

Introduction to Algebra

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SECTION 2.3

Subtraction with Negative Numbers

Objectives

- A** Subtract numbers by thinking of subtraction as addition of the opposite.
- B** Solve applications involving subtraction with positive and negative numbers.

Subtraction with Negative Numbers

How would we represent the final balance in a checkbook if the original balance was \$20 and we wrote a check for \$30? The final balance would be $-\$10$.

We can summarize the whole situation with subtraction:

$$\$20 - \$30 = -\$10$$

RECORD ALL CHARGES OR CREDITS THAT AFFECT YOUR ACCOUNT						
NUMBER	DATE	DESCRIPTION OF TRANSACTION	PAYMENT/DEBIT (-)	DEPOSIT/CREDIT (+)	BALANCE	
					\$20	00
1501	9/15	Campus Bookstore	\$30	00	-\$10	00

Subtraction with Negative Numbers

From this we see that subtracting 30 from 20 gives us -10 . Another example that gives the same answer but involves addition is this:

$$20 + (-30) = -10$$



A Subtraction

Subtraction

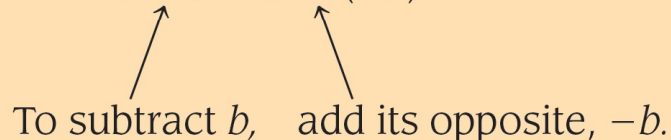
From the beginning of the section, we find that subtracting 30 gives the same result as adding -30 . We use this kind of reasoning to give a definition for subtraction that will allow us to use the rules we developed for addition to do our subtraction problems.

Here is that definition:

Definition

Subtraction If a and b represent any two numbers, then it is always true that

$$a - b = a + (-b)$$

To subtract b , add its opposite, $-b$.

In words: Subtracting a number is equivalent to adding its opposite.

Example 1

Subtract: $5 - 2$

Solution:

We know that $5 - 2 = 3$

We can get the same answer by using the definition we just gave for subtraction.

Instead of subtracting 2, we can add its opposite, -2 .

Here is how it looks:

$$5 - 2 = 5 + (-2)$$

Change subtraction to
addition of the opposite.

$$= 3$$

Apply the rule for addition of
positive and negative numbers.



B Application

Example 2

Many of the planes used by the United States during World War II were not pressurized or sealed from outside air.

As a result, the temperature inside these planes was the same as the surrounding air temperature outside.



Example 2

cont'd

Suppose the temperature inside a B-17 Flying Fortress is 50°F at takeoff and then drops to -30°F when the plane reaches its cruising altitude of 28,000 feet.

Find the difference in temperature inside this plane at takeoff and at 28,000 feet.

Example 2 – *Solution*

The temperature at takeoff is 50°F , whereas the temperature at 28,000 feet is -30°F .

To find the difference we subtract, with the numbers in the same order as they are given in the problem.

$$50 - (-30) = 50 + 30 = 80$$

The difference in temperature is 80°F .