Lesson 1.5 Introducing Significant Digits

Objective

- Introduce rules to identify significant digits in a given number.
- Determine in trailing zeros of an integer are significant.
- Round integers and decimals to a specified number of significant digits.

Extend **7.NS.2d** Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

- **Common Core State Standards***7.NS.2.d*
- **Mathematical Practices** 2. Reason 4. Model mathematics. 5. Use tools strategically. 6. Attend to precision.7. Look for and use structures

Lesson 1.5 Introducing Significant Digits

A given number may contain both significant and nonsignificant digits. The rules for determining which digits in a given number are significant are as follows.

RULE 1: All nonzero digits are significant.

Number	Significant Digits	Number of Significant Digits
487	4, 8, and 7	
65.211	6, 5, 2, 1, and 1	
12,345,678.54	1, 2, 3, 4, 5, 6, 7, 8, 5, and 4	
9,700	9 and 7	

Lesson 1.5 Introducing Significant Digits

A given number may contain both significant and nonsignificant digits. The rules for determining which digits in a given number are significant are as follows.

RULE 1: All nonzero digits are significant.

Number	Significant Digits	Number of Significant Digits
487	4, 8, and 7	3
65.211	6, 5, 2, 1, and 1	5
12,345,678.54	1, 2, 3, 4, 5, 6, 7, 8, 5, and 4	10
9,700	9 and 7	2

Lesson 1.5 Introducing Significant Digits

A given number may contain both significant and nonsignificant digits. The rules for determining which digits in a given number are significant are as follows.

RULE 2: Zeros in between nonzero digits are significant.

Number	Significant Digits	Number of Significant Digits
1,006	1, 0, 0, and 6	
2,309,005	2, 3, 0, 9, 0, 0, and 5	
51.0007	5, 1, 0, 0, 0, and 7	

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A given number may contain both significant and nonsignificant digits. The rules for determining which digits in a given number are significant are as follows.

RULE 2: Zeros in between nonzero digits are significant.

Number	Significant Digits	Number of Significant Digits
1,006	1, 0, 0, and 6	4
2,309,005	2, 3, 0, 9, 0, 0, and 5	7
51.0007	5, 1, 0, 0, 0, and 7	6

Lesson 1.5 Introducing Significant Digits

A given number may contain both significant and nonsignificant digits. The rules for determining which digits in a given number are significant are as follows.

RULE 3: Trailing zeros in a decimal are significant.

Number	Significant Digits	Number of Significant Digits
21.30	2, 1, 3, and 0	
798.00	7, 9, 8, 0, and 0	
40.0	4, 0, and 0	

Math Note

Trailing zeros are significant when there is a decimal point in the number.

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RULE 3: Trailing zeros in a decimal are significant.

Number	Significant Digits	Number of Significant Digits
21.30	2, 1, 3, and 0	4
798.00	7, 9, 8, 0, and 0	5
40.0	4, 0, and 0	3

Math Note

Trailing zeros are significant when there is a decimal point in the number.

Lesson 1.5 Introducing Significant Digits

A given number may contain both significant and nonsignificant digits. The rules for determining which digits in a given number are significant are as follows.

RULE 4: Zeros on the left of the first nonzero digit are NOT significant.

Number	Significant Digits	Number of Significant Digits	Nonsignificant Digits
0.123	1, 2, and 3	3	
0.04	4	1	
0.060	6 and 0	2	
0.000385	3, 8, and 5	3	

RULE 5: Trailing zeros in an integer may or may not be significant due to rounding.

Number After Rounding	Rounded from 298	Significant Digits	Number of Significant Digits	Nonsignificant Digits
300	To the nearest 10	3 and 0	2	
300	To the nearest 100	3	1	

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A given number may contain both significant and nonsignificant digits. The rules for determining which digits in a given number are significant are as follows.

RULE 4: Zeros on the left of the first nonzero digit are NOT significant.

Number	Significant Digits	Number of Significant Digits	Nonsignificant Digits
0.123	1, 2, and 3	3	0
0.04	4	1	The two 0s
0.060	6 and 0	2	The first two 0s
0.000385	3, 8, and 5	3	The first four 0s

RULE 5: Trailing zeros in an integer may or may not be significant due to rounding.

Number After Rounding	Rounded from 298	Significant Digits	Number of Significant Digits	Nonsignificant Digits
300	To the nearest 10	3 and 0	2	The last 0
300	To the nearest 100	3	1	The two 0s

Lesson 1.5 Introducing Significant Digits

Example 12 **Identify significant digits.**

Complete the table. List the significant digits for each number. Then, count the number of significant digits.

Number	Significant Digits	Number of Significant Digits
0.0401	?	?
3.1208	?	?
20	?	?
3.56780	?	?
70.0	?	?

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Solution

Number	Significant Digits	Number of Significant Digits
0.0401	4, 0, and 1	3
3.1208	3, 1, 2, 0, and 8	5
20	2	1
3.56780	3, 5, 6, 7, 8, and 0	6
70.0	7, 0, and 0	3

Alert Watch for students who may be confused about when trailing zeros are significant. For 3.56780 and 70.0, the trailing zeros are significant because both numbers have a decimal point. Contrast these examples with the number 0.0005. Here the zeros are not significant because of **RULE 4**, which applies to decimals and states that numbers to the left of the first nonzero digit, in this case, 5, are not significant.

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Guided Practice

List the significant digits for each number. Then write the number of significant digits.

1. 23,005

2. 367.9410

3. 0.094

4. 450.0

Lesson 1.5 Introducing Significant Digits

Guided Practice

List the significant digits for each number. Then write the number of significant digits.

1 23,005

There are ? significant digits. 5

2 367.9410

There are ? significant digits. 7

3 0.094

9 and 4 are significant digits. 2 significant digits.

4 450.0

4, 5, 0, and 0 are significant digits. 4 significant digits.

Lesson 1.5 Introducing Significant Digits

Example 13 **Round integers to the given number of significant digits.**

a) 4,321 (3 significant digits)

Best Practices

Tell students to first identify the digit specified, counting significant digits from the left, then look to the digit immediately to its right to see whether the specified digit needs to be rounded up.

Lesson 1.5 Introducing Significant Digits

Example 13 **Round integers to the given number of significant digits.**

a) 4,321 (3 significant digits)

Solution

The fourth significant digit is 1, which is less than 5.
4,321 is closer to 4,320 than to 4,330.

So, the integer rounded to 3 significant digits is 4,320.

Best Practices

Tell students to first identify the digit specified, counting significant digits from the left, then look to the digit immediately to its right to see whether the specified digit needs to be rounded up.

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Example 13 **Round integers to the given number of significant digits.**

b) 872,090 (4 significant digits)

Best Practices

Tell students to first identify the digit specified, counting significant digits from the left, then look to the digit immediately to its right to see whether the specified digit needs to be rounded up.

Lesson 1.5 Introducing Significant Digits

Example 13 **Round integers to the given number of significant digits.**

b) 872,090 (4 significant digits)

Solution

The fifth significant digit is 9, which is greater than 5.
872,090 is closer to 872,100 than to 872,000.

So, the integer rounded to 4 significant digits is 872,100.

Best Practices

Tell students to first identify the digit specified, counting significant digits from the left, then look to the digit immediately to its right to see whether the specified digit needs to be rounded up.

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Example 13 **Round integers to the given number of significant digits.**

c) 869,700 (2 significant digits)

d) 119,800,145 (8 significant digits)

Lesson 1.5 Introducing Significant Digits

Example 13

Round integers to the given number of significant digits.

c) 869,700 (2 significant digits)

Solution

The third significant digit is 9, which is greater than 5.
869,700 is closer to 870,000 than to 860,000.

So, the integer rounded to 2 significant digits is 870,000.

d) 119,800,145 (8 significant digits)

Solution

The ninth significant digit is 5.
119,800,145 is exactly halfway between 119,800,150 and 119,800,140.

So, the integer rounded to 8 significant digits is 119,800,150.

Lesson 1.5 Introducing Significant Digits

Example 14

Identify significant digits of a rounded integer with trailing zeros.

RULE 5: Trailing zeros in an integer may or may not be significant due to rounding.

Number After Rounding	Rounded from 298	Significant Digits	Number of Significant Digits	Nonsignificant Digits
300	To the nearest 10	3 and 0	2	
300	To the nearest 100	3	1	

RULE 5 is applicable only when rounding numbers.

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Example 14 **Identify significant digits of a rounded integer with trailing zeros.**

a) The population of Medville is 84,000 and the population of Alberton is 130,000. Both numbers have been rounded to the nearest 1,000.

Lesson 1.5 Introducing Significant Digits

Example 14 **Identify significant digits of a rounded integer with trailing zeros.**

a) The population of Medville is 84,000 and the population of Alberton is 130,000. Both numbers have been rounded to the nearest 1,000.

Solution

In this case, 84,000 has two significant digits, 8 and 4. The number 130,000 has three significant digits: 1, 3, and the first 0.

8 4, 0 0 0

significant not significant

1 3 0, 0 0 0

significant not significant

Lesson 1.5 Introducing Significant Digits

Example 14 **Identify significant digits of a rounded integer with trailing zeros.**

b) In the recent year, there were 140,000 miles of railroad tracks and 46,900 miles of interstate highways in the United States. Both numbers have been rounded to the nearest 100.

Lesson 1.5 Introducing Significant Digits

Example 14 **Identify significant digits of a rounded integer with trailing zeros.**

b) In the recent year, there were 140,000 miles of railroad tracks and 46,900 miles of interstate highways in the United States. Both numbers have been rounded to the nearest 100.

Solution

The number 140,000 has four significant digits: 1, 4, 0, and 0. The number 46,900 has three significant digits: 4, 6, and 9.

1 4 0, 0 0 0

significant not significant

4 6, 9 0 0

significant not significant

Lesson 1.5 Introducing Significant Digits

Example 14 **Identify significant digits of a rounded integer with trailing zeros.**

c) The height of Mount Everest to the nearest 10 feet is 29,030 feet.

Solution

This number has 4 significant digits: 2, 9, 0, and 3. The last 0 is not a significant digit.

2 9, 0 3 0

significant not significant

Lesson 1.5 Introducing Significant Digits

Example 15 **Round decimals to a given number of significant digits.**

Use the rules of significant digits to round each decimal.

a) Round 0.03468 to 3 significant digits.

Lesson 1.5 Introducing Significant Digits

Example 15 **Round decimals to a given number of significant digits.**

Use the rules of significant digits to round each decimal.

a) Round 0.03468 to 3 significant digits.

Solution

Using **RULE 4**, the first two zeros of 0.03468 are not significant.

Only 3 significant digits are required. The fourth significant digit is 8, which is greater than 5.

So, the decimal rounded to 3 significant digits is 0.0347.

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Example 15 **Round decimals to a given number of significant digits.**

b) Round 0.07614 to 2 significant digits.

Lesson 1.5 Introducing Significant Digits

Example 15 **Round decimals to a given number of significant digits.**

b) Round 0.07614 to 2 significant digits.

Solution

Using **RULE 4**, the first two zeros of 0.07614 are not significant.

Only 2 significant digits are required. The third significant digit is 1, which is less than 5.

So, the decimal rounded to 2 significant digits is 0.076.

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Example 15 **Round decimals to a given number of significant digits.**

c) Round 14.0408 to 5 significant digits.

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Example 15 **Round decimals to a given number of significant digits.**

c) Round 14.0408 to 5 significant digits.

Solution

Using **RULE 2**, all the digits in 14.0408 are significant.

Only 5 significant digits are required. The sixth significant digit is 8, which is greater than 5.

So, the decimal rounded to 5 significant digits is 14.041.

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Example 15 **Round decimals to a given number of significant digits.**

d) Round 28.702 to 4 significant digits.

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Example 15 **Round decimals to a given number of significant digits.**

d) Round 28.702 to 4 significant digits.

Solution

Using **RULE 2**, all the digits in 28.702 are significant.

Only 4 significant digits are required. The fifth significant digit is 2, which is less than 5.

So, the decimal rounded to 4 significant digits is 28.70.

Lesson 1.5 Introducing Significant Digits

Independent Practice #1-6 and 22-23

Name:_____ Period_____

Practice 1.5

List the significant digits for each number. Then count the number of significant digits.

1. 0.0017
2. 82.005
3. 300.0
4. 0.0600
5. 45.13
6. 2.002

22. The touchpad that Mike hits at the end of a swimming race is calibrated to measure the time to the nearest hundredth of a second. John claims that Mike won the race by 0.005 second. Jacqui says that Mike won by 0.05 second. Whose claim is more reliable? State your reason.

Lesson Check *#1 & 2*

(can use rules to identify significant digits)