2.5: Applications of Linear Eqns (cont'd)

Note Title 1/27/2015

2.5 #5 Five times the sum of a number and seven is thirty. Find the number.

Let x = the unknown number.

$$5(\text{sum}) = 30$$
$$5(x+7) = 30$$
$$5x + 35 = 30$$
$$5x = -5$$
$$\frac{5x}{5} = \frac{-5}{5}$$
$$x = -1$$

The number is -1.

Example: Mary has \$3.00 in nickels, dimes, and quarters. She has twice as many dimes as quarters, and five more nickels than dimes. How many coins of each type does she have?

number of nickels: $2x+5$
number of dimes: $2x$
number of quarters: x

# of nickels	compared to	# of dimes	compared to	# of qtrs
$2x+5$		$2x$		x

$$\underbrace{\$0.05(2x+5)}_{\text{total value of nickels}} + \underbrace{\$0.10(2x)}_{\text{total value of dimes}} + \underbrace{\$0.25x}_{\text{total value of qtrs}} = \$3.00$$

multiply both sides of eqn by 100:

$$5(2x+5) + 10(2x) + 25x = 300$$

Cont'd on next page.

Cont'd example from previous page.

$$5(2x+5)+10(2x)+25x = 300$$

$$10x+25+20x+25x = 300$$

$$55x+25 = 300$$

$$55x = 275$$

$$x = \frac{275}{55}$$

$$x = 5$$

# of quarters: $x = 5$

# of dimes: $2x = 2(5) = 10$

# of nickels: $2x+5 = 2(5)+5 = 10+5 = 15$

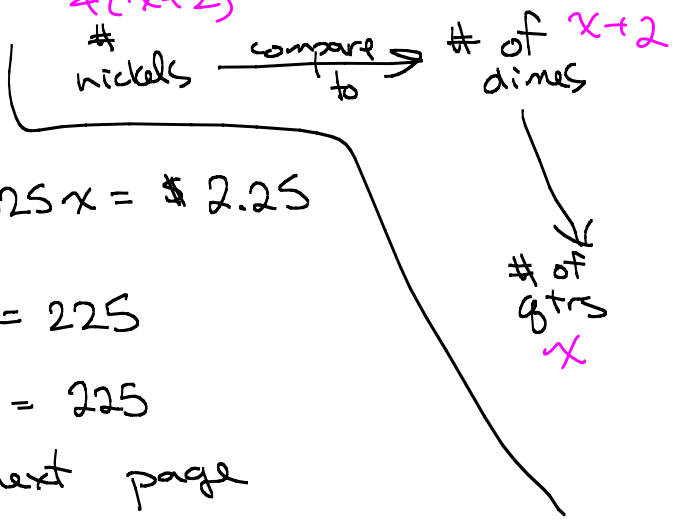
She has 5 quarters, 10 dimes, and 15 nickels.

Check: 5 qtrs: \$1.25
10 dimes: \$1.00
15 nickels: \$0.75
\$3.00 ✓

$$\begin{array}{r} 15 \\ \times\ 5 \\ \hline 75 \end{array}$$

Ex: Joe has \$2.25 in nickels, dimes, and quarters. The number of nickels is four times the number of dimes, and there are two more dimes than quarters. How many coins of each type does he have?

number of nickels: $4(x+2) = 4x+8$
# of dimes: $x+2$
# of quarters: x



$\$0.05(4x+8) + \$0.10(x+2) + \$0.25x = \$2.25$

Multiply both sides by 100:

$$5(4x+8) + 10(x+2) + 25x = 225$$

$$20x+40+10x+20+25x = 225$$

See next page

Example cont'd from previous page:

$$55x + 60 = 225$$

$225 - 60 = 165$

$$55x = 165$$

$$\frac{55x}{55} = \frac{165}{55}$$

$55 \overline{)165}$ → 3

$$x = 3$$

# of qtrs: $x = 3$

# of dimes: $x + 2 = 3 + 2 = 5$

# of nickels: $4x + 8 = 4(3) + 8 = 12 + 8 = 20$

He has 3 quarters, 5 dimes, and 20 nickels.

2.5 #19 Pat is 20 years older than Patrick. In two years, Pat will be twice as old as Patrick. How old are they now?

	Age now	Age in 2 yrs
Pat	$x + 20$	$x + 20 + 2 = x + 22$
Patrick	x	$x + 2$

Pat now → compared to → Patrick now: x

Pat's age in 2 yrs = 2 (Patrick's age in 2 yrs)

$$x + 22 = 2(x + 2)$$

$$x + 22 = 2x + 4$$

$$x + 18 = 2x$$

$$18 = x$$

Patrick's age now: $x = 18$

Pat's age now: $x + 20 = 18 + 20 = 38$

Pat is 38 now and Patrick is 18.

Check: In 2 years, Pat will be 40, Patrick will be 20.

Pat is twice as old ✓

2.7: Linear Inequalities

$<$ means "is less than"

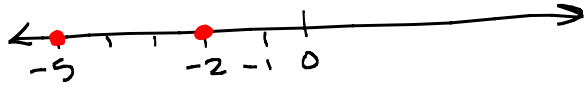
$>$ means "is greater than"

$\leq$ or $\leqslant$ means "is less than or equal to"

$\geq$ or $\geqslant$ means "is greater than or equal to"

$2 < 5$ True

$-2 < -5$ False



$3 \geq 2$ True

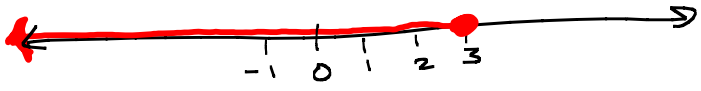
$2 \geq 2$ True

$2 > 2$ False

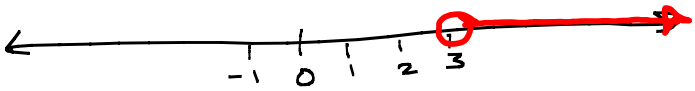
We can use number lines to represent inequalities that have variables in them.

$x < 3$

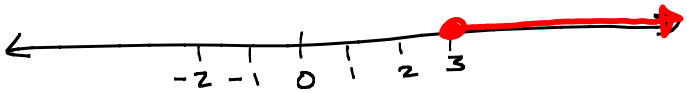
$x \leq 3$



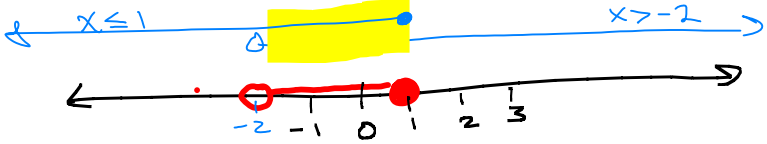
$x > 3$ → same as $3 < x$



$x \geqslant 3$



$x < -2$ OR $x \geqslant 1$



$-2 < x \leq 1$

This means $-2 < x$ and $x \leq 1$

$x > -2$

We'll solve inequalities like this:

$$2x + 1 < 7$$
$$2x < 6$$
$$\frac{2x}{2} < \frac{6}{2}$$
$$x < 3$$

We can add or subtract the same number on both sides. We can multiply/divide both sides by the same positive number

If we divide/multiply both sides by a negative number, we have to reverse the inequality sign.