MATH 5: HANDOUT 4

SUBTRACTION AND WORD PROBLEMS WITH EQUATIONS

Today we discussed algebraic operations, involving negative numbers:

$$\begin{aligned} -2(y+5) &= -2y + 5\cdot(-2) = -2y - 10 \\ -5(y-3) &= -5y - 3\cdot(-5) = -5y + 15 \\ 4(z-6) &= 4z - 6\cdot 4 = 4z - 24 \end{aligned}$$

We can summarize them as following: :

$$\begin{aligned} -(b+c) &= -b - c \\ -(b-c) &= -b + c \\ a(b-c) &= ab - ac \end{aligned}$$

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

$$\begin{aligned} &9a + 15(20-a) = 264 \\ &9a + 15\times 20 - 15a = 264 \\ &300 + 9a - 15a = 264 \\ &300 - 6a = 264 \\ &300 - 264 = 6a \\ &36 = 6a \\ &a = 6 \end{aligned}$$

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

Homework

1. **Simplify each expression.**
   (a) $3(2x-1)$
   (b) $2-(1-x)$
   (c) $7x-(3x+15)$
   (d) $3(2x-1)+x$
   (e) $2a(a-2)-a(a-1)$
   (f) $(2x-1)(x+1)$
2. Alex has \$50. In a store, chocolate bunnies are sold for \$0.45 each. To carry them home, Alex also needs to buy some bags, each costing \$0.30. Each bag can hold up to 30 chocolate bunnies. Alex buys as many bunnies as possible and enough bags to carry them all. How much money does Alex have left?
3. A dog weighs 2 pounds more than a cat. Three cats and four dogs together weigh 43 pounds. How much does a dog weigh? How much does a cat weigh?
4. A father is twice as old as his son. The sum of their ages is 48 years. How old are they?
5. An orange costs 2 cents more than an apple. A grapefruit costs as much as three oranges. A fruit basket consists of 10 apples, 5 oranges, and a grapefruit.
   (a) If the price of an apple is a, what is the price of an orange? of a grapefruit? Simplify your expressions.
   (b) If the fruit basket costs \$1.96, how much does each fruit cost?
6. A pet store sells parrots and canaries. A canary costs twice as much as a parrot. One customer bought 5 canaries and 3 parrots, while another bought 3 canaries and 5 parrots. One of the customers paid \$20 more than the other. How much does each bird cost?
7. In a faraway kingdom, there are two currency exchange offices. The first one gives 300 tugriks per dollar, but charges a 700-tugrik commission for the exchange. The second one gives only 295 tugriks per dollar, but no commission is charged.

   A traveler noticed that it makes no difference to him which office he uses – he would get the same total amount of tugriks either way. How many dollars is he planning to exchange?
8. Two lumberjacks, Jack and Peter, were working together in the forest and sat down to have lunch. Jack had 4 flatbreads, and Peter had 8. Just then, a traveler came by.

   “Hey friends,” he said, “I’ve lost my way in the woods, and the village is still far off. I’m starving â€” could you share a bit of your food with me?”

   “Of course,” replied the lumberjacks. “Come join us – we’ll share what we have.”

   So, the 12 flatbreads were divided equally among the three men. After eating, the traveler checked his pockets, found a \$6, and said:

   “Sorry, friends, that’s all I’ve got. Please share it between yourselves however you think is fair.”

   The traveler left, but the lumberjacks started arguing. Peter said, “Let’s just split the money evenly.” But Jack replied, “Wait — we had 12 flatbreads, that’s \$6 total, or about \$0.5 per flatbread. You had 8, I had 4, so I should get one-third, and you two-thirds.”

   How would you divide the money between the two lumberjacks?

*9. John and Sally together have 93 cents; John and Mina together have 104 cents; Sally and Mina together have 95 cents. How much money does each of them have?

*10. **Translation problem.** 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.