Problem 5 Writing Real-World Inequalities

What inequality describes the situation? Be sure to define a variable.

Plan

How do you know which inequality symbol to use?
The phrase "starting at $19.99" implies that the cost of a trail ride starts at $19.99 and goes up. So the cost is greater than or equal to 19.99.

A

Let c = the cost of a trail ride in dollars.

The sign indicates that $c \geq 19.99$.

B

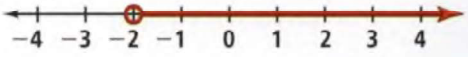
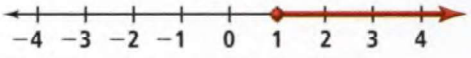
Let s = a legal speed in miles per hour.

The sign indicates that $s \leq 8$.

Got It? **5. Reasoning** In part (B) of Problem 5, can the speed be *all* real numbers less than or equal to 8? Explain.

take note

Concept Summary Representing Inequalities

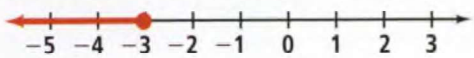
Words	Symbols	Graph
x is less than 3.	$x < 3$	
x is greater than -2.	$x > -2$	
x is less than or equal to 0.	$x \leq 0$	
x is greater than or equal to 1.	$x \geq 1$	

Lesson Check

Do you know HOW?

1. What algebraic inequality represents all real numbers y that are greater than or equal to 12?
2. Is the number a solution of $6x - 3 \geq 10$?

   a. -1 **b.** 0 **c.** 3 **d.** 4
3. What is the graph of $2 > p$?
4. What inequality represents the graph?



Do you UNDERSTAND? MATHEMATICAL PRACTICES

5. **Vocabulary** How do you decide whether a number is a solution of an inequality?
6. **Compare and Contrast** What are some situations you could model with $x \geq 0$? How do they differ from situations you could model with $x > 0$?
7. **Open-Ended** What is a real-world situation that you can represent with the following graph?

Practice and Problem-Solving Exercises

MATHEMATICAL PRACTICES

A Practice

Write an inequality that represents each verbal expression. See Problem 1.

8. v is greater than or equal to 5.

9. b is less than 4.

10. 3 less than g is less than or equal to 17.

11. The quotient of k and 9 is greater than $\frac{1}{3}$.

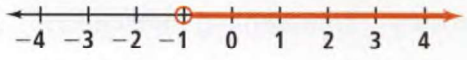
Determine whether each number is a solution of the given inequality. See Problem 2.

12. $3y - 8 > 22$	**a.** 2	**b.** 0	**c.** 5
13. $8m - 6 \leq 10$	**a.** 2	**b.** 3	**c.** -1
14. $4x + 2 < -6$	**a.** 0	**b.** -2	**c.** 1
15. $\frac{6 - n}{n} \geq 11$	**a.** 0.5	**b.** 2	**c.** 4
16. $m(m - 3) < 54$	**a.** -10	**b.** 0	**c.** 9

Match each inequality with its graph. See Problem 3.

17. $x < -1$ **18.** $x \geq -1$ **19.** $-1 < x$ **20.** $-1 \geq x$

A.



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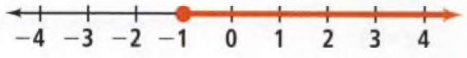

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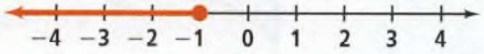

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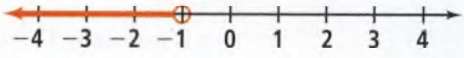
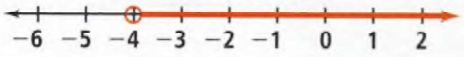


Graph each inequality.

21. $y > 2$	**22.** $t < -4$	**23.** $z \leq -5$	**24.** $v \geq -2$
25. $-3 < f$	**26.** $-\frac{9}{4} \leq c$	**27.** $8 \geq b$	**28.** $5.75 > d$

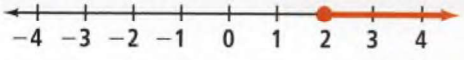
Write an inequality for each graph. See Problem 4.

29.



30.

31.



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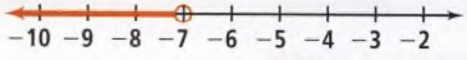

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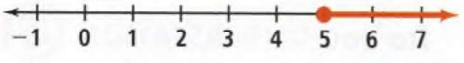

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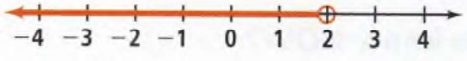

Define a variable and write an inequality to model each situation. See Problem 5.

35. The restaurant can seat at most 172 people.

36. A person must be at least 35 years old to be elected President of the United States.

37. A light bulb can be no more than 75 watts to be safely used in this light fixture.

38. At least 475 students attended the orchestra concert Thursday night.

39. A law clerk has earned more than $20,000 since being hired.

B Apply

40. Error Analysis A student claims that the inequality $3x + 1 > 0$ is always true because multiplying a number by 3 and then adding 1 to the result always produces a number greater than 0. Explain the student's error.

41. Open-Ended Describe a situation that you can model with $x \geq 25$.

42. Ticket Sales Suppose your school plans a musical. The director's goal is ticket sales of at least \$4500. Adult tickets are \$7.50 and student tickets are \$5.00. Let a represent the number of adult tickets and s represent the number of student tickets. Which inequality represents the director's goal?

(A) $5a + 7.5s < 4500$
(B) $7.5a + 5s > 4500$
(C) $7.5a + 5s \leq 4500$
(D) $7.5a + 5s \geq 4500$

STEM **43. Physics** According to Albert Einstein's special theory of relativity, no object can travel faster than the speed of light, which is approximately 186,000 mi/s. What is an inequality that represents this information?

Write each inequality in words.

44. $n < 5$
45. $b > 0$
46. $7 \geq x$
47. $z \geq 25.6$
48. $4 > q$
49. $21 \geq m$
50. $35 \geq w$
51. $g - 2 < 7$
52. $a \leq 3$
53. $6 + r > -2$
54. $8 \leq h$
55. $1.2 > k$

56. Class Party You are making muffins for a class party. You need 2 cups of flour to make a pan of 12 muffins. You have a 5-lb bag of flour, which contains 18 cups. What is an inequality that represents the possible numbers of muffins you can make?

57. Writing Explain what the phrases *no more than* and *no less than* mean when writing inequalities that model real-world situations.

Use the map at the right for Exercises 58 and 59.

58. Think About a Plan You plan to go from Portland to Tucson. Let x be the distance in miles of any flight between Portland and Tucson. What is a true statement about the mileage of any route from Portland to Tucson? Assume that no route visits the same city more than once and that each route has no more than one layover.

- How many routes exist between Portland and Tucson? What are they? Which route is the shortest?
- Can you write an inequality that represents the mileage of any route from Portland to Tucson?

59. Air Travel Your travel agent is making plans for you to go from San Diego to Seattle. A direct flight is not available. Option A consists of flights from San Diego to Boise to Seattle. Option B consists of flights from San Diego to Las Vegas to Seattle. What inequality compares the flight distances of these two options?