

MATH 5: HANDOUT 4
ALGEBRAIC EXPRESSIONS AND WORD PROBLEMS

Today we discussed algebraic operations, involving negative numbers:

$$-2(y + 5) = -2y + 5 \cdot (-2) = -2y - 10$$

$$-5(y - 3) = -5y - 3 \cdot (-5) = -5y + 15$$

$$4(z - 6) = 4z - 6 \cdot 4 = 4z - 24$$

We can summarize them as following: :

$$-(b + c) = -b - c$$

$$-(b - c) = -b + c$$

$$a(b - c) = ab - ac$$

We also talked about solving word problems using equations. Here is an examples of the problem solved using equations:

Problem: An apple cost 9 cents, and an orange 15 cents. Elena bought some apples and oranges, 20 fruit in all, and paid 264 cents. How many apples and how many oranges did she buy?

Solution: Let a =number of apples; then number of oranges is $20 - a$. Thus the total cost of apples is $9a$, total cost of oranges is $15(20 - a)$. And the total cost of all fruits together is $9a + 15(20 - a)$ cents. So we have an equation

$$9a + 15(20 - a) = 264$$

$$9a + 15 \times 20 - 15a = 264$$

$$300 + 9a - 15a = 264$$

$$300 - 6a = 264$$

$$300 - 264 = 6a$$

$$36 = 6a$$

$$a = 6$$

Elena bought 6 apples and $20 - 6 = 14$ oranges.

COMMENT ON PREVIOUS HOMEWORK CLOCK PROBLEM

One of the problems in your previous homework asked you to find an angle between the two clock hands at 12:20. I want to comment that most of you got answers either 120 or 110. I considered both answers as correct. However 110 is the correct one. Let me explain why.

Every minute the minute hand rotates $\frac{360}{60} = 6$ degrees. In 20 minutes the minute hand will rotate $20 \times 6 = 120$ degrees. This was the most common answer in the class.

However what about an hour hand? Did it rotate as well? Every hour the hour hand rotates $\frac{360}{12} = 30$ degrees. In 20 minutes ($\frac{1}{3}$ of an hour) hour hand rotates $\frac{30}{3} = 10$ degrees. So the angle between the minute and the hour hands will be $120 - 10 = 110$ degrees.



HOMWORK

1. Compute the following sums/differences:

- (a) $-7 + (-14)$
- (b) $-54 - (-20)$
- (c) $-99 + (-1)$
- (d) $-(-99 + (-1))$
- (e) $(-10) + (-11) + (-12)$

2. Compute the following products:

- (a) $(-7) \times 6$
- (b) $(-8) \times (-9)$
- (c) $(-5) \times (6) \times (-10)$
- (d) $(-1) \times (-2) \times (-3) \times (-4) \times (-5)$
- (e) $2 \times 2 \times 2 \times 2 \times 2$
- (f) $(-2) \times (-2) \times (-2) \times (-2) \times (-2)$

3. Compute the following expressions without calculator (utilize the distributive law $a(b + c) = ab + ac$ to save yourself lots of time):

- (a) $73 \times 2 + 73 \times 8$
- (b) $1569 \times 87 - 569 \times 87$
- (c) $150 \times (-2) + (-150) \times (18)$
- (d) $1846 \times 101 + (-1846)$

#Hint: represent (-1846) as $1846 \cdot (-1)$

4. Open parenthesis and simplify the following expressions by collecting like terms:

- (a) $3(2x - 1)$
- (b) $2 - (1 - x)$
- (c) $7x - (3x + 15)$
- (d) $3(2x - 1) + x$
- (e) $2a + 1 + 3(a + 2)$

5. Solve equations. (First - open parenthesis, second - collect all x at the left, and numbers at the right, find x . Do not forget to change the + or - sign when you move numbers or variables across the equals sign.)

- (a) $3(3x - 1) = 2(2x + 11)$
- (b) $5(x - 2) = 3x + 20$
- (c) $2(x - 7) = x + 11$

6. An orange costs 2 cents more than an apple. A grapefruit costs as much as 3 oranges. A fruit basket consists of 10 apples, 5 oranges, and a grapefruit.

- (a) Write expressions for the price of each fruit, denoting the price of an apple by letter a .
- (b) If the fruit basket costs 196 cents, how much each of the fruits cost?

7. Create you own word problem and solve it with an equation.

8. * The list below shows some dates written in Swahili:

- tarehe tatu Disemba jumamosi;
- tarehe pili Aprili jumanne;
- tarehe nne Aprili jumanne;
- tarehe tano Octoba jumapili;
- tarehe tano Octoba jumatatu;
- tarehe tano Octoba jumatano.

Here are their English translations (in a different order!):

October 5, Monday

April 2, Tuesday
October 5, Wednesday
October 5, Sunday
December 3, Saturday
April 4, Tuesday

Write the following dates in Swahili: April 3, Wednesday; December 2, Sunday; December 5, Monday.