MATH 1010 ~ Intermediate Algebra

Chapter 2: LINEAR EQUATIONS AND INEQUALITIES

Section 2.3: Business and Scientific Problems

Objectives:

* Use mathematical models to solve business-related problems.
* Use mathematical models to solve mixture problems.
* Use mathematical models to solve rate problems.

It takes me 3 hours to perform a task; It takes my friend 5 hours. If we work together, how long should it take?

RATES IN BUSINESS

① EXAMPLE:

Simple Interest:

(#86) Find the annual interest rate on a CD that earned \$400 interest in 2 years on a principal of \$2500.

$A = P(1+r)$ or $I = Prt$

t = time (yrs)

A = amt after time

I = interest (\$)

P = principal (initial investment)

r = interest rate (%)

I = \$400

r = ?

P = \$2500

t = time = 2 yrs

$I = Prt$

$400 = 2500(r)(2)$

$\frac{400}{5000} = \frac{5000r}{5000}$

$\frac{4}{50}\left(\frac{2}{2}\right) = r$

$8\% = 0.08 = \frac{8}{100} = r$

② EXAMPLE:

(#32) An appliance store charges $50 for the first 1/2 hour of a call and $18 for each additional 1/2 hour of labor. Find the length of service call if you were charged $104.

x = length of service call after 1st half hr (half hrs)

y = length of service call (hours)

① $104 = 50 + 18x$

$-50 \quad -50$

$\frac{54}{18} = \frac{18x}{18}$

$3 = x$

$3(\frac{1}{2}) = \frac{3}{2} = 1.5$ hrs

$1(\frac{1}{2}\text{hr}) + 3(\frac{1}{2}\text{hr})$

$= 4(\frac{1}{2}\text{hr}) = \boxed{2\text{ hrs total}}$

② $104 = 50 + 36y$

$-50 \quad -50$

$\frac{54}{36} = \frac{36y}{36}$

1.5 hrs $= \frac{3}{2} = y$

③ EXAMPLE:

A department store sells a beach towel for $14.00. On sale, the towel is $10.00. What is the discount rate?

$\underline{\;4\;}$ is $\underline{\;x\;}$ % of $\underline{\;\$14\;}$

$$\frac{4}{14} = \frac{14x}{14} \qquad x \approx 0.2857 \approx 28.5\%$$

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

MIXTURE PROBLEMS

④ EXAMPLE:

A grocer mixes two kinds of nuts costing $3.88 per pound and $4.88 per pound to make 100 pounds of a mixture costing $4.13 per pound. How many pounds of each kind of nut are in the mixture?

	$/lb ~~%age~~	# lbs	$
nut 1	$3.88/lb	x	3.88x
nut 2	$4.88/lb	100−x	4.88(100−x)
mix	$4.13/lb	100	4.13(100)

$$3.88x + 4.88(100 - x) = 4.13(100)$$

$$3.88x + 488 - 4.88x = 413$$

$$-x + 488 = 413$$

$$-x = -75$$

$$x = 75$$

75 lbs nut 1
25 lbs nut 2

⑤ EXAMPLE:

Ticket sales for a spaghetti dinner total $1350. There are 4 times as many adult tickets sold as children's tickets. The adult tickets are $6.00 and the children's are $3.00. Find the number of children's tickets sold.

	rate $/ticket	# tix	$
adult	$6/tic	4c	6(4c)
child	$3/tic	c	3c
total	X	~~5c~~	1350

$$6(4c) + 3c = 1350$$

$$24c + 3c = 1350$$

$$27c = 1350$$

$c =$ 50 tickets

DISTANCE PROBLEMS

$d = rt$

d= distance
r= rate (speed)
t= time

⑥ EXAMPLE:

$(mi) = \frac{mi}{hr} \cdot hr$

You ride your bike at an average speed of 8 mi/hr. How long will it take you to ride 12 miles?

$r = 8\ \frac{mi}{\cancel{hr}}$

$t = ?$

$d = 12\ mi$

$12 = 8t$

$\frac{12}{8} = t$

$1.5 = \frac{3}{2} = t$

1.5 hrs

WORK-RATE PROBLEMS

⑦ EXAMPLE:

I can complete a typing task in 4 hours. My daughter can do the task in 7 hours. How long will it take us if we work together?

t = time it takes to complete job together

$$28t\left(\frac{1}{4}+\frac{1}{7}\right)=\left(\frac{1}{t}\right)28t$$

amt of job I do in 1 hr + amt of job daughter does in 1 hr = amt of job done together in 1 hr

$$\cancel{28}^{7}t\left(\frac{1}{\cancel{4}}\right)+\cancel{28}^{4}t\left(\frac{1}{\cancel{7}}\right)=\frac{28\cancel{t}}{\cancel{t}}$$

$$7t+4t=28$$

$$11t=28$$

$$t=\frac{28}{11}\text{ hr} = 2.\overline{54}\text{ hr}$$

$$\approx 2.5\text{ hr}$$

SOLVING FOR A VARIABLE IN A FORMULA

Solve for c in this formula. s = C + rC

$$\frac{s}{1+r} = \frac{c(1+r)}{(1+r)}$$

$$\frac{s}{1+r} = c$$