

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Math Practices: Precision in Math

With any given measurement, **accuracy** is determined by how closely the measured value is to the actual value of the quantity.

The **precision** of the measurement is determined by the level of detail included in the measurement, and is usually determined by the number of decimal places used.

The range in which a measurement lies ( $\pm$  a value) describes the **tolerance** of the measurement.

**Example:** A child is 49.9 inches tall. Three measurements are recorded in the same day. Determine which is (1) the most accurate, (2) the most precise, and (3) has the smallest tolerance.

Measurement A	$50.001 \pm 0.004$
Measurement B	$49.89 \pm 0.02$
Measurement C	$4 \text{ ft } 2 \text{ in} \pm 0.002 \text{ in}$

**Step 1:** Identify the range of data to determine which measurement is the most accurate.

Meas A	$50.001 \pm 0.004$	Range: 49.997 - 50.005
Meas B	$49.89 \pm 0.02$	Range: 49.87 - 49.91
Meas C	$4 \text{ ft } 2 \text{ in} \pm 0.002 \text{ in}$	Range: 49.998-50.002

Measurement C would be the most accurate measurement because it is the closest to the actual height of 49.9

**Step 2:** Identify which measurement is most precise

This is not referring to the most precise range (or, which range has the most decimal places). The preciseness of the measurement is determined by the number of decimal places it contains. Therefore, for the example above, Measurement A is the most precise measurement taken.

**Step 3:** Identify which measurement has the smallest tolerance.

The most tolerant measurement is the one with the smallest  $\pm$  value. In the example above, Measurement C has the smallest  $\pm$  value, and is the most tolerant.

**Practice.** Use your understanding of accuracy, precision, and tolerance to determine the most accurate, most precise, and smallest tolerance of the following data.

Name: \_\_\_\_\_

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1. Actual Measure: 10.5 m

A	10.0 m $\pm$ 0.005 m
B	10.5 m $\pm$ 0.2 m
C	10.22 m $\pm$ 0.2 m

Accurate: \_\_\_\_\_

Precise: \_\_\_\_\_

Smallest Tolerance: \_\_\_\_\_

2. Actual Measure: 5.00 in

A	4.3 in. $\pm$ 0.001 in.
B	5.01 in. $\pm$ 0.1 in.
C	4.8 in. $\pm$ 0.01 in.

Accurate: \_\_\_\_\_

Precise: \_\_\_\_\_

Smallest Tolerance: \_\_\_\_\_

3. Actual Measure: 32.4 mL

A	32.001 mL $\pm$ 0.05 mL
B	32.5 mL $\pm$ 0.005 mL
C	32.42 mL $\pm$ 0.5 mL

Accurate: \_\_\_\_\_

Precise: \_\_\_\_\_

Smallest Tolerance: \_\_\_\_\_

4. Actual Measure: 6.28 m

A	6.2 $\pm$ 0.9 m
B	6 $\pm$ 0.05 m
C	6.19 $\pm$ 1 m

Accurate: \_\_\_\_\_

Precise: \_\_\_\_\_

Smallest Tolerance: \_\_\_\_\_

5. Actual Measure: 21.56 km

A	21 $\pm$ .56 km
B	22.0 $\pm$ 0.0001 km
C	21.560 $\pm$ 0.005 km

Accurate: \_\_\_\_\_

Precise: \_\_\_\_\_

Smallest Tolerance: \_\_\_\_\_

6. Actual Measure: 52.46 mi

A	52 $\pm$ 0.5 mi
B	53.02 $\pm$ 0.2 mi
C	53.5 $\pm$ 0.005 mi

Accurate: \_\_\_\_\_

Precise: \_\_\_\_\_

Smallest Tolerance: \_\_\_\_\_

7. Actual Measure: 90.60 lb

A	90.5 $\pm$ 0.001 lb
B	91.2 $\pm$ 3 lb
C	90.06 $\pm$ 0.05 lb

Accurate: \_\_\_\_\_

Precise: \_\_\_\_\_

Smallest Tolerance: \_\_\_\_\_

8. Actual Measure: 3.5 yd

A	3.46 $\pm$ 0.01 yd
B	3.5 $\pm$ 0.2 cm
C	3.6 $\pm$ 0.0001 cm

Accurate: \_\_\_\_\_

Precise: \_\_\_\_\_

Smallest Tolerance: \_\_\_\_\_

9. Actual Measure: 63.0 mi

A	63.41 $\pm$ 0.1 mi
B	64.1 $\pm$ 0.25 mi
C	62 $\pm$ 0.006 m

Accurate: \_\_\_\_\_

Precise: \_\_\_\_\_

Smallest Tolerance: \_\_\_\_\_

10. Actual Measure: 99.82899 s

A	9.854 $\pm$ 2 s
B	9.891 $\pm$ 0.02 s
C	100 $\pm$ 0.2 s

Accurate: \_\_\_\_\_

Precise: \_\_\_\_\_

Smallest Tolerance: \_\_\_\_\_

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## Answer Key

### Math Practices: Precision in Math

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Answers are given in order: Accuracy, Precision, Tolerance

1. B,C,A
2. B,B,A
3. C,A,B
4. A,C,B
5. C,C,B
6. A,B,C
7. A,C,A
8. B,A,C
9. A,A,C
10. C,A,B