

# Problem Solving: Rounding and Estimating

 Guided Notes

**Rounding** is a way of simplifying numbers to make them easier to understand or work with them.

Rounding can be used when an exact number isn't needed, and an approximate answer will do.

## Rules for Rounding

The rules for rounding are simple, and should make sense if you understand what rounding is.

**Step 1** Identify the place value of the digit you want to round.

**Step 2** If the digit to the right of the identified digit is **5 or more (5, 6, 7, 8, 9)**, increase the identified digit by 1.

If the digit to the right is **less than 5 (0, 1, 2, 3, 4)**, do not change the identified digit.

**Step 3** Change all digits to the right of the rounded identified digit to zeros.

### Sample Problem 1: Round the following numbers.

- a. **141**      Nearest ten      **14**1  $\rightarrow$  **140**  
To round **141** to the nearest ten, observe that the digit in the ones place is **1**. Since this digit is less than 5, we do not add 1 to the digit in the tens place. The number **141** rounded to the nearest ten is **140**.
- b. **1,156**      Nearest hundred      **1,1**5**6**  $\rightarrow$  **1,200**  
To round **1,156** to the nearest hundred, observe that the digit in the tens place is **5**. Since this digit is at least 5, we add 1 to the digit in the hundreds place. The number **1,156** rounded to the nearest hundred is **1,200**.
- c. **17,999**      Nearest thousand      **17,**9**99**  $\rightarrow$  **18,000**  
To round **17,999** to the nearest thousand, observe that the digit in the hundreds place is **9**. Since this digit is at least 5, we add 1 to the digit in the thousands place. The number **17,999** rounded to the nearest thousand is **18,000**.
- d. **342.12**      Nearest tenth      **342.**12  $\rightarrow$  **342.10**  
To round **342.12** to the nearest tenth, observe that the digit in the hundredths place is **2**. Since this digit is less than 5, we do not add 1 to the digit in the tenths place. The number **342.12** rounded to the nearest tenth is **342.10**.
- e. **0.346**      Nearest hundredth      **0.34**6  $\rightarrow$  **0.350**  
To round **0.346** to the nearest hundredth, observe that the digit in the thousandths place is **6**. Since this digit is at least 5, we add 1 to the digit in the hundredths place. The number **0.346** rounded to the nearest hundredth is **0.350**.

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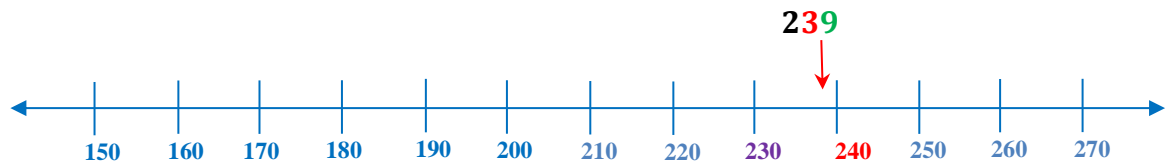
## Using the Number Line to Round Numbers

We can visualize the process of rounding by using a number line.



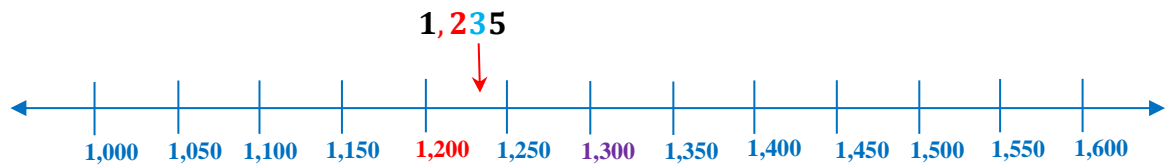
### Sample Problem 2: Round the following numbers. (USE NUMBER LINE)

- a. **239**  
Nearest ten



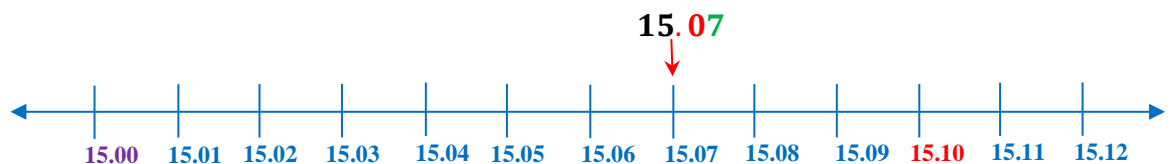
$$23\boxed{9} \rightarrow 240$$

- b. **1,235**  
Nearest hundred



$$1,2\boxed{3}5 \rightarrow 1,200$$

- c. **15.07**  
Nearest tenth



$$15.0\boxed{7} \rightarrow 15.10$$

## Estimating

Estimating is another way of making numbers easier to work with when we don't need to know exactly how many; we just need to know about how many. Estimation is finding a number that is close enough to the right answer.

## Rounding Method

Rounding is one common method used for estimating. Determine the place value to use for the particular problem you want to estimate. Now that your numbers end in zero, you can easily do mental math to solve the problem, whether that requires adding, subtracting, multiplying or dividing.

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**Sample Problem 3:** Estimate the answer using rounding method.

a.  $4,345 + 222 =$

$$4,345 + 222 =$$

Round to nearest ten

$$4,34\boxed{5} \rightarrow 4,350$$

$$22\boxed{2} \rightarrow 220$$

$$4,350 + 220 = 4,570$$

b.  $7,135 - 2,545 =$

$$7,135 - 2,545 =$$

Round to nearest hundred

$$7,1\boxed{3}5 \rightarrow 7,100$$

$$2,5\boxed{4}5 \rightarrow 2,500$$

$$7,100 - 2,500 = 4,600$$

c.  $35 * 12 =$

$$35 * 12 =$$

Round to nearest ten

$$3\boxed{5} \rightarrow 40$$

$$1\boxed{2} \rightarrow 10$$

$$40 * 10 = 400$$

d.  $1,629 \div 389 =$

$$1,629 \div 389 =$$

Round to nearest hundred

$$1,6\boxed{2}9 \rightarrow 1,600$$

$$3\boxed{8}9 \rightarrow 400$$

$$1,600 \div 400 = 4$$

## Front End Estimation

The name comes from the way that you round. Instead of rounding each number to a given place value, we round whatever number is in the front.

With front end estimation, we only round and calculate with numbers in the leftmost place or the very last number on the left. This means that all numbers in other places will be zeros except the number in the leftmost place after the numbers are rounded.

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**Sample Problem 4:** Estimate the answer using front end estimation.

a.  $15,345 + 122 =$

$$15,345 + 122 =$$

$$1\boxed{5},345 \rightarrow 20,000$$

$$1\boxed{2}2 \rightarrow 100$$

$$20,000 + 100 = 20,100$$

b.  $81,135 - 12,545 =$

$$81,135 - 12,545 =$$

$$8\boxed{1},135 \rightarrow 80,000$$

$$1\boxed{2},545 \rightarrow 10,000$$

$$80,000 - 10,000 = 70,000$$

c.  $230 * 128 =$

$$230 * 128 =$$

$$2\boxed{3}0 \rightarrow 200$$

$$1\boxed{2}8 \rightarrow 100$$

$$200 * 100 = 20,000$$

d.  $5,875 \div 145 =$

$$5,875 \div 145 =$$

$$5,\boxed{8}75 \rightarrow 6,000$$

$$1\boxed{4}5 \rightarrow 100$$

$$6,000 \div 100 = 60$$

## Cluster Estimation

Cluster estimation can be used to estimate sums and products when the numbers you are adding or multiplying cluster near or is close in value to a single number.

**Sample Problem 5:** Estimate the answer using cluster estimation.

a.  $345 + 387 + 421 + 399 =$

$$345 + 387 + 421 + 399$$

Notice that they all cluster around **400**.

$$400 + 400 + 400 + 400 = 4 * 400 = 1,600$$

Real answer:

$$345 + 387 + 421 + 399 = 1,552$$

b.  $25 * 28 * 31 * 33 =$

$$25 * 28 * 31 * 33 =$$

Notice that they all cluster around **30**

$$30 * 30 * 30 * 30 = 810,000$$

Real answer:

$$25 * 28 * 31 * 33 = 716,100$$