ELG 5.NBT.A Understand the place value system

Vertical Progression:

3rd Grade	**3.NBT.A. Use place value understanding and properties of operations to perform multi-digit arithmetic.** ○ **3.NBT.1** Use place value understanding to round whole numbers to the nearest 10 or 100. ○ **3.NBT.3** Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.
4th Grade	**4.NBT.A Generalize place value understanding for multi-digit numbers.** ○ **4.NBT.1** Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. ○ **4.NBT.2** Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using **>,** =, and < symbols to record the results of comparisons. ○ **4.NBT.3** Use place value understanding to round multi-digit whole numbers to any place.
5th Grade	**5.NBT.A Understand the place value system.** ○ **5.NBT.A.1** Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. ○ **5.NBT.A.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. ○ **5.NBT.A.3** Read, write, and compare decimals to thousandths. ○ **5.NBT.A.3.a** Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000). ○ **5.NBT.A.3.b** Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. ○ **5.NBT.A.4** Use place value understanding to round decimals to any place.

Students will demonstrate command of the ELG by:

- Explaining patterns in the number of zeros of products when multiplying numbers by powers of ten.
- Explaining patterns in decimal point placement when decimals are multiplied or divided by a power of ten.
- Reading and writing decimals to thousandths using base-ten numerals, number names, and expanded form.
- Comparing two decimals to thousandths based on meanings of the digits in each place using >, =, < symbols to record comparisons.
- Using place value understanding to round decimals to any place.

Vocabulary:

- base-ten numeral
- decimal
- decimal point
- digit
- divide
- equal to (=)
- expanded form
- greater than (>)
- hundredths
- less than (<)
- multiply
- pattern
- place value
- power/exponent
- tenths
- thousandths

Sample Instructional/Assessment Tasks:

1) **Standard(s): 5.NBT.A.1**

Source: llustrative Mathematics
https://www.illustrativemathematics.org/content-standards/5/NBT/A/1/tasks/1562

Item Prompt:

- Kipton has a digital scale. He puts a marshmallow on the scale and it reads 7.2 grams. How much would you expect 10 marshmallows to weigh? Why?
- Kipton takes the marshmallows off the scale. He then puts on 10 jellybeans and then scale reads 12.0 grams. How much would you expect 1 jellybean to weigh? Why?
- Kipton then takes off the jellybeans and puts on 10 brand-new pink erasers. The scale reads 312.4 grams. How much would you expect 1,000 pink erasers to weigh? Why?

Solution

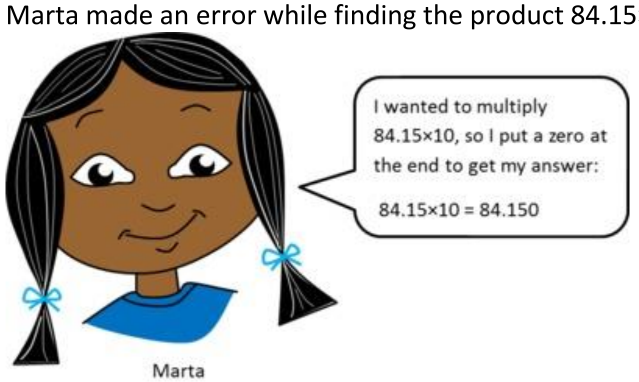
10 marshmallows should weigh 72 grams. 1 jellybean should weigh 1.2 grams. 1,000 pink erasers should weigh about 31,240 grams.

2) **Standard(s): 5.NBT.A.2**

Source: Illustrative Mathematics
https://www.illustrativemathematics.org/content-standards/5/NBT/A/2/tasks/1524

Item Prompt:

Marta made an error while finding the product 84.15×10.



In your own words, explain Marta's misunderstanding. Please explain what she should do to get the correct answer and include the correct answer in your response.

Solution:

Marta is mistakenly trying to continue a pattern dealing with multiplying whole numbers by powers of 10: the product will have the same digits as the whole number followed by the same number of 0s as the power of 10. Marta tried to place a 0 after 84.15 in her problem to continue this pattern, but placing a 0 in the thousandths place did not change the value of 84.15. Instead, Marta can shift the decimal one place to the right so that each digit occupies ten times its original place. Her correct answer is 841.5. Another way of finding the product of 84.15 and 10 is to rewrite 84.15 in expanded notation and use the distributive property:

$$(80+4+0.1+0.05)\times10=(80\times10)+(4\times10)+(0.1\times10)+(0.05\times10)=800+40+1+0.5=841.5$$

Using expanded notation also highlights that the place value of each digit needs to be multiplied by a factor of 10. It should be noted that the digit 8 in the original expression represented 8 tens, but will be 8 hundreds in our product. In Marta's solution, the 8 still only represents 8 tens and the magnitude of the number has not changed.

3) **Standard: 5.NBT.A.5, 5.NBT.A.3**

Source: Illustrative Mathematics
https://www.illustrativemathematics.org/content-standards/5/NBT/A/3/tasks/1813

Task:
Isaiah is thinking of the number 9.52 in his head. Decide whether each of these has the same value as 9.52 and discuss your reasoning.

1. Nine and fifty-two tenths
2. 9 + 0.5 + 0.02
3. 9 ones + 5 tenths + 2 hundredths
4. $(9 \times 1) + (5 \times \frac{1}{10}) + (2 \times \frac{1}{100})$
5. 952 tenths
6. 952 hundredths

Solution

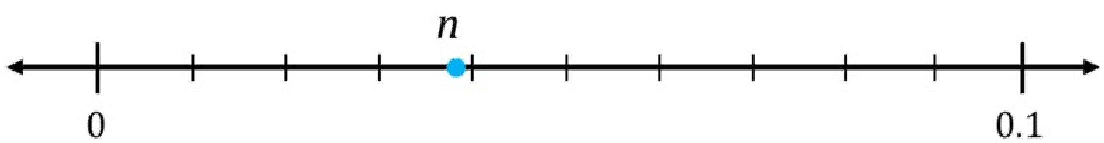
1. Nine and fifty two tenths is not equivalent to 9.52.
2. 9 + 0.5 + 0.02 and 9.52 are equivalent.
3. 9 ones + 5 tenths + 2 hundredths is equivalent to 9.52.
4. The expression $(9 \times 1) + (5 \times \frac{1}{10}) + (2 \times \frac{1}{100})$ is equivalent to 9.52.
5. 952 tenths is not equivalent to 9.52. The value of 952 tenths is actually 95.2 (ten times the value of 9.52).
6. 952 hundredths is equivalent to 9.52.

4) **Standard: 5.NBT.A.4**

Source: llustrative Mathematics:
https://www.illustrativemathematics.org/content-standards/5/NBT/A/4/tasks/1804

Task

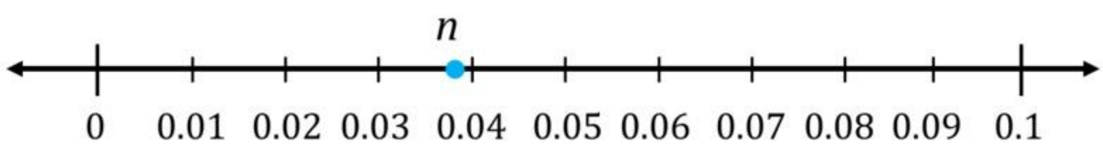
A number n is shown on the number line.



1. The tick marks are evenly spaced. Label them.
2. What is n rounded to the nearest hundredth?
3. What is n rounded to the nearest tenth?

Solution

First, label all of the tick marks:



We can see that n is closer to 0.04 than 0.03, so it rounds up to 0.04.
We can also see that n is closer to 0 than to 0.1, so n rounds down to 0.