Math 10 Lecture Videos

Section 1.6
Subtraction of Real Numbers

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OBJECTIVES:

1. Subtract real numbers.
2. Simplify a series of additions and subtractions.
3. Use the definition of subtraction to identify terms.
4. Use the definition of subtraction to simplify algebraic expressions.
5. Solve applied problems involving subtraction.

Definition of Subtraction

For all real numbers *a* and *b*,

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

In words: To subtract *b* from *a*, add the opposite, or additive inverse, of *b* to *a*. The result of the subtraction is called the *difference.*

Objective 1: Subtract Real Numbers

Subtracting Real Numbers
1. Change the subtraction operation to addition.
2. Change the sign of the number being subtracted.
3. Add, using one of the rules for adding numbers with the same sign or different signs.

Objective 1: Subtract Real Numbers

Examples:

Subtract: $12-15$

$12-15=12+(-15)=-3$

Change the sign to addition.

Replace 15 with -15.

Subtract: $-3-(-9)$

$-3-(-9)=-3+(9)=6$

Change the sign to addition.

Replace -9 with 9.

Objective 2: Simplify a series of additions and subtractions

Simplifying a Series of Additions and Subtractions
1. Change all subtractions to additions of opposites.
2. Group and then add all the positive numbers.
3. Group and then add all the negative numbers.
4. Combine the results of steps 2 and 3.

Objective 3: Simplify a series of additions and subtractions

Simplify: 7 + 2 – 12 – (-3)	
= 7 + 2 + (-12) + (3)	Write as addition of additive inverses.
= (7 + 2 + 3) + (-12)	Group the positive numbers and group the negative numbers.
= 12 + (-12)	Add the positive numbers, then add the negative numbers.
= 0	Combine the results

Objective 2: Simplify a series of additions and subtractions

Simplify: 10 – (-12) – 4 – (-3) - 6	
= 10 – (-12) – 4 – (-3) - 6	Write as addition of additive inverses.
= 10 + 12 + (-4) + 3 + (-6)	Group the positive numbers and group the negative numbers.
= (10 + 12 + 3) + [(-4) + (-6)]	Add the positive numbers, and then add the negative numbers.
= 25 + (-10)	Combine the results.
= 15	

Objective 3: Use the definition of subtraction to identify terms

- We know that the terms of an algebraic expression are separated by addition signs. Let's use this idea to identify the terms of the following algebraic expression:

$$9x - 4y - 5.$$

- Because terms are separated by addition, we rewrite the subtractions in the algebraic expression as additions of opposites. Thus,

$$9x - 4y - 5 = 9x + (-4y) + (-5).$$

- The three terms of the algebraic expression are 9x, -4y and -5.

Objective 4:
Use the subtraction definition to simplify algebraic expression

Simplify: -5x + 6y - 2x - 7y	
= -5x + 6y + (-2x) + (-7y)	Write as an addition.
= (-5x) + (-2x) + [6y + (-7y)]	Rearrange the terms
= [-5 + (-2)]x + [(6 + (-7)]y	Apply the distributive property
= -7x + (-1)y	Add within grouping symbols
= -7x - y	Simplify

Objective 4:
Use the subtraction definition to simplify algebraic expression

Simplify: -3x - 10y - 6x +14y	
= -3x + (-10y) + (-6x) + 14y	Write as an addition.
= (-3x) + (-6x) + [(-10y) + 14y)]	Rearrange the terms
= [-3 + (-6)]x + [(-10) + 14]y	Apply the distributive property
= -9x + 4y	Add within grouping symbols and simplify.

Objective 5: Solve applied problems involving subtraction

The peak of Mount Everest is 8848 meters above sea level. The Marianas Trench, on the floor of the Pacific Ocean, is 10915 meters below sea level. What is the *difference* in elevation between the peak of Mount Everest and the Marianas Trench?

$$8848-(-10{,}915)=8848+10{,}915=19{,}763$$

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1. Subtract real numbers. ✓
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3. Use the definition of subtraction to identify terms. ✓
4. Use the definition of subtraction to simplify algebraic expressions. ✓
5. Solve applied problems involving subtraction. ✓