

Inequalities

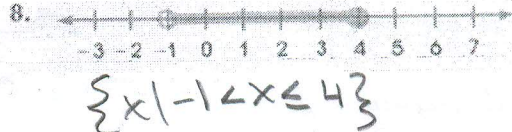
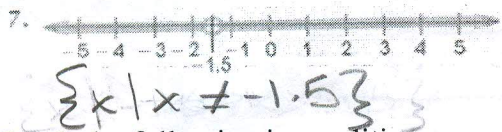
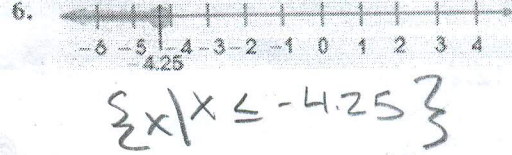
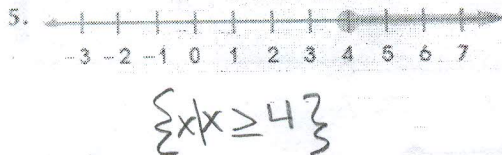
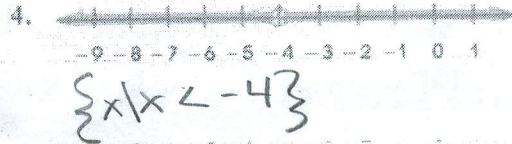
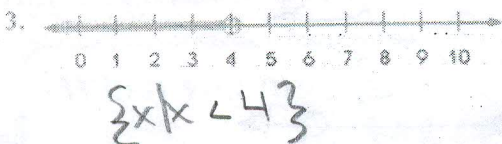
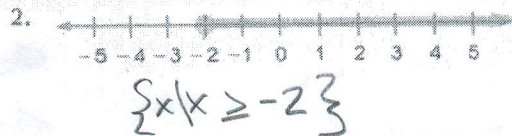
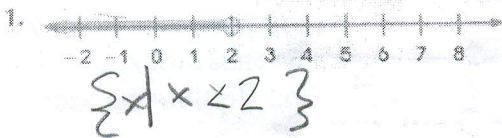
What is an inequality? 2 expressions that are not equal ($>, <, \geq, \leq, \neq$)

Graphing an Inequality

- Inequalities can be represented by shading on a number line.
- We shade the numbers that x could be.
- An open circle on a number means not including (x is not equal to that \neq)
- A closed circle on a number means including (x is equal to that $=$)

For Example:

Write an inequality for each of the following graphs.



Graph the following inequalities.



Homework

Problem Set 1

Graph the following inequalities

1. $x < -3$



2. $x > 6$



3. $x \leq -15$



4. $x \geq 12$



5. $-3 < x \leq 0$



6. $1 < x < 2$



7. $5 \leq x < 7$



8. $x \neq 3$



9. $x \neq 0$



10. $x < 0$ or $x > 2$



11. $x \leq 2$ or $x > 5$



Graph the following sets of numbers on number lines

12. $(-2, 3]$



13. $[2, 4]$



14. $(-\infty, 2]$



15. $(-2, \infty)$



16. $(-\infty, 1] \text{ or } (2, \infty)$



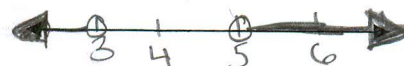
17. $\{x | 2 < x < 1\}$



18. $\{x | 1 \leq x \leq 3\}$



19. $\{x | x < 3 \text{ or } x > 5\}$



20. $\{x | x \neq 3\}$



Solving One-Step Inequalities

Solving Inequalities by Addition or subtraction:

- Undo the inequality by adding or subtracting the same amount to both sides.
- Keep the sign the same.
- Check your work!

For example:

$$\begin{array}{r} 1. \quad x+8 > 10 \\ \underline{-8 \quad -8} \\ x > 2 \end{array}$$

Check!
$$\begin{array}{r} 3+8 > 10 \\ 11 > 10 \checkmark \end{array}$$

$$\begin{array}{r} 2. \quad x-3 < 2 \\ \underline{+3 \quad +3} \\ x < 5 \end{array}$$

Check!
$$\begin{array}{r} 0-3 < 2 \\ -3 < 2 \checkmark \end{array}$$

Solving Inequalities by Multiplication or Division

Solving linear inequalities is pretty much the same as solving linear equations... with one very important exception:

Look at this true statement: $-5 > 3$

Suppose we multiply both sides by -1 $(-1)(5) ? (3)(-1)$
 $-5 ? -3$

What is the relationship between these two numbers? $-5 < -3$

When you multiply an inequality by a negative number,

Flip the symbol over.

This is also true if you divide by a negative.

$$\begin{array}{r} 3. \quad 2x < 10 \\ \underline{\div 2 \quad \div 2} \\ x < 5 \end{array}$$

Check!
$$\begin{array}{r} 2(0) < 10 \\ 0 < 10 \checkmark \end{array}$$

$$\begin{array}{r} 4. \quad -3x < 18 \\ \underline{\div -3 \quad \div -3} \\ x > -6 \end{array}$$

Check!
$$\begin{array}{r} -3(0) < 18 \\ 0 < 18 \checkmark \end{array}$$

$$5. \quad \frac{1}{2}x > 3$$

$$6. \quad x/-3 < 12$$

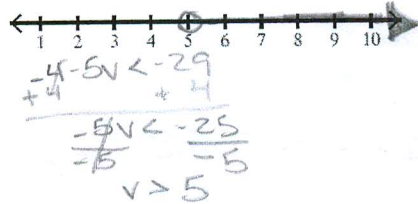
Problem Set 2

Two-Step Inequalities

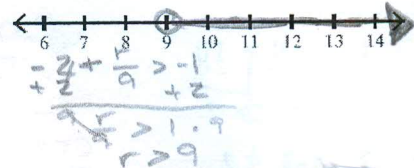
“Undo” the inequality by following PEMDAS backwards.

- First, Add or subtract
- Then, multiply or divide

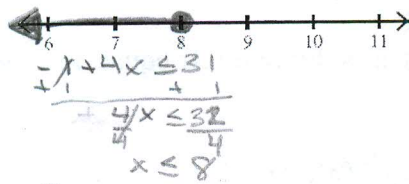
1) $-4 - 5v < -29$



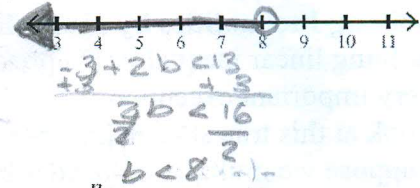
2) $-2 + \frac{r}{9} > -1$



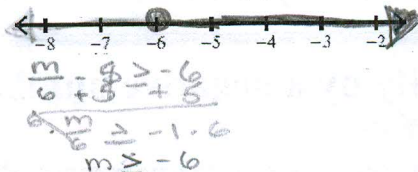
3) $-1 + 4x \leq 31$



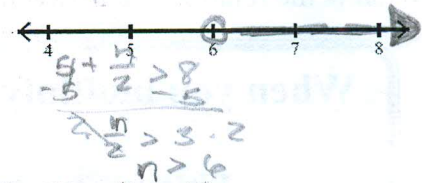
4) $-3 + 2b < 13$



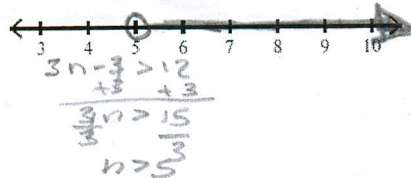
5) $\frac{m}{6} - 5 \geq -6$



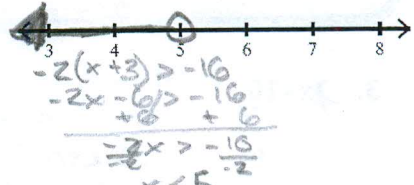
6) $5 + \frac{n}{2} > 8$



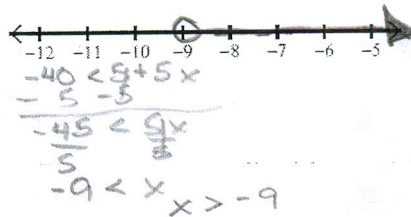
7) $3n - 3 > 12$



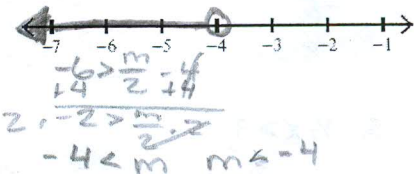
8) $-2(x + 3) > -16$



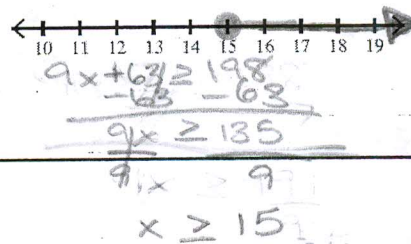
9) $-40 < 5 + 5x$



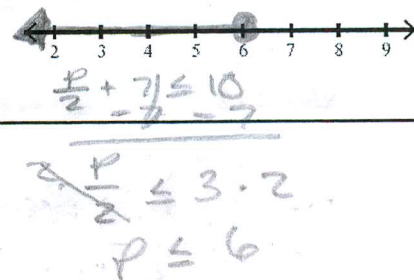
10) $-6 > \frac{m}{2} - 4$



11) $9(x + 7) \geq 198$



12) $\frac{p}{2} + 7 \leq 10$



Multi-Step Inequalities

- Distribute to remove parenthesis
- Combine like terms
- Move variables to the same side
- Add and subtract, then multiply or divide
- Box your answer and check!

Combining "Like Terms"

1. $-3x + 2x \leq 6$

2. $3 - 6n - 4 < 17$
 $-x = 6n < 17$
 $+1$
 $\frac{-4n < 18}{-6} \quad \frac{-6}{-6}$
 $n > -3$

Checks:
 $3 - 6(0) - 4 < 17$
 $3 - 0 - 4 < 17$
 $-1 < 17 \checkmark$

3. $-3x - 2x < 5$

Distributing to remove Parenthesis

1. $8(1 - 4x) > 40$

2. $4(8 - 2b) - 2b \leq 32$

3. $5x - 7(x + 1) > -9$
 $5x - 7x - 7 > -9$
 $-2x - 7 > -9$
 $+7$
 $\frac{-2x > -2}{-2} \quad \frac{-2}{-2}$
 $x < 1$

CK
 $5(0) - 7(0 + 1) > -9$
 $0 - 0 - 7 > -9$
 $-7 > -9 \checkmark$

