

## 4.6 Taking Sides

### *A Practice Understanding Task*

Joaquin and Serena work together productively in their math class. They both contribute their thinking and when they disagree, they both give their reasons and decide together who is right. In their math class right now, they are working on inequalities. Recently they had a discussion that went something like this:



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Joaquin: The problem says that “6 less than a number is greater than 4.” I think that we should just follow the words and write:  $6 - n > 4$ .

Serena: I don’t think that works because if  $n$  is 20 and you do 6 less than that you get  $20 - 6 = 14$ . I think we should write  $n - 6 > 4$

Joaquin: Oh, you’re right. Then it makes sense that the solution will be  $n > 10$ , which means we can choose any number greater than 10.

The situations below are a few more of the disagreements and questions that Joaquin and Serena have. Your job is to decide how to answer their questions, decide who is right, and give a mathematical explanation of your reasoning.

1. Joaquin and Serena are assigned to graph the inequality  $x \geq -7$ .  
Joaquin thinks the graph should have an open dot  $-7$ .  
Serena thinks the graph should have a closed dot at  $-7$ .  
Explain who is correct and why.
2. Joaquin and Serena are looking at the problem  $3x + 1 > 0$ .  
Serena says that the inequality is always true because multiplying a number by three and then adding one to it makes the number greater than zero.  
Is she right? Explain why or why not.

SECONDARY MATH I // MODULE 4  
EQUATIONS AND INEQUALITIES - 4.6

3. The word problem that Joaquin and Serena are working on says, "4 greater than  $x$ ".  
Joaquin says that they should write:  $4 > x$ .  
Serena says they should write:  $4 + x$   
Explain who is correct and why.
4. Joaquin is thinking hard about equations and inequalities and comes up with this idea:  
If  $45 + 47 = t$ , then  $t = 45 + 47$ .  
So, if  $45 + 47 < t$ , then  $t < 45 + 47$ .  
Is he right? Explain why or why not.
5. Joaquin's question in #4 made Serena think about other similarities and differences in equations and inequalities. Serena wonders about the equation  $-\frac{x}{3} = 4$  and the inequality  $-\frac{x}{3} > 4$ . Explain to Serena ways that solving these two problems are alike and ways that they are different. How are the solutions to the problems alike and different?
6. Joaquin solved  $-15q \leq 135$  by adding 15 to each side of the inequality. Serena said that he was wrong. Who do you think is right and why?

Joaquin's solution was  $q \leq 150$ . He checked his work by substituting 150 for  $q$  in the original inequality. Does this prove that Joaquin is right? Explain why or why not.

Joaquin is still skeptical and believes that he is right. Find a number that satisfies his solution but does not satisfy the original inequality.

7. Serena is checking her work with Joaquin and finds that they disagree on a problem. Here's what Serena wrote:

$$3x + 3 \leq -2x + 5$$

$$3x \leq -2x + 2$$

$$x \leq 2$$

Is she right? Explain why or why not?

8. Joaquin and Serena are having trouble solving  $-4(3m - 1) \geq 2(m + 3)$ . Explain how they should solve the inequality, showing all the necessary steps and identifying the properties you would use.
9. Joaquin and Serena know that some equations are true for any value of the variable and some equations are never true, no matter what value is chosen for the variable. They are wondering about inequalities. What could you tell them about the following inequalities? Do they have solutions? What are they? How would you graph their solutions on a number line?
- a.  $4s + 6 \geq 6 + 4s$
- b.  $3r + 5 > 3r - 2$
- c.  $4(n + 1) < 4n - 3$
10. The partners are given the literal inequality  $ax + b > c$  to solve for  $x$ . Joaquin says that he will solve it just like an equation. Serena says that he needs to be careful because if  $a$  is a negative number, the solution will be different. What do you say? What are the solutions for the inequality?

**READY, SET, GO!**

Name

Period

Date

**READY**

Topic: Solving equations and inequalities from a context.

Write the given situation as an equation or inequality and then solve it.

1. The local amusement park sells summer memberships for \$50 each. Normal admission to the park costs \$25; admission for members costs \$15.
  - a. If Darren wants to spend no more than \$100 on trips to the amusement park this summer, how many visits can he make if he buys a membership with part of that money?
  - b. How many visits can he make if he pay normal admission instead?
  - c. If he increases his budget to \$160, how many visits can he make as a member?
  - d. How many can he make as a non-member with the increased budget of \$160?
  
2. Jade just took a math test with 20 questions, each question is worth an equal number of points. The test is worth 100 points total.
  - a. Write an equation that can be used to calculate Jade's score based on the number of questions she got right on the test.
  - b. If a score of 70 points earns a grade of *C*-, how many questions would Jade need to get right to get at least a *C*- on the test?
  - c. If a score of 83 points earns a grade of *B*, how many questions would Jade need to get right to get at least a *B* on the test?
  - d. Suppose Jade got a score of 60% and then was allowed to retake the test. On the retake, she got all the questions right that she got right the first time, and also got half the questions right that she got wrong the first time. What percent of the questions did Jade get right, in total, on the retake?

**SET**

Topic: Solve and justify one variable inequalities

Solve each inequality, justifying each step you use.

3.

$-5x < 35$	Justification

4.

$x + 68 \geq 75$	Justification

5.

$2x - 4 \leq 10$	Justification

6.

$5 - 4x \leq 17$	Justification

7.

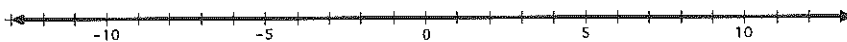
$\frac{x}{-3} > -\frac{10}{9}$	Justification

8.

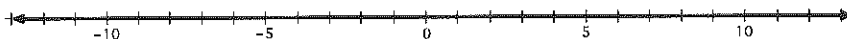
$2(x - 3) \leq 3x - 2$	Justification

Solve each inequality and graph the solution on the number line.

9.  $x - 8 > -20$



10.  $x + 11 > 13$



Solve each multi-step inequality.

11.  $4x + 3 < -1$

12.  $4 - 6x \leq 2(2x + 3)$

13.  $5(4x + 3) \geq 9(x - 2) - x$

14.  $\frac{2}{3}x - \frac{1}{2}(4x - 1) \geq x + 2(x - 3)$

Topic: Solve literal equations

15. Solve the following equation for  $C$ :  $F = \frac{9}{5}C + 32$

16. Given  $V = \frac{1}{3}\pi r^2 h$ , rewrite the formula to isolate the variable  $r$ .

17. The area formula of a regular polygon is  $A = \frac{1}{2}Pa$ . The variable  $a$  represents the apothem and  $P$  represents the perimeter of the polygon. Solve the equation for the apothem,  $a$ .

18. The equation  $y = mx + b$  is the equation of a line. Isolate the variable  $b$ .

19. The equation for the circumference  $c$  of a circle with radius  $r$  is  $c = 2\pi r$ .  
 Solve the equation for the radius,  $r$ .

20. The equation for the area of a circle  $A$  based on diameter  $d$  is  $A = \pi \frac{d^2}{4}$ .  
 Solve the equation to isolate the diameter,  $d$ .

**GO**

Topic: Solve systems of equations by graphing

**Graph both lines on the same coordinate grid. Identify the point of intersection. Then test the  $x$  and  $y$  values of the point of intersection in the two equations.**

21. 
$$\begin{cases} y = 2x + 5 \\ -x + y = 1 \end{cases}$$

22. 
$$\begin{cases} 10 + y = 3x \\ 2x + y = 0 \end{cases}$$

23. 
$$\begin{cases} x + y = 9 \\ x - y = -7 \end{cases}$$

