7-1 Solving Systems of Two Equations

The **solution of a system** of two equations in two variables is an ordered pair of real numbers that is a solution of each equation.

Systems can be solved by **substitution, elimination** and **graphing**.

Using **Substitution**, given linear systems:

$x - y = 2$
$3x - 5y = 0$

$2x - y = 10$
$6x + 4y = 1$

Substitution, given nonlinear systems:

$y = x^2 + 6x$
$y = 8x$

Using Elimination:

$3x + 2y = 12$

$4x - 3y = 33$

Special Cases:

Solve:

$3x + 2y = 5$ $3x + 6y = -10$

$-6x - 4y = 10$ $9x + 18y = -30$

Application Problems:

Example: Find the dimensions of a rectangle with the perimeter of 200m and an area of 500m.

Example: the table shows the personal consumption expenditures (in billions) for dentists and health insurance in the US for several years:

Year	Dentists (billions)	Health Insurance (billions)
2001	66.8	89.4
2002	72.2	96.6
2003	74.6	112.8
2004	80.2	129.5
2005	85	141.3
2006	91.1	146.7
2007	95.8	153.2

a. Find the linear regression equations for the US personal consumption expenditures for dentists and health insurance and graph.

b. Use the models to estimate when the expenditures are equal.

Determining Equilibrium Price

      When producing items, suppliers will increase production if they can get higher prices, so as the price increases, so does the supply **(supply curve).** On the other hand, the demand for a product decreases as the price goes up **(demand curve).** Finally, a point where the supply and demand curves meet is the **equilibrium price.**

Example: Nibok Manufacturing has determined that production and price of a new tennis shoe should be geared to the equilibrium point for this system of equations:

        $p = 160 - 5x$
        $p = 35 + 20x$

The price (p) is in dollars and the number of shoes (x) is in millions of pairs. Find the equilibrium point.

Example: Hank can row a boat 1 mi upstream(against the current) in 24 minutes. He can row the same distance downstream in 13 minutes. If both the rowing speed and current speed are constant, find Hank's rowing speed and the speed of the current.

Example: At Philip's convenience store the total cost of one medium and one large soda is $1.74. The large soda costs $0.16 more than the medium soda. sind the cost of each soda.

Example: Determine a and b so that the graph of y = ax + b contains the two points (-1,4) and (2, 6).

Example: Pedro has two plans to choose from to rent a van.
        Company A: a flat fee of $40 plus 10 cents a mile.
        Company B: a flat fee of $25 plus 15 cents a mile.

    a. How many miles can Pegro drive in order to be charged the same amount by the two companies?

    b. Give reasons why Pedro might choose one plan over the other, explain.