PLTW | Engineering

Activity 3.1a Linear Measurement With SI Units Answer Key

Introduction

Modern civilization cannot exist without measurement systems. Measurements are everywhere, and you use them every day. Every time you buy gas, check the outside temperature, or step on a weight scale, measurements are used to represent a quantity. The abilities to conduct, record, and convert measurements are necessary to understand our technological world and to carry on the business of living. The fields of science, engineering, and mathematics use measurements extensively in the processes of discovery and design.

An interesting aspect of measurement is that a single quantity can be measured in different ways. I may describe the height of a horse in hands, feet, or meters. I can give the length of a property line in chains, miles, or meters. The units commonly used to measure a quantity can change with time and across borders. In the past it was not necessary to understand the system of measurement used by people outside of your local area, but today the world is a global marketplace.

The United States is the only developed country that does not use the International System of Units. In order to participate in the global market, we must be able to understand and communicate using various measurement systems. An object that is designed in the United States may end up being manufactured in another country. Due to the global nature of technology, engineered objects must often be communicated in SI (modern metric) units.

With respect to measurements within the science, engineering, and mathematical communities, accuracy and precision of measurements is extremely important. Often the correctness of a measurement is critical to the work of scientist, engineers, and mathematicians and must be carefully considered.

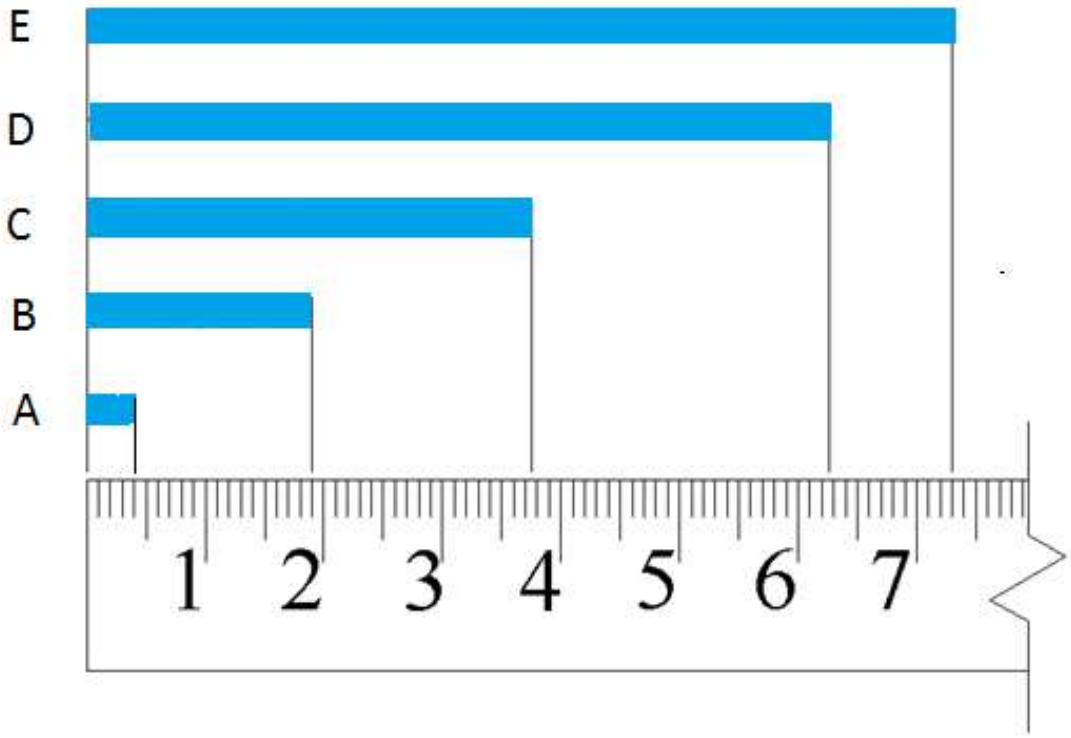
In this activity you will practice taking linear using SI measurements with a metric ruler and correctly recording the measurements to reflect the precision of the measurement.

Equipment

- Ruler – metric

Directions

Record the length of the rectangles shown in the following figure using SI units and the correct number of significant figures. **Include the units of measurement** in your answers.

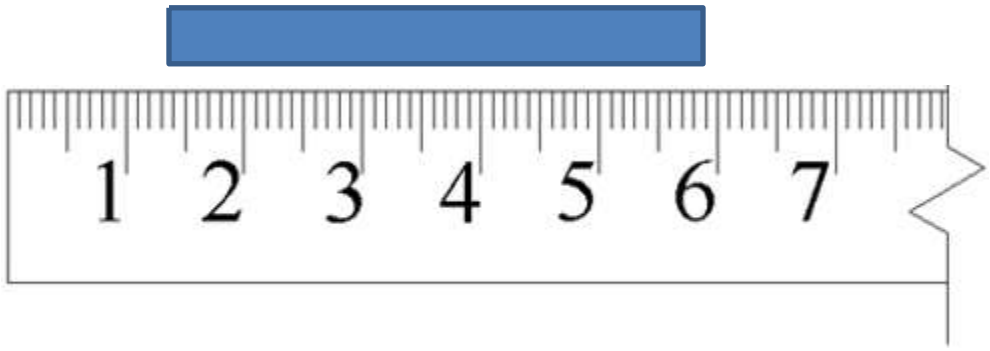


Answers may vary slightly

	Distance	Measurement
1.	A	**0.42 cm or 4.2 mm**
2.	B	**1.90 cm or 19.0 mm**
3.	C	**3.75 cm or 37.5 mm**
4.	D	**6.25 cm or 62.5 mm**
5.	E	**7.30 cm or 73.0 mm**

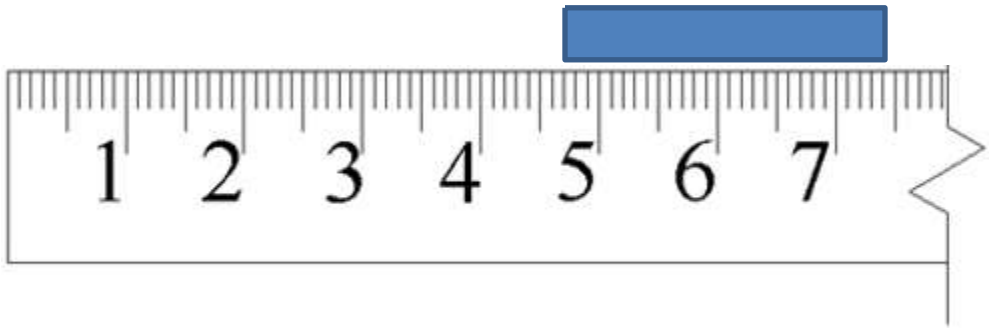
6. Calculate each of the following lengths of the rectangle and record the answer using appropriate significant digits and the **correct unit of measurement**. **Show all calculations.**

a. What is the length of the rectangle? **Show work.**



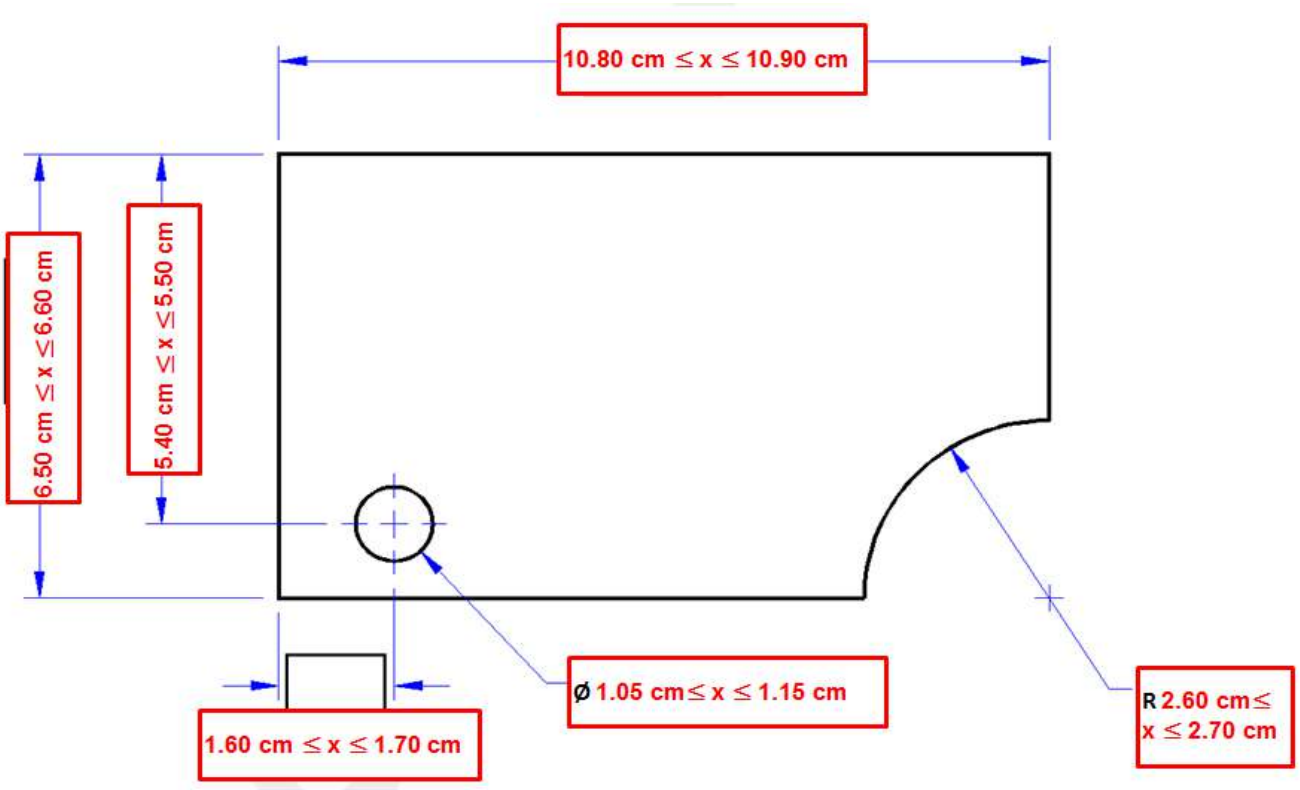
. **4.5cm to 4.7cm**

b. What is the length of the rectangle? **Show work.**



2.60 cm to 2.80cm

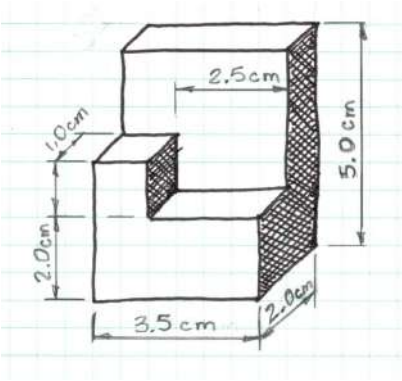
7. Using a metric ruler, measure the missing lengths in the figure below and enter the dimensions in the boxes. Be sure to use the correct number of significant digits and include units. Answers can be in mm or cm. The following answers provide an acceptable range of measurements. Students' answers should be within the range provided for each measurement.



8. Measure and record the linear measurement of items in your classroom using appropriate metric units as directed by your instructor. Be sure to include the appropriate number of significant digits. **Answers will vary but should be fairly consistent among students.**

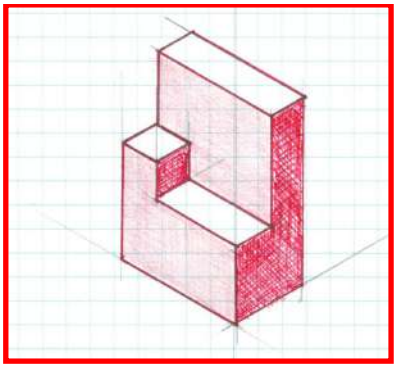
Object	Description of measurement	Measurement units	Measurement
CD	Diameter	cm	
Lined paper	Distance between lines	mm	

9. What type of pictorial is shown below? How can you tell?



Cavalier Oblique. The sketch is an oblique pictorial since the front view is drawn "straight on" Depth of 2.0cm is the same measurement as the height of 2.0cm so it must be full depth. If the depth of 2.0 cm was half of the height of 2cm it would have been cabinet but it is not the came

10. Create a **full scale isometric** view of the object represented in the following sketch using the dimensions shown. Use a metric ruler to obtain the correct dimensions on your sketch (If the height of the drawing in #9 is 5 cm then the isometric drawing needs to be 5 cm as well).



Conclusion

1. What is the most widely used system of measurement in the world? Which is the only industrialized country not to adopt it?

   The International System of Units (SI), the USA

2. How many cm are in a m? How many mm are in a m? How many mm are in a cm?

   100 cm in a m.
   1000 mm in a m
   10 mm in a cm

3. Convert 821 mm into m and cm.
   Covert 435 cm into m and mm.
   Convert 7 m into cm and mm.

   821 mm – 82.1 cm - 0.821 m
   435 cm – 4350 mm – 4.350 m
   7m – 700cm – 7000 mm