

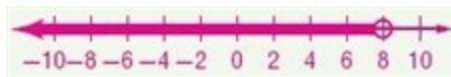
1-5 Solving Inequalities

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

1. $b + 6 < 14$

ANSWER:

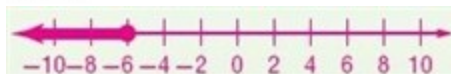
$$b < 8$$



3. $18 \leq -3x$

ANSWER:

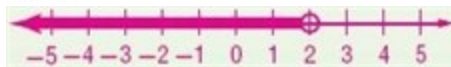
$$x \leq -6$$



5. $-4w - 13 > -21$

ANSWER:

$$w < 2$$



7. $s \geq \frac{s+6}{5}$

ANSWER:

$$s \geq \frac{3}{2}$$



9. **YARD WORK** Tara is delivering bags of mulch. Each bag weighs 48 pounds, and the push cart weighs 65 pounds. If her flat-bed truck is capable of hauling 2000 pounds, how many bags of mulch can Tara safely take on each trip?

ANSWER:

40 bags

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

11. $n + 6 \leq 3$

ANSWER:

$$n \leq -3$$



13. $-12t \geq -6$

ANSWER:

$$t \leq \frac{1}{2}$$



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15. $\frac{k}{3} - 14 < -5$

ANSWER:

$$k < 27$$



17. $-6z - 14 > -32$

ANSWER:

$$z < 3$$



19. $12 < -4(3c - 6)$

ANSWER:

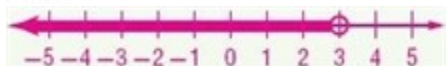
$$c < 1$$



21. $\frac{9z+5}{4} + 18 < 26$

ANSWER:

$$z < 3$$



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

23. Twelve less than the product of three and a number is less than 21.

ANSWER:

$$3x - 12 < 21; x < 11$$

25. The difference of 5 times a number and 6 is greater than the number.

ANSWER:

$$5x - 6 > x; x > 1.5$$

27. **HIKING** Danielle can hike 3 miles in an hour, but she has to take a one-hour break for lunch and a one-hour break for dinner. If Danielle wants to hike at least 18 miles, solve $3(x - 2) \geq 18$ to determine how many hours the hike should take.

ANSWER:

at least 8 hours

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

29. $-8(4x + 6) < -24$

ANSWER:

$$x > -\frac{3}{4}$$



31. $0.24y - 0.64 > 3.86$

ANSWER:

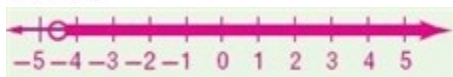
$$y > 18.75$$



33. $-6v + 8 > -14v - 28$

ANSWER:

$$v > -4.5$$



35. $-2r < \frac{6 - 2r}{5}$

ANSWER:

$$r > -\frac{3}{4}$$



37. **MONEY** Jin is selling advertising space in *Central City Magazine* to local businesses. Jin earns 3% commission for every advertisement he sells plus a salary of \$250 a week. If the average amount of money that a business spends on an advertisement is \$500, how many advertisements must he sell each week to make a salary of at least \$700 that week?

- Write an inequality to describe this situation.
- Solve the inequality and interpret the solution.

ANSWER:

a. $250 + 0.03(500a) \geq 700$

b. $a \geq 30$; He must sell at least 30 advertisements.

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

39. The sum of one third a number and 4 is at most the sum of twice that number and 12.

ANSWER:

$$\frac{x}{3} + 4 \leq 2x + 12; x \geq -4.8$$

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41. **MARATHONS** Jamie wants to be able to run at least the standard marathon distance of 26.2 miles. A good rule for training is that runners generally have enough endurance to finish a race that is up to 3 times his or her average daily distance.
- a. If the length of her current daily run is 5 miles, write an inequality to find the amount by which she needs to increase her daily run to have enough endurance to finish a marathon.
 - b. Solve the inequality and interpret the solution.

ANSWER:

a. $3(5 + d) \geq 26.2$

b. $d \geq 3.73$; In order to have enough endurance to run a marathon, Jamie should increase the distance of her average daily run by at least 3.73 miles.

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43. **MULTIPLE REPRESENTATIONS** In this exercise, you will explore graphing inequalities on a coordinate plane.

a. **TABULAR** Organize the following into a table. Substitute 5 points into the inequality $y \geq -\frac{1}{2}x + 3$. State whether the resulting statement is *true* or *false*.

b. **GRAPHICAL** Graph $y = -\frac{1}{2}x + 3$. Also graph the 5 points from the table. Label all points that resulted in a true statement with a T. Label all points that resulted in a false statement with an F.

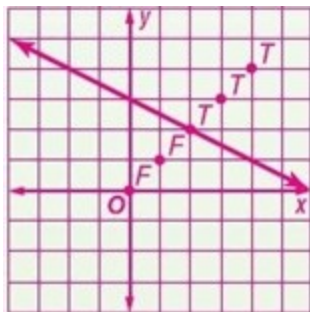
c. **VERBAL** Describe the pattern produced by the points you have labeled. Make a conjecture about which points on the coordinate plane would result in true and false statements.

ANSWER:

a. **Sample answer:**

Point	Resulting Statement	True or False
(0, 0)	$0 \geq 3$	False
(1, 1)	$1 \geq \frac{5}{2}$	False
(2, 2)	$2 \geq 2$	True
(3, 3)	$3 \geq \frac{3}{2}$	True
(4, 4)	$4 \geq 1$	True

b. **Sample answer:**



c. **Sample answer:** The points on or above the line result in true statements, and the points below the line result in false statements. This is true for all points on the coordinate plane.

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45. **ERROR ANALYSIS** Madlynn and Emilie were comparing their homework. Is either of them correct? Explain your reasoning.

Madlynn	Emilie
$\frac{4x+5}{-2} - 1 > -3$	$\frac{4x+5}{-2} - 1 > -3$
$\frac{4x+5}{-2} < -2$	$\frac{4x+5}{-2} > -2$
$4x+5 > 4$	$4x+5 > 4$
$4x > -1$	$4x > -1$
$x > -\frac{1}{4}$	$x > -\frac{1}{4}$

ANSWER:

No; sample answer: Madlynn reversed the inequality sign when she added 1 to each side. Emilie did not reverse the inequality sign at all.

47. **CHALLENGE** Given $\triangle ABC$ with sides $AB = 3x + 4$, $BC = 2x + 5$, and $AC = 4x$, determine the values of x such that $\triangle ABC$ exists.

ANSWER:

Using the Triangle Inequality Theorem, we know that the sum of the lengths of any 2 sides of a triangle must be greater than the length of the remaining side. This generates 3 inequalities to examine.

$$\begin{aligned} 3x+4+2x+5 &> 4x & 3x+4+4x &> 2x+5 \\ x &> -9 & x &> 0.2 \\ 2x+5+4x &> 3x+4 \\ x &> -\frac{1}{3} \end{aligned}$$

In order for all 3 conditions to be true, x must be greater than 0.2.

49. **WRITING IN MATH** Why does the inequality symbol need to be reversed when multiplying or dividing by a negative number?

ANSWER:

Sample answer: When one number is greater than another number, it is either more positive or less negative than that number. When these numbers are multiplied by a negative value, their roles are reversed. That is, the number that was more positive is now more negative than the other number. Thus, it is now less than that number and the inequality symbol needs to be reversed.

51. **STATISTICS** The mean score for Samantha's first six algebra quizzes was 88. If she scored a 95 on her next quiz, what will her mean score be for all 7 quizzes?
- A** 89 **C** 91
B 90 **D** 92

ANSWER:

A

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53. What is the complete solution of the equation $|8 - 4x| = 40$?

- A $x = 8$; $x = 12$
- B $x = 8$; $x = -12$
- C $x = -8$; $x = -12$
- D $x = -8$; $x = 12$

ANSWER:

D

Solve each equation. Check your solutions.

55. $7|3y - 4| = 35$

ANSWER:

$$\left\{-\frac{1}{3}, 3\right\}$$

57. **ASTRONOMY** Pluto travels in a path that is not circular. Pluto's farthest distance from the Sun is 4539 million miles, and its closest distance is 2756 million miles. Write an equation that can be solved to find the minimum and maximum distances from the Sun to Pluto.

ANSWER:

$$|t - 3647.5| = 891.5$$

59. **GEOMETRY** The formula for the surface area of a cylinder is $SA = 2\pi r^2 + 2\pi rh$.

- a. Use the Distributive Property to rewrite the formula by factoring out the greatest common factor of the two terms.
- b. Find the surface area for a cylinder with radius 3 centimeters and height 10 centimeters using both formulas. Leave the answer in terms of π .
- c. Which formula do you prefer? Explain your reasoning.

ANSWER:

a. $SA = 2\pi r(r + h)$

b. $78\pi \text{ cm}^2$

c. Sample answer: The formula in part **b** is quicker.

Solve each equation. Check your solutions.

61. $|x| = 9$

ANSWER:

$$\{-9, 9\}$$

63. $|4y - 15| = 13$

ANSWER:

$$\left\{\frac{1}{2}, 7\right\}$$

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65. $16 = 4|w + 2|$

ANSWER:

$$\{-6, 2\}$$