

Activity 3: Words, Pictures, and Equations

In the following, you'll be asked to solve problems that require representing real-world quantities (distance, weight, money, etc.) with letters. These letters (variables) can be thought to stand for the *actual* (although not necessarily known) value of the quantity, along with the proper units. We'll suggest choices for these letters here, but you are always free to use other names for variables if you wish.

1. a) Jasmin's grandparents offer to pay her 5 cents for every apple she picks from their orchard, but after counting her apples will withhold 2 cents for every bad apple they find. Write an equation representing how much money she will make from picking a certain number of apples, some of which are bad.

(Suggested notation: M = amount of money, A = number of apples, and B = number of bad apples)

b) Using algebra, you should be able to manipulate your expression into the form $M = m_1(A - B) + m_2B$, for appropriate choices of m_1 and m_2 . Do this, finding the values of m_1 and m_2 in the process, and give a commonsense interpretation to the quantity $A - B$. How would you put this new equation into words?

c) Instead of counting the apples individually, Jasmin's grandfather sorts the good and bad apples into different bins, and then weighs each bin. He then uses these weights to figure out her pay, under the assumption that one apple weighs half a pound. Modify the equation from part b so that Jasmin's payment (M) is a function of the bin weights. Make

sure to be precise about units here!

(Suggested notation: g = weight of “good” bin, b = weight of “bad” bin)

d) After collecting her money, Jasmin learns that her grandparents' apples more accurately weigh $\frac{2}{5}$ of a pound each. Figure out whether Jasmin should have gotten paid more or less, using first verbal reasoning, and then using the equation derived in part c. These methods should agree.

2. a) In planning her busy day, Daniella finds that she needs to ride the subway from her apartment first due West 10 miles, then Northeast 7 miles, and finally Southeast 20 miles. By drawing a diagram on graphing paper and using a ruler, figure out about how far from home she is after concluding her last errand.

b) After getting on the subway, Daniella realizes that she forgot a book that needs to be returned at the library, which lies a mere block from her final stop. Based on her route, does it look like she'll be riding fairly close to her house anytime later in the day, so that she can get off and quickly pick up her book?

c) (Bonus) Can you think of any easy way to determine the answer to part b only using equations, and without the help of a diagram?

3. a) A movie theater offers a family matinee special: adult admission is \$6, and admission for children under 14 is \$2. What is the theater's revenue at this showing if A adults and C children come to see the movie?

b) The employee checking tickets counts 12 families, 8 couples, and 5 individuals enter the movie. If the average family entering consists of one adult and two (under-14) children, how much should the theater's revenue have been that night?

c) After all is said and done, the revenue for that showing ended at \$230. Does this agree with your answer from b? If not, assuming everything you were told in part b is true, can you think of any reasons for this discrepancy? In order to answer part b, did you need to make any additional assumptions, beyond what you were given?