Algebra 1

2.4 Creating and Solving Inequalities

On a number line, the **graph of an inequality** in one variable is the set of points that represent all solutions of the inequality.

- Closed dot = ≥, ≤
- Open dot = >, <
- Flip inequality symbol if changing sides of variable & number
  ex) $5 > x$ to $x < 5$
- Flip inequality symbol if you multiply/divide by a negative #
  ex) $-3x > -6$ to $x < 2$

ex) graph $x > 4$

ex) graph $x \leq -3$

ex) graph $-4 > y$

$y < -4$

EXAMPLE 1 **Solve a two-step inequality**

Solve $3x - 7 < 8$. Graph your solution.

$+7 \quad +7$

$\frac{3x}{3} < \frac{15}{3}$

$x < 5$

EXAMPLE 2 **Solve a multi-step inequality**

Solve $-0.6(x - 5) \leq 15$.

$-.6x + 3 \leq 15$

$-3 \quad -3$

flip it!

$\frac{-.6x}{-.6} \leq \frac{12}{-.6}$

$x \geq -20$

EXAMPLE 3 Solve a multi-step inequality

Solve $6x - 7 > 2x + 17$. Graph your solution.

$-2x \quad -2x$

$4x - 7 > 17$

$+7 \quad +7$

$\frac{4x}{4} > \frac{24}{4}$

$x > 6$

EXAMPLE 4 Identify the number of solutions of an inequality

Solve the inequality, if possible.

T = ℝ F = ∅ ← blank

a. $14x + 5 < 7(2x - 3)$

$14x + 5 < 14x - 21$

$5 < -21$

T or F ?

No soln or ∅

b. $12x - 1 > 6(2x - 1)$

$12x - 1 > 12x - 6$

$-1 > -6$

T or F

ℝ or Infinitely many Soln's

GUIDED PRACTICE for Examples 3 and 4

Solve the inequality, if possible. Graph your solution.

4. $5x - 12 \leq 3x - 4$

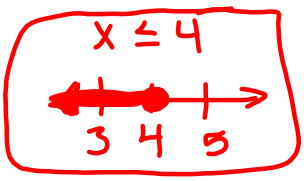
$-3x \quad -3x$

$2x - 12 \leq -4$

$+12 \quad +12$

$2x \leq 8$

$x \leq 4$



5. $5(m + 5) < 5m + 17$

$5m + 25 < 5m + 17$

$25 < 17$

F

∅

6. $1 - 8s \leq -4(2s - 1)$

$1 - 8s \leq -8s + 4$

$1 \leq 4$

T

ℝ

Inequality symbols

- $>$ is greater than, is more than
- $<$ is less than, is smaller than, is fewer than
- $\leq$ is less than or equal to, is at most, is no more than
- $\geq$ is greater than or equal to, is at least

Translate the sentence.

1) Four more than twice a number is at most 32

$4 + 2x \leq 32$

$2x + 4 \leq 32$

2) A number decreased by 5 is at least 21.

$x - 5 \geq 21$

3) Negative eight times a number is no more than sixteen.

$-8x \leq 16$

4) The sum of a number and 3 is no less than 28.

$n + 3 \geq 28$

Nora is planning a birthday party for her little sister, Colleen. Nora's budget will allow her to spend no more than $50 for party supplies. Eight children, including Colleen, will attend the party, and Nora wants to determine how much she could spend on party favors for each child. She will also purchase a cake for $10. Write an inequality that represents the situation, and find possible solutions.

Cake + Party Favors

$10 + 8 \cdot x \leq 50$

$-10 \quad -10$

$8x \leq 40$

$x \leq 5$

$5 or less on each party favor

Trina is buying 12 shirts for the drama club. She will choose a style for the blank shirts and then pay an additional charge of $2.75 for each shirt to have the club logo. If Trina cannot spend more than $99, how much can she spend on each blank shirt? Write and solve an inequality to find the possible cost of each blank shirt.

12 x

$12x + 2.75(12) \leq 99$

$12x + 33 \leq 99$

$-33 \quad -33$

$\frac{12x}{12} \leq \frac{66}{12}$

$x \leq 5.50$

$5.50 or less for each blank shirt

Sergio needs to buy gifts for 8 friends. He wants to give the same gift to all his friends and he plans to have the gifts wrapped for an additional charge of $1.50 each. If Sergio spends at least $70, he will receive free shipping on his order. Write and solve an inequality to determine how much Sergio needs to spend on each gift in order to receive free shipping.

Sergio needs to spend at least $28 on each gift to get free shipping

$x + 1.50x \geq 70$

$\frac{2.50x}{2.5} \geq \frac{70}{2.5}$

$x \geq 28$

The *Daily Info* charges a fee of $650 plus $80 per week to run an ad. The *People's Paper* charges $145 per week. For how many weeks must an ad run for the total cost at the *Daily Info* to be less expensive than the cost at the *People's Paper?* Let w be the number of weeks the ad runs in the paper.

Daily Info $650 + 80w$ < People's Paper $145w$

$-80w \quad -80w$

More than 10 weeks

$\frac{650}{65} < \frac{65w}{65}$

$10 < w$ or $w > 10$

The Home Cleaning Company charges $312 to power-wash the siding of a house plus $12 for each window. Power Clean charges $36 per window, and the price includes power-washing the siding. How many windows must a house have to make the total cost from The Home Cleaning Company less expensive than Power Clean? Let w be the number of windows.

Home Cleaning Co $312 + 12w$ < Power Clean $36w$

$-12w \quad -12w$

More than 13 windows

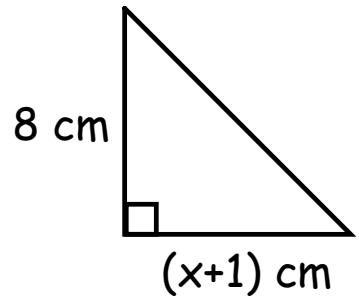
$\frac{312}{24} < \frac{24w}{24}$

$13 < w$ or $w > 13$

Write and solve an inequality to find the possible values of x.

Area of a $\Delta = \frac{1}{2}bh$

Area $\leq$ 44 square centimeters



Area $\leq 44\ cm^2$

$\frac{1}{2}(x+1)(8) \leq 44$

combine

$4(x+1) \leq 44$

$4x+4 \leq 44$

$-4 \quad -4$

$\frac{4x}{4} \leq \frac{40}{4}$

$x \leq 10$

Homework:

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ec: 22