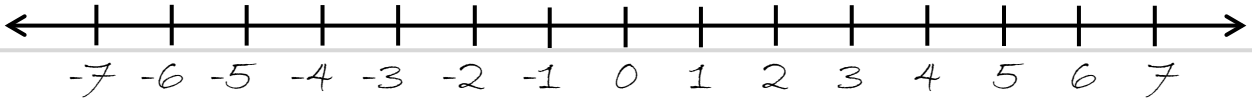
Subtraction

Objective 1

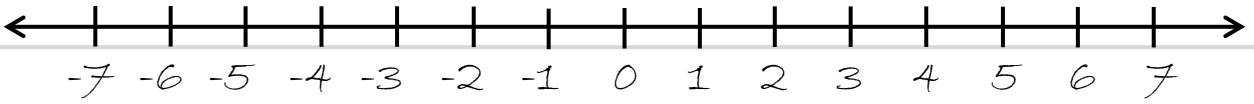
Understand Subtraction on a Number Line

Using a number line let's demonstrate the subtraction process using the problem $7 - 5$.



Using the number line above, start at 7 and move left 5 units. You end up at 2. Therefore $7 - 5 = 2$.

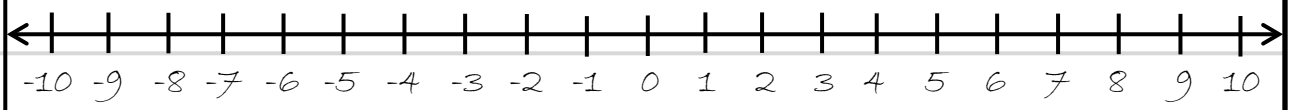
Next, let's demonstrate the subtraction process using the problem $5 - 7$.



Using the number line above, start at 5 and move left 7 units. You end up at -2. Notice that $7 - 5 = 2$ and $5 - 7 = -2$. Think about how these two problems are related. This can help you with basic subtraction problems that have negative results!

If $35 - 10 = 25$, what do you think $10 - 35$ is equal to? It must equal -25.

Example 1: Use the number line below to perform each subtraction problem.

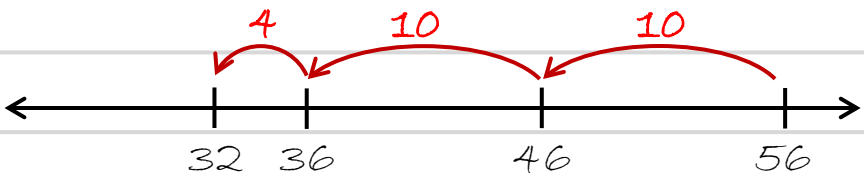


a) $10 - 5$
b) $5 - 10$
c) $10 - 8$
d) $8 - 10$
e) $7 - 4$
f) $4 - 7$
g) $9 - 8$
h) $8 - 9$
i) $4 - 8$
j) $1 - 10$
k) $3 - 6$
l) $2 - 5$
m) $7 - 0$
n) $0 - 7$
o) $8 - 16$
p) $6 - 12$
q) $7 - 16$
r) $8 - 18$

Objective 2

Perform Subtraction Problems using the Vertical Format (no borrowing).

Suppose we want to subtract 24 from 56. In this case we would need to calculate $56 - 24$. Performing this calculation on a number line would allow us to visually demonstrate the process. In this case we start at 56 and move left a total of 24 units. The result is 32.



Performing subtraction problems on a number line can help us develop our "mental math" skills. But when the numbers are relatively large, the vertical format is most often used.

Example 2: Calculate 56 – 24 using the vertical format.

$$\begin{array}{r} 56 \\ -\ 24 \\ \hline 32 \end{array}$$

Note: Be sure to line up the numbers in columns according to place value.

Note: Performing subtraction using the vertical format cannot give us negative results.

Example 3: Calculate 33 – 48.

In this case we will first calculate 48 – 33 using the vertical format. From Example 1, we can conclude that our answer is the negative result of 48 – 33.

$$\begin{array}{r} 48 \\ -\ 33 \\ \hline 15 \end{array}$$

Therefore 33 – 48 = –15.

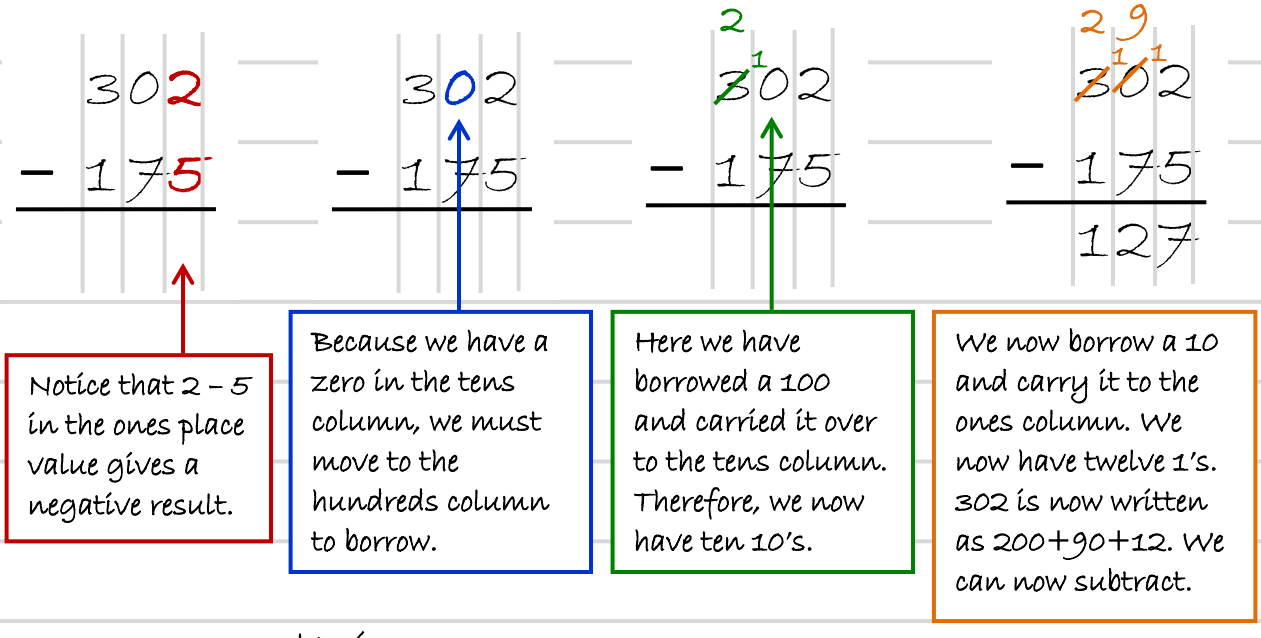
Objective 3

Perform Subtraction Problems using the Vertical Format with Borrowing.

Sometimes using the vertical format requires a technique called "borrowing". This occurs when subtracting two numbers in a column gives a negative result. To prevent the negative result, we borrow from the adjacent column to the left. The process of "borrowing" is demonstrated in the following example.

Example 4: Calculate 302 – 175.

Here we will use the vertical format which requires us to use the "borrowing" technique.



Our result is 302 – 175 = **127**.

Answer the following homework questions.

In Exercises 1 – 9, use a number line to perform each subtraction problem.

1) 9 – 7
2) 8 – 5
3) 6 – 4
4) 15 – 7
5) 13 – 8
6) 11 – 6
7) 7 – 15
8) 8 – 13
9) 6 – 11

In Exercises 10 – 15, perform each subtraction problem using the vertical format. Note: These problems do not require borrowing.

10) 48 – 13
11) 96 – 52
12) 138 – 126
13) 627 – 405
14) 3,508 – 1,207
15) 7,096 – 5,084

In Exercises 16 – 21, perform each subtraction problem using the vertical format. Note: These problems require borrowing.

16) 15 – 7
17) 13 – 8
18) 600 – 429
19) 1,000 – 837
20) 59 – 73
21) 48 – 61

In Exercises 22 – 27, write in the correct number to make the equation true.

22) 9 – ___ = 5
23) ___ – 9 = -5
24) 48 – ___ = 38
25) ___ – 48 = -38
26) 21 – ___ = 13
27) ___ – 21 = -13

Objective 4: Write a mathematical expression using words.

Definition

The **difference** of two numbers **a** and **b** is written **a – b**. The word **difference** indicates subtraction. If **a** is larger than **b**, the difference is positive. If **a** is smaller than **b**, the difference is negative.

Example 5: Using the word **difference**, write "8 – 6" as a word statement, and find the value of the difference.

We first begin our sentence by defining the mathematical operation first and then define the numbers. Notice how the word "and" is used.

The word statement is written as:

"The difference of eight and six."

The value of the difference is 2.

Example 6: Using the word **difference**, write "-7 – 5" as a word statement, and find the value of the difference.

The word statement is written as:

"The difference of negative seven and five."

The value of the difference is -12.

Answer the following homework questions.

28) The word "difference" is used to represent _____.

29) Write "the difference of 8 and 3" using math symbols.

30) Write "the difference of x and y" using math symbols.

31) Using the word difference, write "-7 – 13" as a word statement and find the value of the difference.

In Exercises 32 – 35, find each difference.

32) $608 - 405$

33) $504 - 387$

34) $9{,}014 - 152$

35) $8{,}000 - 3{,}618$

36) Find the perimeter of the figure below.