**COLLEGE PREP**

**SECTION 1.2A - INTRO TO PROBLEM SOLVING**

**Objectives:**

* Translate English sentences into mathematical statements.
* Solving problems using mathematical models.
* Review percentage problems

**TRANSLATING INTO EQUATIONS:**

Last chapter we translated statements into algebraic expressions. This chapter we will translate into *equations.* The difference is the verb in the English statement.

**WORDS TRANSLATING INTO AN EQUAL SIGN:**

 Is, was, is equivalent to, yields, gives, are, results in, equals, is equal to

**Examples:** Three more than a number x is 7 (3+x=7)

 Twice the sum of a number n and 4 is 18 2(n+4)=18

 The difference of x and 4 equals the quotient of x and 3 x-4=x/3

***STEPS FOR SOLVING WITH MATHEMATICAL MODELS:***

1. Identify what you are looking for. What kind of problem is it: Direct translation, mixture, uniform motion, etc.? What do we want to find out? The last sentence of the problem is usually what we are trying to solve for.

2. Assign a variable to the unknown.

3. Translate the problem. Is it an expression or an equation?

4. Solve the problem

5. Check the reasonableness of the answer. Does it make sense?

6. Answer the original question in a complete sentence.

**DIRECT TRANSLATION PROBLEMS:**

***PERCENTAGES:***

 There is a quick way to set up a ratio for percentages. If you look at the statements that are given, you need to look for key words -- is, of, and percent

 Set up the problem this way: $\frac{is}{of}=\frac{\%}{100}$

**Examples:** What percent of 60 is 32? $\frac{32}{60}=\frac{x}{100}$ x = 53.3%

 What is 30% of 42? $\frac{x}{42}=\frac{30}{100}$ x = 30\*42/100 =12.6

***CONSECUTIVE INTEGERS:***

**Example:** The sum of three consecutive odd integers is 33. Find the integers.

 Step 1: Identify. This is direct translation, and odd integers look like 1, 3, 5, 7,… etc.

 Step 2: Assign a variable: the first odd integer is named x, the second is x+2, and the third is x+4.

 Step 3/4: Translate and solve.

 x + (x + 2) + (x + 4) = 33 so 3x + 6 = 33 so 3x = 27 so x = 9

 Step 5/6: Check the answer and answer the question.

 The 3 consecutive integers are 9, 11, and 13. Check: 9 + 11 + 13 = 33.

**Example:** Metro Auto Rental charges $25 daily plus $ .10 per mile. Suburban Car Rental charges $20 daily plus $ .20 per mile. For how many miles will the cost of the two plans be the same?

 Step 1: Identify. This is a direct translation problem. We want to know when the cost of Metro equals the cost of Suburban.

 Step 2: Name a variable. Let $m$=the number of miles.

 Step 3 / 4: Translate and solve. Cost of Metro = $25 + .10(the number of miles) = 25+.10$m$

 Cost of Suburban = $20 +.20(number of miles) = 20+.20$m$

 Since Cost of Metro=Cost of Suburban, then $25+.10m=20+.20m$

 Subtract 20 from both sides $5+.10m=.20m$

 Subtract .10m from both sides $5=.10m$

 Divide both sides by .10 $50=m$

 Step 5 /6: Check the answer & answer the question.

 Cost of Metro: $\$25+\$ .10\left(50\right)=\$25+\$5=\$30$

 Cost of Suburban: $\$20+\$ .20\left(50\right)=\$20+\$10=\$30$ Checks!

 **ANSWER: the cost is the same at 50 miles.**

**Example:** Provo Electric is having a 25% off sale on microwave ovens. If the sale price of a microwave is $81, what was the original price of the microwave oven?

 Step 1: Identify. This is direct translation involving percents.

 Step 2: Name a variable. We want to know what the original price was, so let $p=original price$

 Step 3 /4: Translate and solve. We know that the original price minus the discount of 25% of the original price will give us the sale price of $81, so $price-discount=81$ or

 $p-.25p=81$ Now solve.

 $.75p=81$ Divide by .75

 $p=\frac{81}{.75}=\frac{81}{\frac{3}{4}}=81∙\frac{4}{3}=108$

 Step 5 / 6: Check: $.25\left(108\right)=27, 108-27=81$

 **ANSWER: The original price was $108.**

Homework: page 75-76, # 9-13 odds, 19-23 odds, 25-31 odds, 32, 33, 35, 43