5-2 Practice
Solving Equations with Variables on Each Side

Solve each equation. Show your work. Check your solution.

1. $3g - 12 = 9g$

2. $14m = 18 + 12m$

3. $7c - 7 = 4c + 17$

4. $-11t = 15 - 6t$

5. $20s + 4 = 13s - 10$

6. $-2h - 16 = 3h - 6$

7. $27j - 6 = 14j + 7$

8. $-1 + 19w = 11w + 23$

9. $8 - p = -12 - 3p$

10. $9k - 26 = 6k - 8$

11. $28 - 4d = 5d - 17$

12. $2y + 7 = y$

13. $11.7 - 2x = x$

14. $3b + 4.4 = 2.6 - 6b$

OVER $\longrightarrow$

15. $\frac{3}{4}y - 6 = \frac{1}{4}y + 10$ **16.** $2c + 7.5 = 6.2 - 3c$

17. $5d - 11 = 2d + 2$ **18.** $6a - 10 = 2a - 7$

19. $8n - 6 = -9n + 11$ **20.** $2f - 9 = 14f + 1$

Define a variable and write and equation to find each number. Then solve.

21. Twice a number is 60 more than five times the number. What is the number?

22. Four times a number is 21 more than the number. What is the number?

23. Eight less than three times a number equals the number. What is the number?

24. A number equals six less than four times a number. What is the number?

25. TENNIS   The area of a tennis court is 2808 ft^2, or 8 square feet more than 3.5 times the size of the area of a racquetball court. What is the area of a racquetball court?

26. CELLULAR PHONES   One cellular phone carrier charges $26.50 a month plus $0.15 a minute for local calls. Another carrier charges $14.50 a month and $0.25 a minute for local calls. For how many minutes is the cost of the plan the same?

5-3 Study Guide and Intervention

Inequalities

Write Inequalities A mathematical sentence that contains any of the symbols listed below is called an **inequality.**

<	>	≤	≥
• is less than • is fewer than	• is greater than • is more than • exceeds	• is less than or equal to • is no more than • is at most	• is greater than or equal to • is no less than • is at least

Example 1 Write an inequality for the sentence.

Fewer than 70 students attended the last dance.

Words	*Fewer than* 70 students attended the last dance.
Symbols	Let s = the number of students.
Inequality	$s < 70$

You can substitute a value for a variable in an inequality and determine whether the value makes the inequality true or false.

Example 2 For the given value, state whether each inequality is *true* or *false*.

a. $5y - 6 < 14; y = 5$

$5y - 6 < 14$ Write the inequality.

$5(5) - 6 < 14$ Replace the variable with the given value.

$19 < 14$ Simplify.

This sentence is false.

b. $r - 16 \geq -12; r = 4$

$r - 16 \geq -12$

$4 - 16 \geq -12$

$-12 \geq -12$

Although $-12 > -12$ is false, $-12 = -12$ is true. So, this sentence is true.

Exercises

Write an inequality for each sentence.

1. The maximum diving depth is no more than 45 feet below sea level.

2. Adult male elephants can weigh over 12,000 pounds.

3. The maximum fee for any student is $15.

4. You must be at least 38 inches tall to ride the roller coaster.

For the given value, state whether the inequality is *true* or *false*.

5. $m + 8 \geq 5; m = -3$

6. $4 - p < -2; p = 6$

7. $b + 12 \leq 15; b = -1$

8. $j - 7 < -8; j = 0$

## 5-3 Study Guide and Intervention (continued)

Inequalities

Graph Inequalities Inequalities can be graphed on a number line. This helps you see which values make the inequality true. You can also write inequalities for a graph.

> An *open dot* indicates that the number marked *does not* make the sentence true.
> A *closed dot* indicates that the number marked *does* make the sentence true.
> The direction of the line indicates whether numbers *greater than* or *less than* the number marked make the sentence true.

Example 1 Graph each inequality on a number line.

a. $x > 8$

b. $x \le 8$
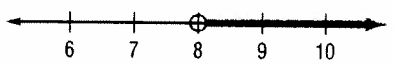
The **open dot** means 8 *does not* make the sentence true. The line means that numbers greater than 8 make the sentence true.

The **closed dot** means 8 *does* make the sentence true. The line means that numbers less than 8 make the sentence true.

Example 2 Write an inequality for each graph.

a.

b.
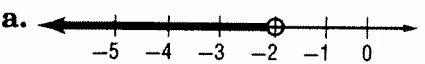
The open dot means −2 is not included in the graph. The arrow points left, so the graph includes all numbers less than −2. The inequality is $x < -2$.
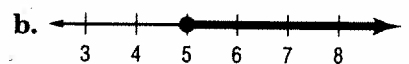
The closed dot means 5 is included in the graph. The arrow points right, so the graph includes all numbers greater than 5. The inequality is $x \ge 5$.
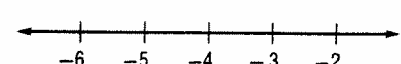
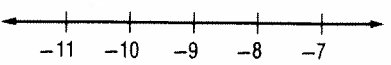## Exercises

Graph each inequality on a number line.

1. $x > 7$
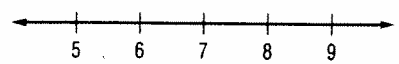
2. $a \le -2$
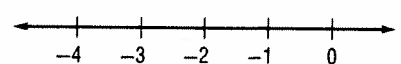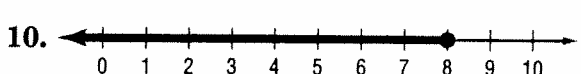

3. $d < -4$

4. $w > -9$

5. $t \ge -5$
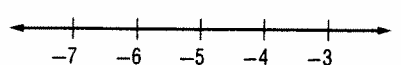
6. $n < -11$
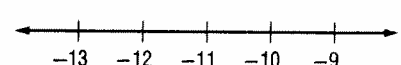
Write the inequality for each graph.
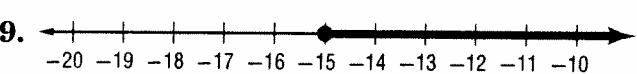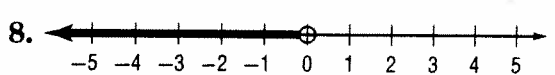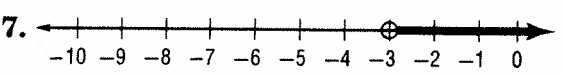
7.

8.

9.

10.

Lesson 5-3

5-3 Practice

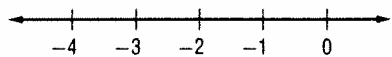### Inequalities

Write an inequality for each sentence.

1. More than 3400 people attended the flea market.

2. Her earnings at $11 per hour were no more than $121.

3. The 10-km race time of 84 minutes was at least twice as long as the winner's time.

4. A savings account increased by $70 is now more than $400.

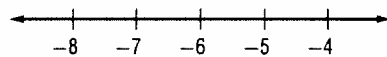**For the given value, state whether each inequality is *true* or *false*.**

5. $9 - x > 3$, $x = 6.5$

6. $9.5 + n < 19$, $n = 10$

7. $3k < 27\frac{1}{2}$, $k = 8$

8. $21 \leq 4c$, $c = 5.2$

9. $\frac{x}{4} \leq 8$, $x = 32$

10. $\frac{9}{c} > 2$, $c = 3\frac{1}{2}$

Graph each inequality on a number line.
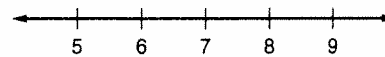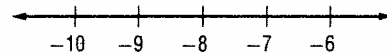
11. $a < -2$

```
   +----+----+----+----+----+
  -4   -3   -2   -1    0
```
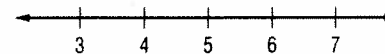
12. $t > -6$

```
   +----+----+----+----+----+
  -8   -7   -6   -5   -4
```

13. $d \geq 7$

```
   +----+----+----+----+----+
   5    6    7    8    9
```

14. $b \geq 11$

```
   +----+----+----+----+----+
   9   10   11   12   13
```

15. $x \leq -8$

```
   +----+----+----+----+----+
 -10   -9   -8   -7   -6
```

16. $w > 5$

```
   +----+----+----+----+----+
   3    4    5    6    7
```

17. $n < 20$

```
   +----+----+----+----+----+
  18   19   20   21   22
```

18. $b \leq -4$

```
   +----+----+----+----+----+
  -6   -5   -4   -3   -2
```

19. $a \geq -6$

```
   +----+----+----+----+----+
  -8   -7   -6   -5   -4
```

Write the inequality for each graph.

20.
```
  +----+----⊕----+----+
 11   12   13   14   15
```

21.
```
  +----+----●━━━━+━━━━+
 -5   -4   -3   -2   -1
```

22.
```
  +----+----⊕━━━━+━━━━+
-20  -19  -18  -17  -16
```

23.
```
  +----+----●━━━━+━━━━+
  5    6    7    8    9
```
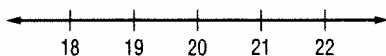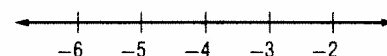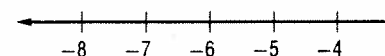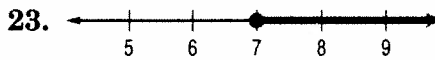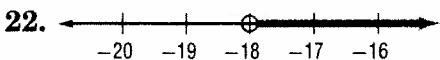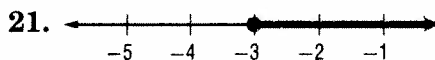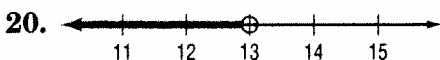
24. **HIPPOS** The average time a human being can hold their breath underwater is 1 minute. A hippo can hold its breath underwater for at least 5 times as long as a human. Write an inequality that represents how long a hippo can hold its breath underwater.

25. **CHARITY** In the first hour of a charity auction, $4800 was raised. This was at most $1200 more than was raised in the second hour of the auction. Write an inequality that represents the amount raised in the second hour.

Lesson 5-3

5-4 Skills Practice

Solving Inequalities

Solve each inequality. Check your solution.

1. $p + 9 > 13$ **2.** $t + 7 < -4$ **3.** $-12 \geq 7 + x$ **4.** $f + (-7) \leq 9$
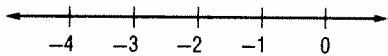
5. $5 > -3 + y$ **6.** $r + 7 \leq -3$ **7.** $b - 15 > 11$ **8.** $z + (-4) < -8$

9. $j - 4 \leq -10$ **10.** $-5 > h - 3$ **11.** $13 > w - (-14)$ **12.** $g - 7 > -4$
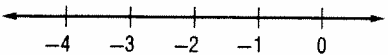
13. $-15 \leq d + (-2)$ **14.** $2 + c \leq -8$ **15.** $15 > c + 3$ **16.** $j + 9 \leq -10$

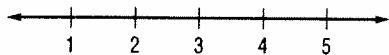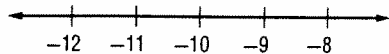**Solve each inequality. Then graph the solution on a number line.**
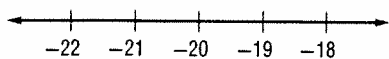
17. $-8x > 16$

    $-4 \quad -3 \quad -2 \quad -1 \quad 0$

18. $7y < -35$

    $-7 \quad -6 \quad -5 \quad -4 \quad -3$

19. $12a \geq -24$

    $-4 \quad -3 \quad -2 \quad -1 \quad 0$

20. $-12 \leq 4a$

    $-5 \quad -4 \quad -3 \quad -2 \quad -1$

21. $-6z < -18$

    $1 \quad 2 \quad 3 \quad 4 \quad 5$

22. $14 > -2k$

    $-9 \quad -8 \quad -7 \quad -6 \quad -5$

23. $5 > \dfrac{x}{-2}$

    $-12 \quad -11 \quad -10 \quad -9 \quad -8$

24. $\dfrac{r}{-3} \leq -4$

    $10 \quad 11 \quad 12 \quad 13 \quad 14$

25. $-10t \geq 200$

    $-22 \quad -21 \quad -20 \quad -19 \quad -18$

26. $\dfrac{y}{7} < 2$

    $12 \quad 13 \quad 14 \quad 15 \quad 16$

27. $\dfrac{-1}{2}x \leq -6$

    $10 \quad 11 \quad 12 \quad 13 \quad 14$
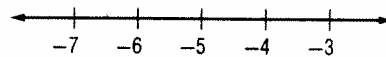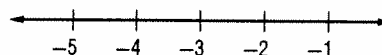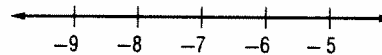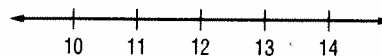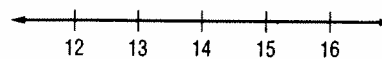
28. $\dfrac{b}{-3} \leq 6$

    $-20 \quad -19 \quad -18 \quad -17 \quad -16$
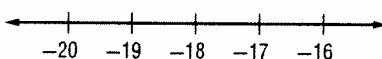
29. SHOPPING Chantal would like to buy a new pair of running shoes. Shoes that she likes start at $85. If she has already saved $62, what is the least amount she must still save?

Lesson 5-4

5-4 Practice

Solving Inequalities

Solve each inequality. Check your solution.

1. $-6 \geq g + 4$

2. $15 + d > 10$

3. $p + (-8) \leq -12$

4. $-13 < k - (-16)$

5. $-1 + s \leq 5$

6. $12 > w - (-0.3)$
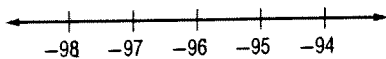
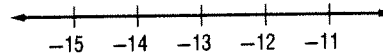**7.** $-1\frac{7}{8} < d + (-2)$

8. $z - 0.9 > -4.8$

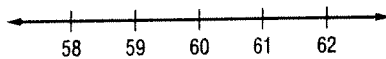**9.** $b - \frac{1}{5} < 3\frac{1}{10}$

Solve each inequality. Then graph the solution on a number line.
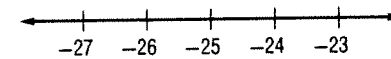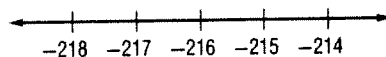
10. $24 \geq \dfrac{g}{-4}$

```
 ←——+———+———+———+———+——→
   -98  -97  -96  -95  -94
```

11. $-78 > 6h$

```
 ←——+———+———+———+———+——→
   -15  -14  -13  -12  -11
```

12. $\dfrac{f}{-5} < -12$

```
 ←——+———+———+———+———+——→
    58   59   60   61   62
```

13. $100 \geq -4s$

```
 ←——+———+———+———+———+——→
   -27  -26  -25  -24  -23
```

14. $\dfrac{p}{-36} < 6$

```
 ←——+———+———+———+———+——→
  -218 -217 -216 -215 -214
```

15. $-4 > \dfrac{c}{-3.5}$

```
 ←——+———+———+———+———+——→
    12   13   14   15   16
```

16. $-24 < \frac{1}{2}b$

```
 ←——+———+———+———+———+——→
   -50  -49  -48  -47  -46
```

17. $-3 \leq \dfrac{c}{-1.5}$

```
 ←——+———+———+———+———+——→
     2    3    4    5    6
```
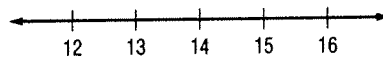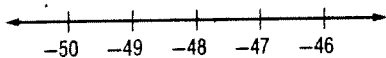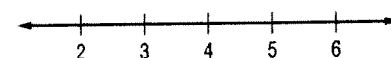
18. TRANSPORTATION A certain minivan has a maximum carrying capacity of 1200 pounds. If the luggage weighs 150 pounds, what is the maximum weight allowable for passengers?

19. DISCOUNTS To qualify for a store discount, Jorge's soccer team must spend at least $560 for new jerseys. The team needs 20 jerseys.

   a. Write an inequality to represent how much the team should spend on each jersey to qualify for the discount.

   b. How much should the team spend for each jersey?

Solving Multi-Step Equations and Inequalities

Solve Equations with Grouping Symbols Equations with grouping symbols can be solved by first using the Distributive Property to remove the grouping symbols.

Example 1 Solve $2(6m - 1) = 8m$. Check your solution.

$2(6m - 1) = 8m$	Write the equation.
$12m - 2 = 8m$	Use the Distributive Property.
$12m - 12m - 2 = 8m - 12m$	Subtraction Property of Equality
$-2 = -4m$	Simplify.
$\frac{-2}{-4} = \frac{-4m}{-4}$	Division Property of Equality
$\frac{1}{2} = m$	Simplify.

CHECK $2(6m - 1) = 8m$

$26\left[\left(\frac{1}{2}\right) - 1\right] \overset{?}{=} 8\left(\frac{1}{2}\right)$ Replace m with $\frac{1}{2}$.

$2(3 - 1) \overset{?}{=} 4$ Simplify.

$4 = 4 \checkmark$ The solution checks.

No Solution or All Numbers as Solutions Some equations have no solution. The solution set is the **null** or **empty set**, which is represented by $\varnothing$. Other equations have every number as a solution. Such an equation is called an **identity**.

Example 2 Solve each equation.

a. $2(x - 1) = 4 + 2x$

$2x - 2 = 4 + 2x$

$2x - 2x - 2 = 4 + 2x - 2x$

$-2 = 4$

The solution set is $\varnothing$.

b. $-2(x - 1) = 2 - 2x$

$-2x + 2 = 2 - 2x$

$-2x + 2 - 2 = 2 - 2 - 2x$

$-2x = -2x$

$x = x$

The solution set is all real numbers.

Exercises: Solve each equation. Show your work! check!

1) $8(g - 3) = 24$

2) $5(x + 3) = 25$

3) $7(2c - 5) = 7$

4) $2(3d + 7) = 5 + 6d$

5) $2(s + 11) = 5(s + 2)$

6) $7y - 1 = 2(y + 3) - 2$

7) $2(f + 3) - 2 = 8 + 2f$

8) $2(x - 2) + 3 = 2x - 1$

9) $1 + 2(b + 6) = 5(b -$

Solving Multi-Step Equations and Inequalities

Solve Multi-Step Inequalities Some inequalities require more than one step to solve. For such inequalities, undo the operations in reverse order, just as in solving multi-step equations. Remember to reverse the inequality symbol when multiplying or dividing each side of the inequality by a negative number. If the inequality contains parentheses, use the Distributive Property to begin simplifying the inequality.

Example Solve $12 - 2x > 24 + 2x$. Graph the solution on a number line.

|	
$12 - 2x > 24 + 2x$	Write the inequality.
$12 - 2x - 2x > 24 + 2x - 2x$	Subtraction Property of Inequality
$12 - 4x > 24$	Simplify.
$12 - 12 - 4x > 24 - 12$	Subtraction Property of Inequality
$-4x > 12$	Simplify.
$\dfrac{-4x}{-4} < \dfrac{12}{-4}$	Division Property of Inequality
$x < -3$	Simplify.

CHECK

$12 - 2x > 24 + 2x$	Try –4, a number less than –3.
$12 - 2(-4) > 24 + 2(-4)$	Replace x with –4.
$12 + 8 > 24 - 8$	Simplify.
$20 > 16 ✔$	The solution checks.

Graph the solution $x < -3$.
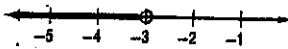
Exercises : Solve & Graph Each Inequality. Show work!

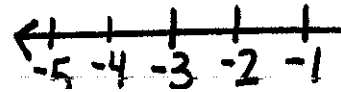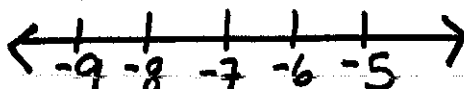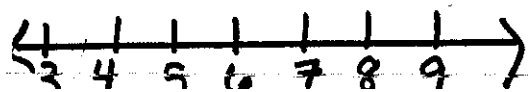**1)** $5c + 9 < -11$

2) $8 - 4p > 20$

3) $c + 5 \leq 4c - 1$
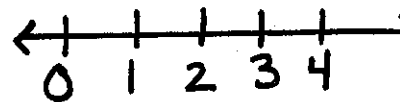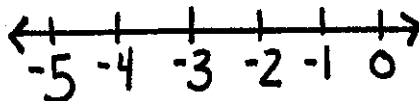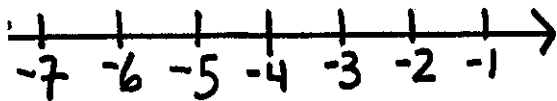
4) $18 - 2n \geq 6$

5) $3(d+2) < -15$

6) $\dfrac{b}{3} + 9 > 8$

Name _____ Date _____ Pd_____

Chapter 5 (Multi-Step Equations and Inequalities)
<u>Bringing It All Together #1</u>

Vocabulary Check

**Circle the correct term that best completes the sentence.**

1) An (equation, inequality) is a mathematical sentence that contains a less than or greater than symbol.

2) (Perimeter, Area) is the distance around a geometric figure.

3) The inequality symbol must be reversed when you multiply or divide by a (positive, negative) number.

4) When finding the area of a triangle, multiply (2, ½) by the product of the base and height.

5) The symbol ≥ means (less than, greater than) or equal to.

6) The statement $d + 0 = d$ is an example of the (additive, multiplicative) identity.

7) The area of a rectangle is equal to the (sum, product) of the length and width.

8) The (Addition, Distributive) Property can be used to remove grouping symbols.

9) The measure of the amount of space in a figure is the (perimeter, area).

10) A null or empty set is shown by the symbol $(0, \emptyset)$.

OVER ⟶

Name _____ Date _____ Pd_____

5-1 Perimeter and Area (pp. 221-226)

Find the perimeter and area of each figure.

11)

5 ft

5 ft

12)

4 m

7 m

13)

4 cm   5 cm

3 cm

14)

7 in.   5 in.   9 in.

11 in.
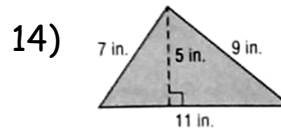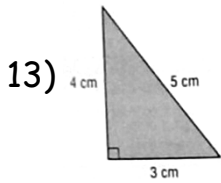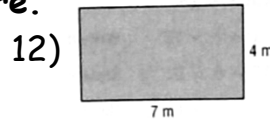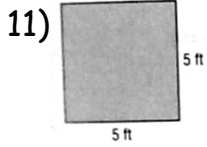
15)   The area of a gymnastics mat is 142.5 square feet. If the width of the mat is 9.5 feet, what is the length?

5-2 Solving Equations with Variables on Each Side (pp. 229-233)

Solve each equation. Show your work ☺ Check your solution if necessary.

16) $3a + 6 = 2a$

17) $10 - x = 9x$

18) $b - 6 = -b + 2$

19) $5 + 2y - 12 = y + 9$

20) $9q + 6 = 6q - 9$

21) $c - 12 = 4c - 12$

OVER⟶

Name _____ Date _____ Pd_____

5-3 Inequalities (pp. 234-239)

Write an inequality for each sentence.

_____22) Jeremiah can spend at most $15 at the store.

_____23) There are more than 35 students in the band.

For the given value, state whether each inequality is *true* or *false*. Show your work.

_____24) $x + 6 > 7$; $x = 2$ _____25) $13 - a < 9$; $a = 10$

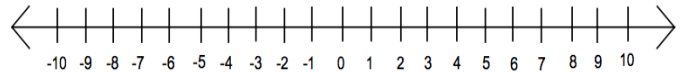_____26) $16 \leq 4a$; $a = 4$ _____27) $3m + 4 \geq 12$; $m = 2$

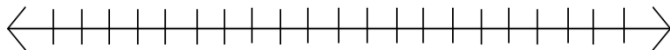_____28) $6x > 18$; $x = 3$ _____29) $6b + 4 > 12$; $b = 2$

5-4 Solving Inequalities (pp. 241-247)

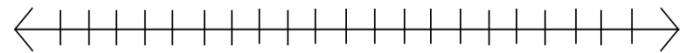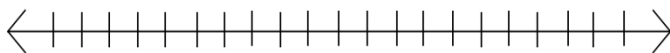**Solve each inequality. Show your work ☺ Graph the solution on the number line.**

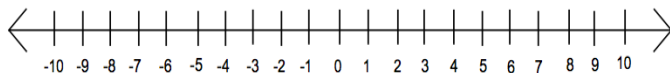30) $x - 4 < 8$ 31) $y + 3 \geq 11$

32) $a - 15 \leq 3$ 33) $x + 13 > -22$

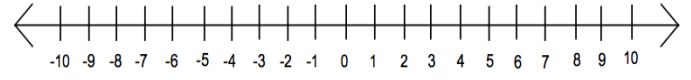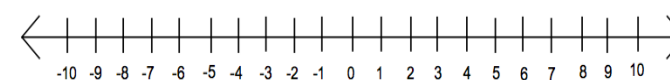34) $-3z \leq -24$ 35) $6h > 42$

36) $-5x < -13$ 37) $\frac{2}{3}x > 6$

OVER ⟶

5-5 Solving Multi-Step Equations and Inequalities (pp. 248-253)

Solve. Show your work ☺ Check your solution if necessary.

38) $8b + 5 = 21$

39) $15 - 4n = -13$

40) $12 = 6(z - 4)$

41) $\frac{3}{4}(12 + 4a) = 21$

42) $-4g - 5 \geq -17$

43) $18 > -12 + 6m$

44) $24 - 3c \leq 15$

45) $\frac{2}{3}k + 9 < 5$

_____46) A car sales associate receives a monthly salary of $1700 plus $140 for every car he sells. How many cars must he sell monthly to earn at least $4500?

FINALLY DONE