Solving Word Problems with Systems of Equations

Goal:

- to solve word problems using a system of equations

Jumbo-Gym charges a membership of $650.
Super-Fitness charges $400 plus $2/visit.
Which gym has the better offer?

It depends on the number of visits

This is an example of a word problem that can be solved using a system of equations.

Let x be the # of visits

y be the total cost

Jumbo-Gym: $y = 650$

Super-Fitness: $y = 400 + 2x$

Use comparison $Y_1 = Y_2$

$$650 = 400 + 2x$$
$$-400 \qquad -400$$

$$\frac{250}{2} = \frac{2x}{2}$$

$$x = 125$$

Interpretation: At 125 visits it costs the same. If you go more than 125 times Jumbo-Gym is better.

Steps for solving word problems:

1. Identify the unknowns and represent them using variables. (be specific)

2. Express the given information as equations. (Usually 2 equations)

3. Choose the most appropriate method to solve the system of equations.

4. Interpret the solution.

At the Bell Centre, Mike spends $19.50 to buy four hot-dogs and two soft-drinks. Jane spends $32.00 to buy six hot-dogs and four soft-drinks.

How much would it cost you to buy two hot-dogs and one soft-drink?

Let x be the cost of 1 hot-dog ($)

y be the cost of 1 soft-drink ($)

$19.50 = 4x + 2y$ ①

$32 = 6x + 4y$ ②

Use elimination:

① $\times 2$ $39 = 8x + 4y$

② $-$ $32 = 6x + 4y$

$\frac{7}{2} = \frac{2x}{2}$

$3.5 = x$ Hot-dog costs $3.50

Plug $x = 3.5$ into ②

$32 = 6(3.5) + 4y$

$32 - 21 = 21 - 21 + 4y$

$\frac{11}{4} = \frac{4y}{4}$

$2.75 = y$ One soft-drink costs $2.75

Two hot-dogs + one soft-drink =

$2(3.50) + 1(2.75)$

$= 7 + 2.75$

$= \$9.25$

The perimeter of a rectangle is 60 cm. The length of the rectangle is 2 cm longer than the width.

What is the area of the rectangle?

Let ℓ be the length (cm)

w be the width (cm)

A be the area (cm^2)

Perimeter = 60

$2\ell + 2w = 60$ (1)

$\ell = 2 + w$ (2)

Use substitution:

sub (2) into (1)

$2(2+w) + 2w = 60$

$4 + 2w + 2w = 60$

$4 + 4w = 60$

$-4 \quad -4$

$4w = 56$

$\frac{4w}{4} = \frac{56}{4}$

$w = 14$

The width is 14 cm

length: $\ell = 2 + w$

$= 2 + 14$

$= 16$

The length is 16 cm

$\text{Area} = \ell \cdot w$

$= 14 \cdot 16$

$= 224 \text{ cm}^2$

Homework : p. 42 #5, 7, 12, 13

1. c) $y = \frac{5x+7}{3}$ ①

$3x - 2y = 12$ ②

sub ① into ②

$$3x - 2\left(\frac{5x+7}{3}\right) = 12$$

$\times 3 \quad / \times 3$

$$3x - \frac{10x}{3} - \frac{14}{3} = 12$$

$$\frac{9x}{3} - \frac{10x}{3} - \frac{14}{3} = 12$$

$$\left(\frac{-1x}{3} - \frac{14}{3}\right)^{\times 3} = 12^{\times 3}$$

$$-x - 14^{+14} = 36^{+14}$$

$$\frac{-x}{-1} = \frac{50}{-1}$$

$$x = -50$$

plug $x = -50$ into ①

$$y = \frac{5(-50)+7}{3}$$

$$= \frac{-250+7}{3}$$

$$= \frac{-243}{3}$$

$$= -81$$

$$(-50, -81)$$