

LINEAR WORD PROBLEMS COMMON CORE ALGEBRA I



Although word problems can often be some of the most challenging for students, they give us great opportunities to refine our understanding of the relationships between quantities and how to manipulate expressions to solve equations. When you solve any real world problem in mathematics you are **modeling** a physical situation with **mathematical tools**, such as **equations**, **diagrams**, **tables**, as well as many others.

As we work through these problems, try to make sure to always do the following:

MODELING AND SOLVING LINEAR WORD PROBLEMS

1. Clearly define the quantities involved with common sense variables and **let statements**.
2. Use your **let statements** to write out expressions for **quantities that you are interested in**.
3. Carefully translate the information you are told into an equation.
4. Solve the equation – remember to mentally note the justification for each step.
5. Check the reasonableness of your answer! This could be the most important, and neglected, step in the modeling/problem solving method.

Let's start off with a reasonably easy example.

Exercise #1: The sum of a number and five more than the number is 17. What is the number?

(a) First experiment with some numbers. This will help you when going to the abstract with variables.

(b) Now, let's carefully set up **let statements** and an **equation** that relates the quantities of interest. Solve the equation for the number.

Exercise #2: The difference between twice a number and a number that is 5 more than it is 3. Which of the following equations could be used to find the value of the number, n ? Explain how you arrived at your choice.

- (1) $2n - n + 5 = 3$ (3) $n + 5 - 2n = 3$
- (2) $n - (2n + 5) = 3$ (4) $2n - (n + 5) = 3$



The modeling process can become much more complicated when the information becomes more convoluted. Let's work with one particular **age** problem next.

Exercise #3: Evie and her father are comparing their ages. At the current time, Evie's father is 36 years older than her. Three years from now, Evie's father will be five times her age at that point. How old is Evie now?

(a) Before we start to work with setting up variables, expressions, and equations, let's first do some **guess-and-check** work. Try a few ages for Evie now, and see if any are correct. Think carefully about the information given in the question.

(b) Set up careful let statements to define **expressions** that keep track of Evie's age and her father's age now and three years from now. Then, set up an equation that summarizes the information in the problem about their ages in five years. Then, solve the equation and check for reasonableness.

Exercise #4: Kirk has 12 dollars less than Jim. If Jim spends half of his money, and Kirk spends none, then Kirk will have two dollars more than Jim. How much money did they both start with?



Name: _____

Date: _____

LINEAR WORD PROBLEMS

COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. The sum of three times a number and 2 less than 4 times that same number is 15. Which of the following equations could be used to find the value of the number, n ? Explain how you arrived at your choice.

(1) $3n + 4n - 2 = 15$ (3) $4n + 3(n - 2) = 15$

(2) $3n + 4(n - 2) = 15$ (4) $3n - 4(n - 2) = 15$

2. Create a let statement for the following examples. Be sure to carefully read the question and figure out exactly what you are looking for. Then, set up an equation that summarizes the information in the problem and solve the equation and check for reasonableness.

<p>(a) The sum of 3 less than 5 times a number and the number increased by 9 is 24. What is the number?</p>	<p>(b) Tom is 4 more than twice Andrews age. Sara is 8 less than 5 times Andrews age. If Tom and Sara are twins, how old is Andrew?</p>
<p>(c) A wireless phone plan costs Eric \$35 for a month of service during which he sent 450 text messages. If he was charged an fixed fee of \$12.50, how much did he pay per text?</p>	<p>(d) Daniel is currently 26 years older than his son. In six years he will be three times older than his son. How old are both of them now?</p>



APPLICATIONS

3. There is a competition at the local movie theater for free movie tickets. You must guess all four employees' ages given a few clues. The first clue is that when added together, their ages total 106 years. Kirk is twice ten years less than the manager's age, Brian is 12 years younger than twice the manager's age, and Matt is 6 years older than half the manager's age. What are all four of their ages? It may help to set up four let statements, one for each employee (including the manager).

REASONING

In some cases the answers you will get won't make physical sense or need a bit of interpreting. Look at the next example and be careful when you interpret your final solution.

4. Tanisha and Rebecca are signing up for new cellphone plans that only charge for the number of minutes and everything else is included in a monthly fee. Their plans are as follows:

Tanisha's plan: \$0.15 per minute used talking and a \$25 monthly fee.

Rebecca's Plan: \$0.10 per minute used talking and a \$18.50 monthly fee.

(a) Figure out after how many minutes the two plans will charge the same amount?

(b) Interpret your answer. It may help to read their two plans again and think about which one you would rather pay.

