Sections 2.2-2.4: Applications of Algebra

Translating between words and math expressions:

Brainstorm: What are some words that might be used to indicate the following mathematical symbols?

+	−	·	÷	=

Note: Percent means "out of a hundred". To convert between raw numbers and a percentage, you either divide by 100 (move the decimal to the left 2 places) or multiply by 100 (move the decimal to the right 2 places).

Examples: Convert the following phrases into mathematical expressions or equations

(1) A number increased by 8

(2) 2 more than 3 times a number

(3) 12 times the sum of a number and 5

(4) 7 more than twice a number is fifteen.

(5) The product of two and four more than a number is seven.

(6) Four less than a number ie equal to the quotient of that number and five

(7) 20% of a number

(8) A number increased by 10% produces 90.

Steps for solving word problems:

(1) Read the problem (maybe more than once). If helpful, draw a picture.

(2) Translate the words into relevant math equations.

(3) Plug in any necessary information, and solve for the wanted quantity.

(4) Check that your answer has units and that it makes sense in the context of the problem.

Examples:

(1) Two numbers sum to 34 and their different is 10. Find the numbers.

(2) You buy shorts for $30 after the price was reduced by 20%. What was the original price of the shorts?

(3) The length of a rectangular garden is 4 yards less than twice the width. If the perimeter is 22 yards, what are the dimensions?

(4) Jasmyn is considering two different ride- sharing services, Thumber and Destination. Thumber charges a base fee of $5 and a mileage fee of 95 cents per mile traveled. Destination charges a base fee of $9.50 and a mileage fee of 80 cents per mile traveled. How many miles would Jasmyn have to travel for the total cost of the two services to be the same?

(5) The price, including the sales tax, that Carmela paid for a Segway i2 SE was $6945.25. If the sales tax rate was 6.85%, determine the price of the Segway before the sales tax was added.

(6) Erin took her family to visit Ocean City, Maryland. When they made their one-night hotel reservation, they were quoted a rate of $95 per night before tax. When they checked out, their total bill was $110.85, which included the room tax and a $3.50 charge for a candy bar from the in-room bar. Determine the tax rate for the room.

(7) A tennis ball is thrown in the air has a height given by $h = -16t^2 + v_0 t + h_0$, where v_0 is the initial velocity, h_0 is the initial height, and t is the time after the ball is thrown, in seconds. If a tennis ball is projected upward with initial velocity 40 ft/s from an initial height of 3ft, what is the height of the ball after 1 second?

If interest on an account is **simple interest**, the equation for that interest is given by $i = prt$, where i is the simple interest, p is the principal amount (i.e. the start/initial amount of money), r is the interest rate (as a raw number), and t is the time.

Example: Gwen makes a $25000, 3.5% simple interest loan to Eric for 4 years.

(a) At the end of 4 years, what is the amount of simple interest that Eric will have to pay?

(b) When Eric settles his loan, how much money, in total, will he be paying?

If an initial/principal amount of P dollars is depositive into an account paying an annual rate of interest r (as a raw number) compoounded (i.e. paid) n times per year, then after t years, the account with contain A dollars, where A is given by:

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Example: Pola invests $1350 at a 3.6 annual interest rate compounded monthly.

(a) How much money will it be worth in 2 years?

(b) How much interest was earned in that amount of time?