

ASSIGNMENT: Accuracy, Precision and Uncertainty

Name: _____

Date: _____

1. Runa used a metre stick marked off in half centimetres to measure the length of the classroom. What are the precision and the uncertainty?

precision: _____

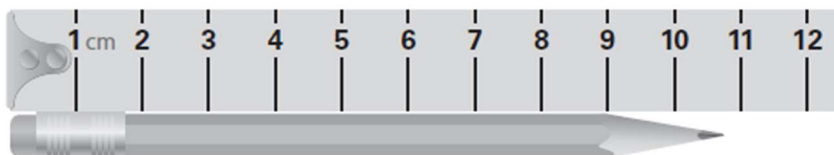
uncertainty: _____

2. The odometer on Sam's car measure distances to the nearest tenth of a kilometer. What are the precision and the uncertainty of the odometer?

precision: _____

uncertainty: _____

3. Examine the following measurement:



- a) What is the precision of the measuring device?

- b) What is the length of the measured item, including its uncertainty?

4. Examine the following measurement:



- a) What is the precision of the measuring device?

- b) What is the length of the measured item, including its uncertainty?

5. Marcia's oven indicates temperatures to the nearest 10 °C. She sets it at 160 °C.

a) What are the precision and uncertainty of the oven thermometer?

precision: _____

uncertainty: _____

b) What is the maximum possible temperature in the oven? What is the minimum possible temperature?

maximum: _____

minimum: _____

6. Sam is a nurse, and she is filling a syringe with medicine for a patient. The dose required is 24 mL. The syringe is marked in 2 mL units.

a) What are precision and uncertainty in Sam's measurements?

precision: _____

uncertainty: _____

b) What are the maximum and minimum amounts of medicine that could be in the syringe?

maximum: _____

minimum: _____

7. Frank measured his height as 1.75 m using a tape measure marked in centimetres.

a) Write his height as: *measured value* \pm *measurement uncertainty*.

b) What is the range of possible values of his actual height?

8. Add the following measurements, including uncertainty.

$$45.2 \text{ cm} \pm 0.5 \text{ cm}$$

$$34.8 \text{ cm} \pm 0.5 \text{ cm}$$

$$25.5 \text{ cm} \pm 0.5 \text{ cm}$$

9. Subtract the following measurements, including uncertainty.

$$14'9\frac{3}{4}'' \pm \frac{1}{16}''$$

$$3'5\frac{1}{4}'' \pm \frac{1}{16}''$$

10. Colm is preparing liquid fertilizer to apply to his garden. He has filled a bucket marked in half-litres with 4 L of the fertilizer mixture. (1 L = 1000 mL)

a) Write the volume of liquid in the bucket in the form: *measured value* \pm *measurement uncertainty*.

b) Colm uses a small jug marked in 100 mL increments to remove 600 mL of the mixture from the bucket. Write the volume of the liquid in the small jug in the form: *measured value* \pm *measurement uncertainty*.

c) What is the volume of liquid left in the bucket? Write your answer in the form: *measured value* \pm *measurement uncertainty*.

11. Craig and Stephy's wedding rings are being made by a jeweler. Craig's ring weights 9.22 g and Stephy's weights 5.73 g.

a) What are the precision and uncertainty for the weight of each ring?

precision: _____

uncertainty: _____

b) What are the maximum and minimum possible combined weights of the two rings? Hint: add the two weights, including the uncertainties.

maximum: _____

minimum: _____

12. Danita wants to install new cupboards in her kitchen. The space available in her kitchen is 130 cm wide, measured to the nearest centimeter. She plans to buy pre-built cupboards. She measured the three sizes available as 41 cm, 65 cm, and 24 cm wide. Assume all measurements have an uncertainty of ± 0.5 cm.

If Danita were to buy one of each size of the cupboards, can she safely assume that they will fit the in the available space? Why or why not?

1. 0.5 cm, ± 0.25 cm
 2. 0.1 km, ± 0.05 km
 3. a) 1 cm b) 11 cm ± 0.5 cm
 4. a) $1/16''$ b) $3/8'' \pm 1/32''$
 5. a) 10 °C, ± 5 °C b) max = 165 °C, min = 155 °C
 6. a) 2 mL, ± 1 mL b) max = 25 mL, min = 23 mL
 7. a) 175 cm ± 0.5 cm (or 1.75 m ± 0.005 m) b) 174.5 cm to 175.5 cm (1.745 m to 1.755 m)
 8. 105.5 cm ± 1.5 cm
 9. $114\ 1/2'' \pm 1/8''$
 10. a) 4 L ± 0.25 L (or 4000 mL ± 250 mL) b) 600 mL ± 50 mL c) 3400 mL ± 300 mL
 11. a) 0.01g, ± 0.005 g b) max = 14.96 g, min = 14.94 g
 12. No, the cupboards might not fit. The maximum possible length of the cupboards (131.5 cm) is more than the minimum possible space available (129.5 cm).