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STUDENT's ACTIVITY SHEET FOR GENERAL PHYSICS 1

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

TITLE/LESSON: <u>ACCURACY AND PRECISION</u>

OBJECTIVES: At the end of the lesson, you are expected to:
  a. define accuracy from precision;
  b. differentiate accuracy and precision; and
  c. apply the concepts of accuracy and precision in real life situation.

A. Content Standard:

The learners demonstrate an understanding of accuracy versus precision.

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 accuracy and precision. (STEM_GP12EU-Ia-2)

II: LEARNING RESOURCES

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

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

IV: INTRODUCTION/RATIONALE

Accuracy and Precision

Accuracy and precision are two important factors to consider when taking data measurements. Both accuracy and precision reflect how close a measurement is to an actual value, but accuracy reflects how close a measurement is to a known or accepted value, while precision reflects how reproducible measurements are, even if they are far from the accepted value.

What I Need to Know

This activity sheet was designed and written with you in mind. It is here to help you master the Accuracy and Precision. 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:

- Accuracy and Precision

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

1. define accuracy from precision;
2. differentiate accuracy and precision; and
3. apply the concepts of accuracy and precision in real life situation.

What I Know

Activity 1.1 Let's Compare!

Directions: Explain the concept of accuracy and precision in the situation below. (**2 minutes**)

Would you rather...have a pilot that is accurate in-flight landings or have a pilot that is precise in-flight landings? Justify your answer.

What's In

Activity 1.2 Watch It! Watch Out!

Directions: Answer the following questions. (**2 minutes**)

1. Are your measurements accurate? How precise is that measurement?

2. How does precision and accuracy relate to what will be doing in experiment this year?

What's New

Activity 1.3 Watch IT Right!

Directions: Analyze the situation below: (**2 minutes**)

If the weather temperature reads 28 °C outside and it is 28 °C outside, then the measurement is said to be accurate. If the thermometer continuously registers the same temperature for several days, then the measurement is also precise. Do you agree? Explain why.

What is It

Accuracy and Precision in Measurement

There are two basic concepts to any collection of measurements: accuracy and precision. Accuracy is how close the measured data is to the actual value. For example, if you know that you have a mass standard that is 50.00 grams, and you measure it to be 49.98 grams, then your

measurement is very accurate. On the other hand, if you measure it to be 43.24 grams, your measurement is not very accurate.

Precision is how close your measurements are relative to each other, not the actual value. For example, let say you measured that same mass standard and came up with the values:

43.24, 43.30, 43.20, 43.25, 43.32

You could say that your measurement was very precise because all the values are very close to each other. On the other hand, if your measurements were:

50.03, 43.40, 53.01, 47.54, 30.23

Measurements would not very precise because they are all apart relative to each other.

Mnemonic to Remember the Difference

An easy way to remember the difference between accuracy and precision is:

- A**C**curate is **C**orrect (or **C**lose to real value)
- P**R**ecise is **R**epeating (or **R**epeatable)

What's More

Activity 1.4 Let's Find Out!

Directions: Take turns tossing your pennies. Each person who tosses will need another partner to mark the target with a unique color and symbol identifier based on where their partner's pennies initially land. From this, begin to make meaning about the word's precision and accuracy. (**2 minutes**)

What I Have Learned

Activity 1.5 Let's Compare!

Directions: Explain the concept of accuracy and precision in a dartboard. Assume that someone throws three darts at a dartboard. (**2 minutes**)

High precision   High precision   Low precision
High accuracy   Low accuracy   Low accuracy
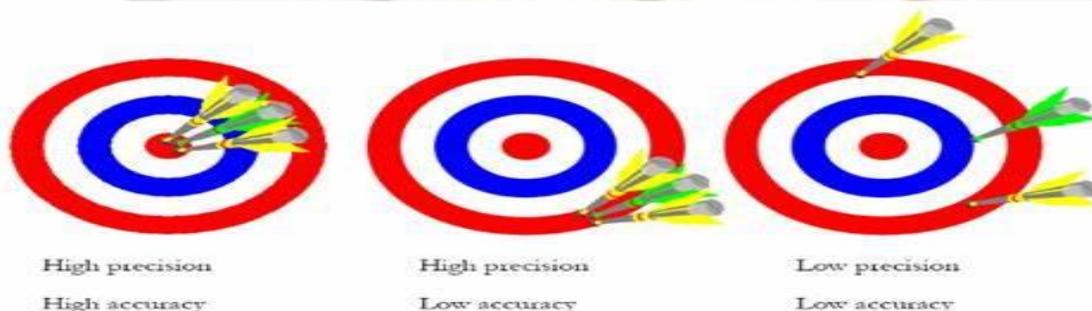
What I Can Do

Activity 1.6 How Precise and Accurate Are You?
Materials: 1 sheet of carbon paper, 1 steel ball
1 blank sheet of paper, ruler, pencil

Procedure for Collecting Data:

1. On the sheet of blank paper, draw 'cross-hairs' in the center. Carefully repeat this on the reverse side of the paper so that the cross-hairs coincide. Write your name on each side of the paper. Label one side "dropped target" and label the other side "tossed target."

2. Place the paper on the floor and practice dropping the steel ball from 1 meter, taking aim at the cross-hairs. Your partner must be able to catch the ball after the first bounce so that for each drop the ball only hits the paper once.

3. When you are ready to perform the experiment, place the piece of carbon paper under the target so that the ink side is facing up. Place the target paper with the side marked "drop target" face down on the carbon paper so that an ink mark will be made on it when the ball hits.

4. For the drop target, drop the ball from a height of approximately 1 meter ten times so that there will be 10 marks on the drop side of the target paper. Then, for the toss target, flip the target paper over and toss the ball ten times while standing approximately 1 meter away from the target so that there will be 10 marks on the toss side of the target paper. Each lab partner needs to do this so they have their own set of marks to analyze.

5. On each side of the target paper, draw a circle of whatever size is needed in order to include all the hit marks. Use the two furthest marks as the ends of the diameter of this circle. Then, mark the center point of the circle with a heavy dot and measure the radius of each circle and record your data below.

6. On each side of the target paper, measure the distance from the center of the cross-hairs to the center of the circle. Record your data below.

7. Attach your target paper to this lab.

	Radius of circle	Distance from cross-hairs to center of circle
drop target		
toss target		

Questions: In this activity, the cross-hairs represent the accepted value of some quantity that you are trying to measure and the hit marks represent your attempts to measure it. (**5 minutes**)

1. What does the center point of the circle represent?
2. What does the size of the circle represent?
3. How is the distance from the cross-hairs to the center of the circle related to the accuracy of the experiment?
4. How is the size of the circle containing all the hits related to the precision of the experiment?
5. Which set of measurements was more accurate? Explain.
6. Which set of measurements was more precise? Explain.

Assessment

Quiz #2

Directions: Answer the following questions. (**5 minutes**)

1. The volume of a liquid is 26 mL. A student measures the volume and finds it to be 26.2 mL, 26.1 mL, 25.9 mL, and 26.3 mL in the first, second, third, and fourth trial, respectively. Which of the following statements is true for his measurements?
   A. They are neither precise nor accurate.
   B. They have poor accuracy.
   C. They have good precision.

D. They have poor precision.

2. *The volume of a liquid is 20.5 mL. Which of the following sets of measurement represents the value with good accuracy?*
   A. 18.6 mL, 17.8 mL, 19.6 mL, 17.2 mL

   B. 19.2 mL, 19.3 mL, 18.8 mL, 18.6 mL

   C. 18.9 mL, 19.0 mL, 19.2 mL, 18.8 mL

   D. 20.2 mL, 20.5 mL, 20.3 mL, 20.1 mL

Additional Activities

Activity 1.7 Believe It or Not!

Directions: Research the story of Apollo 13 and perform the calculations that the astronauts had to do

in flight to save their lives. (**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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