2.5: Applications (continued)

Note Title 1/27/2015

2.5 #13 Cody is twice as old as Evan. Three years ago, the sum of their ages was 27. Find Cody's and Evan's age now.

	Age now	Age 3 years ago
Cody	$2x$	$2x-3$
Evan	x	$x-3$

Cody's age now → compared to → Evan's age now (x)

$$2x-3+x-3=27$$
$$3x-6=27$$
$$3x=33$$
$$\frac{3x}{3}=\frac{33}{3}$$
$$x=11$$

Evan's age now: $x=11$

Cody's age now: $2x=2(11)=22$

Evan is 11 now, and Cody is 22 now.

check: 3 years ago, Evan was 8. Cody was 19. $8+19=27$ ✓

Money Problems

Examples: Mary has \$3.00 in nickels, dimes, and quarters. If 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 → compare to → # of qtrs

$2x+5$ | $2x$ | x

$$\$0.05(2x+5)+\$0.10(2x)+\$0.25x=\$3.00$$

($\$0.05(2x+5)$: total value of nickels; $\$0.10(2x)$: total value of dimes; $\$0.25x$: total value of qtrs)

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$\$0.05(2x+5) + \$0.10(2x) + \$0.25x = \$3.00$

Multiply both sides by 100:

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

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

$55x + 25 = 300$

$55x = 275$

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

$x = 5$

# of qtrs: $x = 5$

# 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 quarters:	\$1.25
10 dimes:	\$1.00
15 nickels:	\$0.75
	\$3.00 ✓ 1st sentence checks

$15 \times 5 = 75$

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

# of nickels: $4(x+2)$

# of dimes: $x+2$

# of quarters: x

$4(x+2)$ nickels → compare to → $x+2$ dimes → compare to → x quarters

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

Multiply both sides by 100:

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

$20(x+2) + 10x + 20 + 25x = 225$

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

$55x + 60 = 225$

$55x = 165$

$x = \frac{165}{55} = 3$

55 × 3 = 165

225 − 60 = 165

# of qtrs: $x = 3$

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

# of nickels: $4(x+2) = 4(3+2) = 4(5) = 20$

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

2.7: Linear Inequalities

$<$ means "is less than"

$>$ means "is greater than"

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

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

True or false?

$2 < 5$ True

$-2 < -5$ False

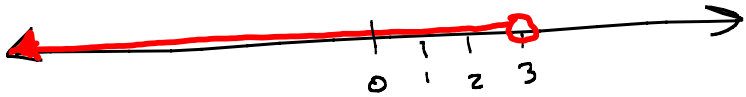
$3 \geq 2$ True

$2 \geq 2$ True

$2 > 2$ False

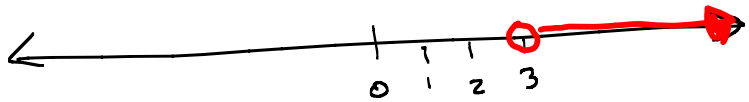
We can use number lines to represent inequalities that have variables in them:

$x < 3$

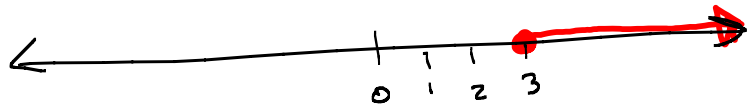


$x \leq 3$

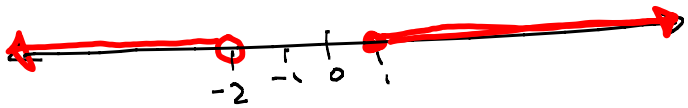
$x > 3$



$x \geq 3$

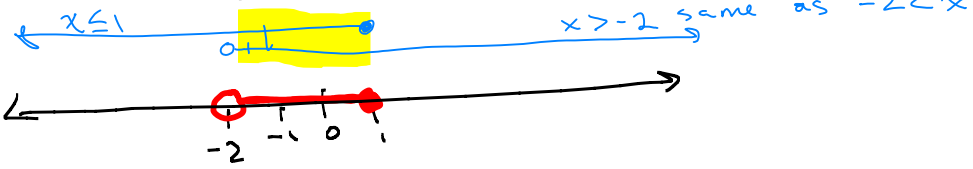


$x < -2$ OR $x \geq 1$



$-2 < x \leq 1$

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



Note: $-2 < x$ is equivalent to $x > -2$

Ex: $x + 3 < 8$ solve

$x < 5$

We can add or subtract the same nonzero number on both sides. We can also divide/multiply both sides by the same positive number. If you multiply/divide both sides by the same negative number, you must reverse the inequality signs.