MA 15200 Lesson 11 Section 1.3

I Solving Applied Problems with Linear Equations of one Variable

1. After reading the problem, let a variable represent the unknown (or one of the unknowns). Represent any other unknown using the variable. Hint: Let your variable be the unknown you know the least about.
2. Develop a plan; a sentence or formula that relates the information and unknowns.
3. Write an equation that models the sentence or formula.
4. Solve the equation and answer the problem's question. The variable itself may not be the answer or may only be one of the answers.

Hints:

- Sometimes a picture helps. Label the variable by what it represents as well as other unknowns.
- Let your variable be the unknown you know the least about.
- If a total is know, let the variable equal part of the total and total - variable represent the remaining part of the total.
- Simple interest: $I = P r t$

Ex 1: Find three consecutive even integers so that the first added to twice the second is the same as twice the third.

Ex 2: A caterer charges $45 plus $8 per person. How many persons can Dawn have at her catered dinner, if she has budgeted $140?

Ex 3: The sale price on a camera after a 20% discount is $72. What was the price before the discount?

Ex 4: There were 1200 tickets sold for a local drama club production. Tickets brought before opening night cost $9 each. Tickets bought at opening night cost $11 each. If the production sold out and $11,320 revenue was collected from the sale of the tickets, how many tickets were purchased prior to opening night?

Ex 5: Marvin took 5 tests (each out of 100 points) during a semester. He made the same score on the first test and the fifth test. Scores on the second, third, and fourth tests were 72, 85, and 79. If Marvin averaged 78, what was Marvin's score on the first test?

Ex 6: A second angle of a triangle is 5° more than double a first angle. The third angle is 5° less than triple the first angle. Find the measure of each angle of the triangle. Hint: The sum of the 3 angles of any triangle is 180°.

Ex 7: In a certain community in 2005, 45% of school-aged children had their own cell phones. This was increasing by approximately 3.6% per year. If this trend continues, in what year will 99% of the school-aged children have their own cell phones?

Ex 8: One car rental company will rent a certain type of car for $22 a day plus $0.26 a mile. A second car rental company will rent the same type of car for $19 a day plus $0.28 a mile. For what daily number of miles would the rental charges be the same?

Ex 9: Find the dimensions of a rectangle with a perimeter of 54 meters, if its length is 3 meters less than twice its width.

Ex 10: Tricia received an inheritance of $5500. She invested part of it at 8% interest and the reminder at 12% interest. At the end of a year, she had earned a total of $540 interest from both accounts. How much did Tricia invest in the 12% account?

Ex 11: Sarah invested part of a $25,000 gift in a bank fund that earned 8% profit and the remainder of the money in a stock plan that lost 2 ½ %. Find the amount of each investment if her overall net profit was $792.50.

Ex 12: A rectangular picture measures 11 inches by 8 ½ inches and has a picture frame of uniform width around it. The perimeter of the outside of the frame is 55 inches. Determine the width of the frame.

There are common geometric figure formulas listed on page 123 of the textbook. You may need these formulas for applied problems throughout this semester.

II Solving a Formula for One of its Variables

Solving a formula for a variable means rewriting the formula so that the variable is isolated on one side of the equation. It does not mean obtaining a numeral value for that variable.

Ex 13: Solve $y = mx + b$ for m

Ex 14: Solve $V = \frac{1}{3}\pi r^2 h$ for h

Examine the following formula that was solved for x. Both answers are correct. On A, both sides were divided by the coefficient of the parentheses first, then a subtraction was performed. On B, the parentheses were cleared first, subtraction performed, then division. Both answers are acceptable. Be aware on quizzes, exams, or online homework that answers could be given either way.

A $n(w+x)=12$ Solve for x.

$$w + x = \frac{12}{n}$$

$$x = \frac{12}{n} - w$$

B $n(w+x)=12$ Solve for x.

$$nw + nx = 12$$

$$nx = 12 - nw$$

$$x = \frac{12 - nw}{n}$$

Ex 15: Solve $\frac{2}{3}x(r+s)=K$ for r

Sometime the distributive property must be used to factor out the variable being solved for, if that variable is in more than one term. If the equation $ab+ac=d$ is solve for a, you would begin by writing $a(b+c)=d$, then divide both sides by the parentheses.

Ex 16: Solve $y=\frac{n}{m-n}$ for n

Ex 17: Solve $\frac{1}{a}+\frac{2}{b}=\frac{3}{c}$ for b

Note: If an answer result is $x=\frac{b}{y-c}$, an equivalent answer is $x=\frac{-b}{c-y}$. Depending on which side of the equation you move the variable terms for the variable you are solving, may determine which answer you find. Be aware of this. The second expression for x can be found by multiplying the first expression's numerator and denominator by -1.