NAME _____ DATE _____ PERIOD _____

1-5 Study Guide and Intervention

Solving Inequalities

One-Step Inequalities The following properties can be used to solve inequalities.

Addition and Subtraction Properties for Inequalities	Multiplication and Division Properties for Inequalities
For any real numbers a, b, and c: If $a < b$, then $a + c < b + c$ and $a - c < b - c$. If $a > b$, then $a + c > b + c$ and $a - c > b - c$.	For any real numbers a, b, and c, with $c \neq 0$: If c is positive and $a < b$, then $ac < bc$ and $\frac{a}{c} < \frac{b}{c}$. If c is positive and $a > b$, then $ac > bc$ and $\frac{a}{c} > \frac{b}{c}$. If c is negative and $a < b$, then $ac > bc$ and $\frac{a}{c} > \frac{b}{c}$. If c is negative and $a > b$, then $ac < bc$ and $\frac{a}{c} < \frac{b}{c}$.

These properties are also true for $\leq$ and $\geq$.

Example 1 **Solve $2x + 4 > 36$.**

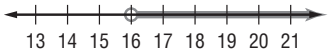
Graph the solution set on a number line.

$2x + 4 - 4 > 36 - 4$

$2x > 32$

$x > 16$

The solution set is $\{x \mid x > 16\}$.



Example 2 **Solve $17 - 3w \geq 35$.**

Graph the solution set on a number line.

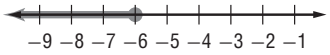
$17 - 3w \geq 35$

$17 - 3w - 17 \geq 35 - 17$

$-3w \geq 18$

$w \leq -6$

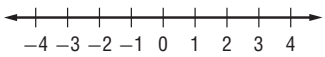
The solution set is $\{w \mid w \leq -6\}$.



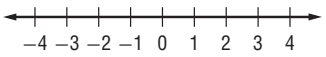
Exercises

Solve each inequality. Then graph the solution set on a number line.

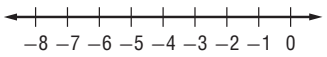
1. $7(7a - 9) \leq 84$



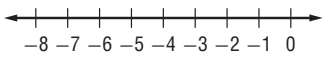
2. $3(9z + 4) > 35z - 4$



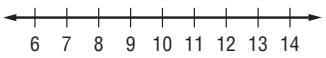
3. $5(12 - 3n) < 165$



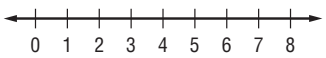
4. $18 - 4k < 2(k + 21)$



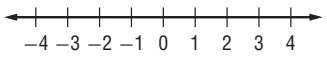
5. $4(b - 7) + 6 < 22$



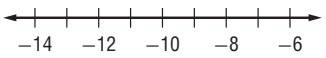
6. $2 + 3(m + 5) \geq 4(m + 3)$



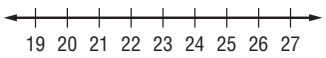
7. $4x - 2 > -7(4x - 2)$



8. $\frac{1}{3}(2y - 3) > y + 2$



9. $2.5d + 15 \leq 75$



NAME _____ DATE _____ PERIOD _____

1-5 Study Guide and Intervention *(continued)*

Solving Inequalities

Multi-Step Inequalities An inequality is a statement that involves placing the inequality sign between two expressions. In order to solve the inequality, you need to find the set of all the values of the variable that makes the inequality true.

Example **GAMES After three quarters of the season has past, the Tigers have won 48 out of 72 games. How many of the remaining games must they win in order to win more than 70% of all their games this season?**

Understand Let x be the number of remaining games that the Tigers must win. The total number of games they will have won by the end of the season is $\frac{3}{4}(48 + x)$. They should win at least 70% of their games.

Plan $\frac{3}{4}(48 + x) > 0.7(72)$

Solve

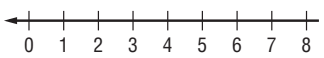
$\frac{3}{4}(48 + x) > 0.7(72)$	Original Inequality
$48 + x > \frac{4}{3}0.7(72)$	Multiply each side by $\frac{4}{3}$.
$48 + x > 67.2$	Simplify.
$x > 19.2$	Subtract 48 from each side.

The Tigers have to win 20 or more games.

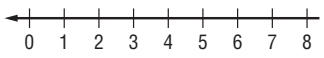
Exercises

Solve each inequality. Then graph the solution set on a number line.

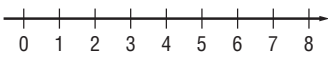
1. $c \geq \frac{c + 4}{3}$



2. $r + 7 < 3(2r - 6)$



3. $3h < \frac{2h + 26}{5}$



4. Jim makes $5.75 an hour. Each week, 26% of his total pay is deducted for taxes. How many hours does Jim have to work if he wants his take-home pay to be at least $110 per week? Write and solve an inequality for this situation.

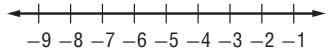
NAME _____ DATE _____ PERIOD _____

1-5 Skills Practice

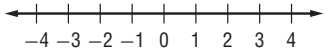
Solving Inequalities

Solve each inequality. Then graph the solution set on a number line.

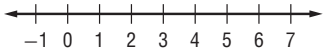
1. $\frac{z}{-4} \geq 2$



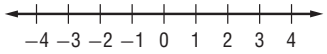
2. $3a + 7 \leq 16$



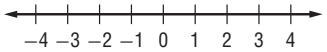
3. $16 < 3q + 4$



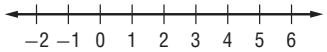
4. $20 - 3n > 7n$



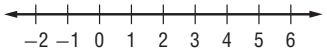
5. $3x \geq -9$



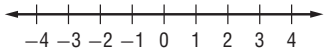
6. $4b - 9 \leq 7$



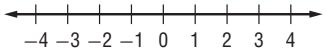
7. $2z < -9 + 5z$



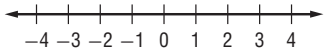
8. $7f - 9 > 3f - 1$



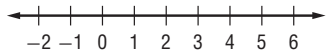
9. $-3k - 8 \leq 5k$



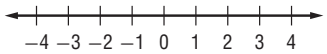
10. $7t - (t - 4) \leq 25$



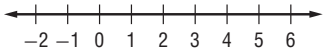
11. $0.7m + 0.3m \geq 2m - 4$



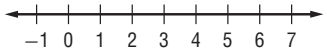
12. $4(5x + 7) \leq 13$



13. $1.7y - 0.78 > 5$



14. $4x - 9 > 2x + 1$



Define a variable and write an inequality for each problem. Then solve.

15. Nineteen more than a number is less than 42.

16. The difference of three times a number and 16 is at least 8.

17. One half of a number is more than 6 less than the same number.

18. Five less than the product of 6 and a number is no more than twice that same number.

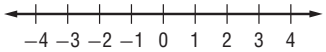
NAME _____ DATE _____ PERIOD _____

1-5 Practice

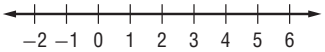
Solving Inequalities

Solve each inequality. Then graph the solution set on a number line.

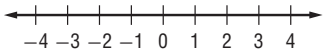
1. $8x - 6 \geq 10$



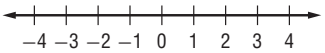
2. $23 - 4u < 11$



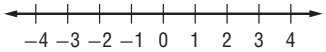
3. $-16 - 8r \geq 0$



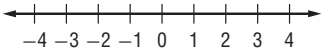
4. $14c < 9c + 5$



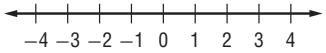
5. $9x - 11 > 6x - 9$



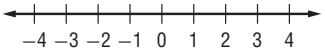
6. $-3(4w - 1) > 18$



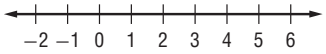
7. $1 - 8u \leq 3u - 10$



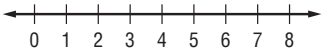
8. $17.5 < 19 - 2.5x$



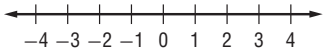
9. $9(2r - 5) - 3 < 7r - 4$



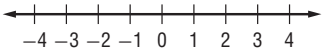
10. $1 + 5(x - 8) \leq 2 - (x + 5)$



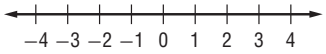
11. $\frac{4x - 3}{2} \geq -3.5$



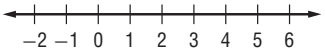
12. $q - 2(2 - q) \leq 0$



13. $-36 - 2(w + 77) > -4(2w + 52)$



14. $4n - 5(n - 3) > 3(n + 1) - 4$



Define a variable and write an inequality for each problem. Then solve.

15. Twenty less than a number is more than twice the same number.

16. Four times the sum of twice a number and −3 is less than 5.5 times that same number.

17. HOTELS The Lincoln's hotel room costs \$90 a night. An additional 10% tax is added. Hotel parking is \$12 per day. The Lincoln's expect to spend \$30 in tips during their stay. Solve the inequality $90x + 90(0.1)x + 12x + 30 \leq 600$ to find how many nights the Lincoln's can stay at the hotel without exceeding total hotel costs of \$600.

18. BANKING Jan's account balance is \$3800. Of this, \$750 is for rent. Jan wants to keep a balance of at least \$500. Write and solve an inequality describing how much she can withdraw and still leave enough for rent and a \$500 balance.

NAME _____ DATE _____ PERIOD _____

1-5 Word Problem Practice

Solving Inequalities

1. PANDAS An adult panda bear will eat at least 20 pounds of bamboo every day. Write an inequality that expresses this situation.

2. PARTY FAVORS Janelle would like to give a party bag to every person who is coming to her party. The cost of the party bag is \$7 per person. Write an inequality that describes the number of people P that she can invite if Janelle has D dollars to spend on the party bags.

3. INCOME Manuel takes a job translating English instruction manuals to Spanish. He will receive \$15 per page plus \$100 per month. Manuel would like to work for 3 months during the summer and make at least \$1500. Write and solve an inequality to find the minimum number of pages Manuel must translate in order to reach his goal.

4. FINDING THE ERROR The sample below shows how Brandon solved $5 < -2x - 7$. Study his solution and determine if it is correct. Explain your reasoning.

$5 < -2x - 7$
$12 < -2x$
$-6 < x$

5. CARNIVALS On a Ferris wheel at a carnival, only two people per car are allowed. The two people together cannot weigh more than 300 pounds. Let x and y be the weights of the people.

a. Write an inequality that describes the weight limitation in terms of x and y.

b. Write an inequality that describes the limit on the average weight a of the two riders.

c. Ron and his father want to go on the ride together. Ron's father weighs 175 pounds. What is the maximum weight Ron can be for the two to be allowed on the ride?

NAME _____ DATE _____ PERIOD _____

1-5 Enrichment

Equivalence Relations

A relation R on a set A is an *equivalence relation* if it has the following properties.

Reflexive Property For any element a of set A, a R a.

Symmetric Property For all elements a and b of set A, if a R b, then b R a.

Transitive Property For all elements a, b, and c of set A, if a R b and b R c, then a R c.

Equality on the set of all real numbers is reflexive, symmetric, and transitive. Therefore, it is an equivalence relation.

In each of the following, a relation and a set are given. Write *yes* if the relation is an equivalence relation on the given set. If it is not, tell which of the properties it fails to exhibit.

1. $<$, {all numbers}

2. $\cong$, {all triangles in a plane}

3. is the sister of, {all women in Tennessee}

4. $\geq$, {all numbers}

5. is a factor of, {all nonzero integers}

6. $\sim$, {all polygons in a plane}

7. is the spouse of, {all people in Roanoke, Virginia}

8. $\perp$, {all lines in a plane}

9. is a multiple of, {all integers}

10. is the square of, {all numbers}

11. $\|$, {all lines in a plane}

12. has the same color eyes as, {all members of the Cleveland Symphony Orchestra}

13. is the greatest integer not greater than, {all numbers}

14. is the greatest integer not greater than, {all integers}