Section 2.3 Subtraction with Negative Numbers

1. Definition of Subtraction: If \( a \) and \( b \) are any two numbers, then it is true that:
\[
    a - b = a + (-b)
\]
Subtracting a number is the same as adding its opposite.

Example 1: Write each of the given subtraction problems as an equivalent addition problem using the definition of subtraction.

   a. \( 14 - 7 = 14 + (-7) \)
   
   b. \( 9 - (-4) = 9 + (-(-4)) = 9 + 4 \)
   
   c. \( -13 - 5 \)
   
   d. \( 17 - 9 \)
   
   e. \( -15 - (-4) \)
   
   f. \( 17 - (-6) \)

2. Subtraction with Negative Numbers: To subtract two numbers, rewrite the expression as "addition of the opposite", and then apply the addition rules.

Example 2: Simplify.
   
   a. \( -7 - 5 \)
      
      \[
          = -7 + (-5) \quad \text{change subtraction to addition of the opposite}
      \]
      
      \[
          = -12 \quad \text{apply rule for adding}
      \]
b. \(-8 - (-5)\)
   
   \[= -8 + [-(5)]\]
   change subtraction to addition of the opposite
   
   \[= \]
   apply rule \(-(-a) = a\)
   
   \[= \]
   apply rule for adding numbers that have different signs

Example 3: Simplify each of the following.

a. \(17 - (-10)\)

b. \(-3 - 10\)

c. \(4 - 10\)

Practice Problems:

Rewrite as equivalent addition expressions

a. \(-14 - 8\)
   
   b. \(-13 - (-3)\)

   c. \(35 - (-4)\)

Simplify by rewriting as an equivalent addition expression and then applying the addition rules.

   d. \(-15 - (-4)\)

   e. \(-18 - 14\)

   f. \(15 - 32\)

Answers:

a. \(-14 + (-8)\)

b. \(-13 + [(-3)] = -13 + 3\)

   c. \(35 + [(-4)] = 35 + 4\)

   d. \(-11\)

   e. \(-32\)

   f. \(-17\)