

1.6 Use Precision and Measurement

**Before**

You measured using a ruler and protractor.

Now

You will compare measurements for precision.

Why?

So you can determine which measurement is more precise, as in Ex. 31.

Significant digits are the digits in a measurement that carry meaning contributing to the precision of the measurement.

0.0070

KEY CONCEPT*For Your Notebook***Determining Significant Digits**

Rule	Example	Significant digits	Number of significant digits
All nonzero digits	281.39	281.39	5
Zeros that are to the right of both the last nonzero digit and the decimal point	0.0070	0.00 70	2
Zeros between significant digits	500.7	500.7	4

Zeros at the end of a whole number are usually assumed to be nonsignificant. For example, 220 centimeters has 2 significant digits, while 202 centimeters has 3 significant digits.

KEY CONCEPT*For Your Notebook***Determining Significant Digits in Calculations**

Operations	Rule	Example
Addition and Subtraction	Round the sum or difference to the same place as the last significant digit of the least precise measurement.	$\begin{array}{r} 3.24 \leftarrow \text{hundredths} \\ + 7.3 \leftarrow \text{tenths} \\ \hline 10.54 \leftarrow \text{tenths} \end{array}$ <i>10.5</i>
Multiplication and Division	The product or quotient must have the same number of significant digits as the least precise measurement.	$\begin{array}{r} 40 \leftarrow 1 \text{ sig digit} \\ \times 31 \leftarrow 2 \text{ sig digits} \\ \hline 1240 \leftarrow \text{exact answer} \end{array}$ <i>1000</i> $\leftarrow 1 \text{ sig digit}$

1000

**LESSON
1.6****Practice A***For use with the lesson "Use Precision and Measurement"***Choose the more precise measurement.****1.** 5 yd; 5.2 yd**2.** 12 ft; 4 yd**3.** 8.2 gal; 3.6 pt**4.** 43 min; 43 sec**5.** 6.1 m; 18.2 cm**6.** 17.5 lb; 14 oz

Determine the number of significant digits in the measurement.

- | | | |
|--------------|------------------------|---------------------------|
| 7. 42 ft | 8. 2.56 cm | 9. 7080 mi |
| | | 3 |
| 10. 40.003 m | 11. 5100 mm | 12. 0.0090 sec |
| 5 | 2 | 2 |

13. How many significant digits are in the sum $2 + 5.8$?

$$\begin{array}{r} 2 \\ 5.8 \\ \hline 7.8 \end{array}$$

Handwritten red annotations: The digit 2 is circled, and the digit 8 in the result 7.8 is circled.

14. How many significant digits are in the difference $17.3 - 0.57$?

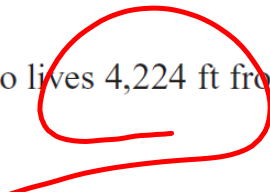
Handwritten red annotations: "1 sig digit" and "tenth" (circled) with an arrow pointing to the tenths place in 17.3. "hundredth" is written below 0.57.

$$\begin{array}{r} 17.3 \\ - 0.57 \\ \hline 16.73 \end{array}$$

Handwritten red annotations: An arrow points from the circled "tenth" to the tenths place in the result 16.73, which is then written as 16.7.

- 15. Basketball** Shana averaged 11.9 points per game in January. Her teammate, Marsha, averaged 12.75 points per game during the same month. Which measure is more precise?

Marsha (12.75)

- 16. Distance** Randy lives 1.97 mi from his school. Theo lives 4,224 ft from his school?
Which measure is more precise?
- 

17. **Cheese** Sam purchased 0.25 lb of provolone cheese, 2 lb of Swiss cheese, and 1.50 lb of Colby cheese from the deli. Which measure has the most significant digits?

Colby

1.50

- 18. Comparing** Three students were asked to measure a desk. Their measurements are shown in the table.

Student	Measurement
Kaylib	2.01 ft
Alisa	23.9 in.
Mario	24 in.

Which student made the most precise measurement?

Alisa

$$\begin{array}{r} 2.75 \\ + .809 \\ \hline 3.559 \\ 3.56 \end{array}$$

$$\begin{array}{r} 21.3 \rightarrow \textcircled{3} \\ \times 2.591 \\ \hline 55.1833 \\ 55.2 \end{array}$$

EXAMPLE 3 Calculating with significant digits

Perform the indicated operation. Write the answer with the correct number of significant digits.

a. $45.1 \text{ cm} + 19.45 \text{ cm}$

b. $6.4 \text{ ft} \times 2.15 \text{ ft}$

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Solution

a. $45.1 \text{ cm} + 19.45 \text{ cm} = 64.55 \text{ cm}$

The least precise measurement is 45.1 centimeters. Its last significant digit is in the tenths place. Round the sum to the nearest tenth.

The correct sum is 64.6 centimeters.

b. $6.4 \text{ ft} \times 2.15 \text{ ft} = 13.76 \text{ ft}^2$

The least precise measurement is 6.4 feet. It has two significant digits. Round the product to two significant digits.

The correct product is 14 square feet.

**GUIDED PRACTICE** for Examples 2 and 3

Determine the number of significant digits in each measurement.

5. 800.20 ft

6. 0.005 cm

7. 36,900 mi

Perform the indicated operation. Write the answer with the correct number of significant digits.

8. $27.23 \text{ m} - 12.7 \text{ m}$

9. $45.16 \text{ yd}^2 \div 4.25 \text{ yd}$

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Perform the indicated operation. Write the answer with the correct number of significant digits.

8. $27.23 \text{ m} - 12.7 \text{ m}$ **14.5 m** 9. $45.16 \text{ yd}^2 \div 4.25 \text{ yd}$ **10.6 yd**