PRACTICE & PROBLEM SOLVING

UNDERSTAND

10. Make Sense and Persevere Sasha is solving the absolute value equation $|2x| + 4 = 8$. What is the first step she should take?

11. Use Structure The absolute value inequality $5 \leq |x| - n$ is graphed below. What is the value of n?

12. Error Analysis Describe and correct the error a student made when solving $2|x| < 16$.

> Solve $2|x| < 16$.
> $2|x| < 16$
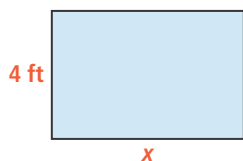> $\dfrac{2|x|}{2} < \dfrac{16}{2}$ Divide both sides by 2.
>
> $|x| < 8$ Simplify.
> $x < 8$ or $x > -8$ Rewrite using "or." ✗

13. Mathematical Connections Jack wants to model a situation where the perimeter of the rectangle below is 6 ft plus or minus 1.5 ft.

4 ft

x

Because he is modeling a length "plus or minus" another length, he decides to use an absolute value equation for his model. Do you agree with his decision? Explain your reasoning.

14. Higher Order Thinking Let a, b, c, and x be real numbers.

a. How is solving $|ax| + b = c$ different from solving $|ax + b| = c$?

b. How is solving $|ax| + b \leq c$ different from solving $|ax + b| \geq c$?

PRACTICE

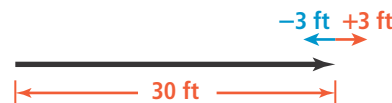**Solve each absolute value equation.** SEE EXAMPLE 1

15. $2 = |x| - 1$

16. $|x| - 4 = 9$

17. $14 = |x| + 2$

18. $|x| + 4 = -9$

19. $|-2x + 8| = 20$

20. $|x - 4| = 9$

21. $2|x + 8| = 20$

22. $2|x - 8| = 20$

23. $5|x + 3| + 8 = 6$

24. $3|x - 2| - 8 = 7$

Write and solve an absolute value equation for the minimum and maximum times for an object moving at the given speed to travel the given distance. (Figures are not to scale.) SEE EXAMPLE 2

25. 5 mi/h

−2.5 mi +2.5 mi

10 mi

26. 10 ft/s

−3 ft +3 ft

30 ft
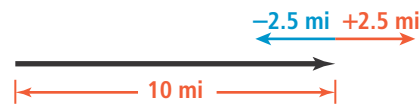
Solve each absolute value inequality. Graph the solution. SEE EXAMPLES 3 AND 4

27. $2 \leq |x| - 8$

28. $-2 > |x| - 8$

29. $|x| + 5 \geq 10$

30. $|x| + 2.4 < 3.6$

31. $|2x + 5| \geq 9$

32. $|2x - 5| < 9$

33. $-2|x + 4| \leq -6$

34. $-2|2x + 4| + 10 > -6$

Match each absolute value inequality to the graph that represents its solution. Explain your reasoning. SEE EXAMPLES 3 AND 4

35. $3|x| - 2 \leq 10$

A.

36. $2|x| - 1 < 7$

B.

37. $3|2x| + 1 > 25$

C.

38. $2|4x| - 7 \geq 25$

D.

APPLY

39. Make Sense and Persevere A company manufactures cell phone cases. The length of a certain case must be within 0.25 mm of 125 mm, as shown (figure is not to scale). All cases with lengths outside of this range are removed from the inventory. How could you use an absolute value inequality to represent the lengths of all the cases that should be removed? Explain.

— 0.25 mm +0.25 mm

|← 125 mm →|
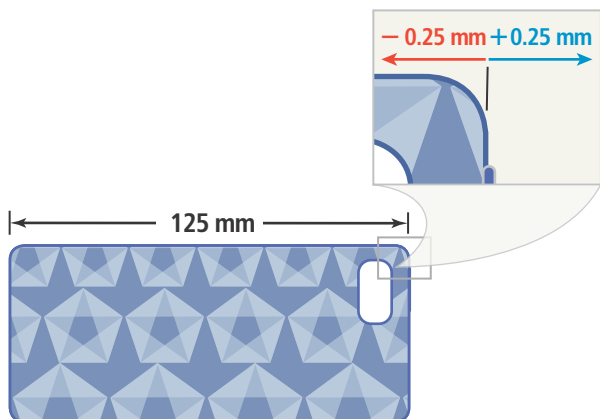
40. Construct Arguments Ashton is hosting a banquet. He plans to spend $400, plus or minus $50, at a cost of $25 per guest. Solve $|25x - 400| = 50$ to find the maximum and minimum number of guests. If there can be up to 7 guests at each table, what is the minimum number of tables Ashton should reserve so that every guest has a seat?

41. Model With Mathematics Hugo is pumping regular gas into his truck. Write and solve an absolute value equation to represent how many gallons of gas will be pumped when the total is $25 plus or minus $0.50.

GAS STATION $/Gallon	
Regular	$2.50
Plus	$2.75
Premium	$3.50
Diesel	$2.75
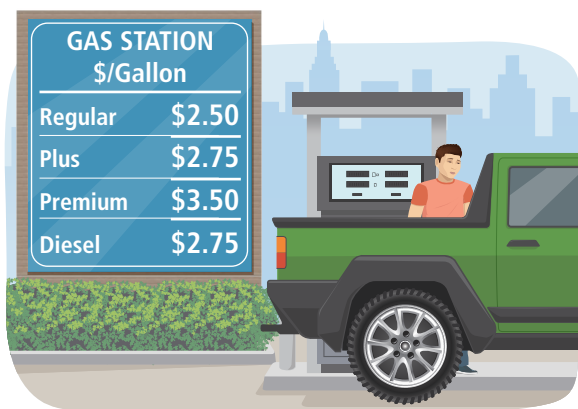
ASSESSMENT PRACTICE

42. Arrange steps in the solution to $2|x - 3| + 4 < 12$ in the correct order.

A. $-1 < x < 7$

B. $2|x - 3| + 4 < 12$

C. $2|x - 3| < 8$

D. $-4 < x - 3 < 4$

E. $|x - 3| < 4$

43. SAT/ACT What is the solution of $|4x - 6| = 2$?

Ⓐ $x = 1, x = 2$

Ⓑ $x = -1, x = 2$

Ⓒ $x = 1, x = -2$

Ⓓ $x = -1, x = -2$

Ⓔ $x = -2, x = 2$

44. Performance Task A road sign shows a vehicle's speed as the vehicle passes.

SPEED LIMIT **30**

YOUR SPEED

Part A The sign blinks for vehicles traveling within 5 mi/h of the speed limit. Write and solve an absolute value inequality to find the minimum and maximum speeds of an oncoming vehicle that will cause the sign to blink.

Part B Another sign blinks when it detects a vehicle traveling within 2 mi/h of a 35 mi/h speed limit. Write and solve an absolute value inequality to represent the speeds of the vehicles that cause the sign to blink.

Part C The sign is programmed to blink using absolute value inequalities of the form $|x - a| \leq b$ and $|x - a| \geq b$. Which of these formulas is used to program the sign for cars traveling either 5 mi/h above or below the 20 mi/h speed limit? What are the values of a and b? Explain.