Algebra 1 Name:

2.4 Explain – Solving Multi-Step Inequalities - Notes

Essential Question: How can you solve a multi-step inequality?

Main Ideas/ Questions	Notes/Examples
What You Will Learn	• To solve multi-step inequalities. • To use multi-step inequalities to solve real-life problems.

Steps to Solve Inequalities

Step 1: Use the distributive property to remove any grouping symbols.
Step 2: Simplify the expression on each side of the equation.
Step 3: Collect the variables on one side of the equation and the constant terms on the other side.
Step 4: Isolate the variable (add/subtract then multiply/divide).

When solving inequalities, you must reverse the inequality sign when multiplying or dividing by a negative.

Practice: Solve each inequality.

1. $2 + \frac{b}{-3} \leq 3$

$-2 \quad -2$

$(-3)\frac{b}{-3} \leq 1\,(-3)$

$b \geq -3$

Mult. by neg: FLIP!

2. $8 \leq -4(d+1)$

$8 \leq -4d - 4$

$+4 \quad +4$

$\frac{12}{-4} \leq \frac{-4d}{-4}$ ÷ by neg, FLIP!

$-3 \geq d$ or $d \leq -3$

VT CT

3. $5 - 2n > 8 - 4n$

$+4n \quad +4n$

$5 + 2n > 8$

$-5 \quad -5$

$\frac{2n}{2} > \frac{3}{2}$

$n > 3/2$

4. $8j - 4j + 6 < -2 + 3j$

(VT) (CT)

$4j + 6 < -2 + 3j$

$-3j \quad -3j$

$j + 6 < -2$

$-6 \quad -6$

$j < -8$

5. $12(\frac{1}{4}w + 3) \leq 2(w - 4)$

(VT) (CT)

$3w + 36 \leq 2w - 8$

$-2w \quad -2w$

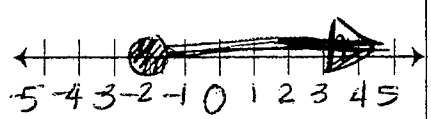
$w + 36 \leq -8$

$-36 \quad -36$

$w \leq -44$

6. Graph the solution in #1.

$b \geq -3$



Making Connections

Solve: $5 - 2n > 8 - 2n$

$-5 \quad -5$

$-2n > -2n + 3$

$+2n \quad +2n$

$0 > 3$

False! (0 is not greater than 3!)

← the variable term canceled out completely!

Does every equation have a solution?

No, x term is not there. 0 IS NOT > 3.

No Solution

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Inequalities with Special Solutions

NO "x" term

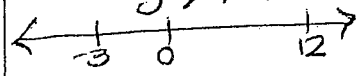
Practice: Solve the following inequalities.

6. $8b - 3 > 4(2b + 3)$

$8b - 3 > 8b + 12$

$-8b \quad -8b$

$-3 > 12$ ← False!



The inequality $-3 > 12$ is FALSE. So, there is NO SOLUTION.

7 $2(5w - 1) \leq 7 + 10w$.

$10w - 2 \leq 7 + 10w$

$-10w \quad -10w$

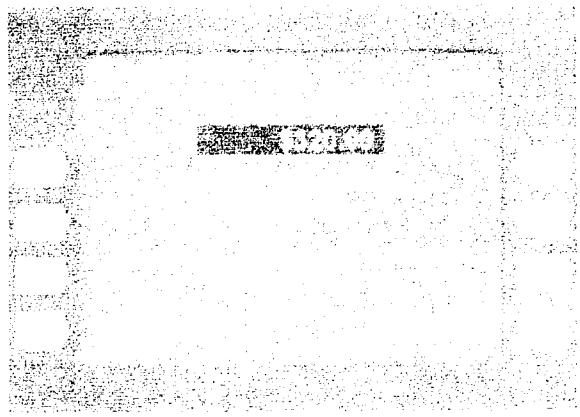
$-2 \leq 7$ ← TRUE!

The inequality $-2 \leq 7$ is TRUE. So, All Real Numbers are solutions.

Solving Real-Life Problems

n = # of $20 bills

You need to withdraw cash from the bank for an upcoming concert.



a. Write an inequality that represents how many $20 bills you can withdraw from the account without going below the minimum balance.

account balance ≥ 100

$320 - 20n \geq 100$

$-320 \quad -320$

$\frac{-20n}{-20} \geq \frac{-220}{-20}$

÷ by neg, flip

$n \leq 11$

b. Is it reasonable for you to be able to withdraw 12 $20 bills without going below the minimum balance? Justify your answer.

NO $320 - 20(12) \geq 100$

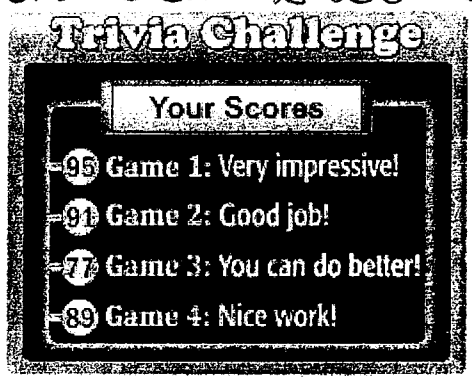
$320 - 240 \geq 100$

$80 \geq 100$

FALSE!

Balance can't be below 100.

8. You need a mean score of at least 90 points to advance to the next round of the touch-screen trivia game. What scores in the fifth game will allow you to advance?



Mean Score ≥ 90

$\frac{\#1 + \#2 + \#3 + \#4 + \#5}{5} \geq 90$

(5) $\frac{95 + 91 + 77 + 89 + x}{5} \geq 90(5)$

$352 + x \geq 90$

$x \geq 98$

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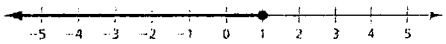
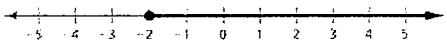
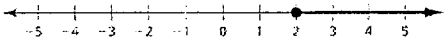
2.4 Assignment: Solving Multi-Step Inequalities

Video Notes: https://www.youtube.com/watch?v=KoMVR5-4vgQ

In Exercises 1–3, match the inequality with its graph.

A. 

B. 

C. 

1. $6y - 5 \geq 7$ **2.** $3m + 5 \leq 8$ **3.** $-4x + 3 \leq 11$

In Exercises 4–9, solve the inequality.

4. $3x - 4 < 2$ **5.** $4t + 11 \geq 7$ **6.** $4 < -2(y + 3)$

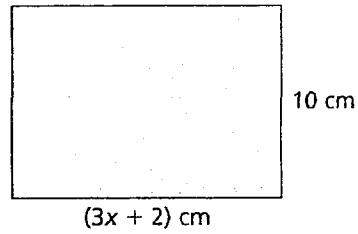
7. $5 < -2t - 3$ **8.** $\frac{k}{3} + 6 < 7$ **9.** $2 + \frac{p}{2} \geq 7$

10. $9w - 4w + 6 \geq 1 + 5w$ **11.** $8(x - 3) > 4(2x - 6)$

12. $4x - 2(-x + 4) < 2(5x + 2)$ **13.** $9(p + 2) \leq 3(3p - 5)$

14. The area of the rectangle shown is at most 140 square centimeters.

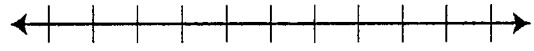
a. Write and solve an inequality to find the possible values of x.



b. Based on the answer in part (a), is it possible for the rectangle to have a length of 15 centimeters? Explain.

15. Solve and graph:

The difference between 12 times a number x and 20 is at most twice x.



STAAR Review:

16. Solve the equation $2x + 7 = 15$

A $x = 2$ B $x = 8$ C $x = 11$ D $x = 14.5$

17. Which of the following inequalities does not have a solution of $x \leq 2$?

A $x + 4 \leq 2$ B $-5x \geq -10$ C $10x \leq 20$ D $x - 7 \geq -11$

18. **8th Grade review:** Which of the following is not a function? Justify your answer.

A {(-1, 4), (1, 6), (4, 10)} B {(-1, 2), (1, 3), (-1, 4)}

A or B (circle one) is not a function because.....