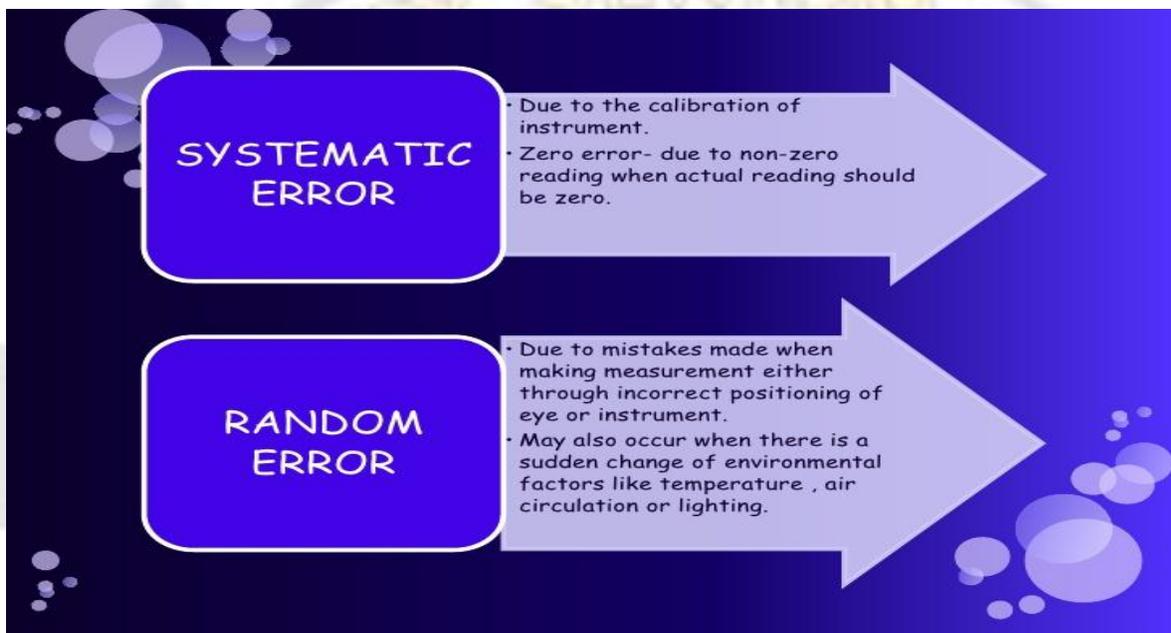
What's More

Activity 1.4 A Job for Me!

Directions: Make a concept map showing the causes of random and systematic errors. **(3 minutes)**

What I Have Learned

Activity 1.5 A Time to Shine!

Directions: Give at least 5 examples of random and systematic errors you have encountered in real life situations. **(2 minutes)**

1. _____
2. _____
3. _____
4. _____
5. _____

What I Can Do

Activity 1.6 Put Your Best!

Directions: Tell whether it is a random or systematic error. **(5 minutes)**

_____1. When weighing yourself on a scale, you position yourself slightly differently each time.

_____2. Not reading the meniscus at eye level for a volume measurement will always result in an inaccurate reading. The value will be consistently low or high, depending on whether the reading is taken from above or below the mark.

_____3. Measuring the mass of a sample on an analytical balance may produce different values as air currents affect the balance or as water enters and leaves the specimen.

_____4. Measuring length with a metal ruler will give a different result at a cold temperature than at a hot temperature, due to thermal expansion of the material.

_____5. Measuring your height is affected by minor posture changes.

_____6. An improperly calibrated thermometer may give accurate readings within a certain temperature range, but become inaccurate at higher or lower temperatures.

_____7. Measuring wind velocity depends on the height and time at which a measurement is taken. Multiple readings must be taken and averaged because gusts and changes in direction affect the value.

_____8. Readings must be estimated when they fall between marks on a scale or when the thickness of a measurement marking is taken into account

Assessment

Quiz #3

Directions: Give the key differences of random and systematic errors in terms of the following:
(3 minutes)

1. Basic definition
2. Causes
3. Examples

Additional Activities

Activity 1.7 Let's Compare!

Directions: Make a Venn diagram of random and systematic errors. **(2 minutes)**

V. REFLECTION: (5 minutes)

Base on the activity/ies conducted, complete the phrases stated below:

✓ I understand that
_____
_____.

- ✓ I realize that
_____
_____.

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