Evaluate each expression.

12. $\frac{2}{3}\left(3^3+12\right)$

SOLUTION:

$$\begin{aligned}\frac{2}{3}\left(3^3+12\right)&=\frac{2}{3}(3\cdot3\cdot3+12)\\&=\frac{2}{3}(27+12)\\&=\frac{2}{3}(39)\\&=2(13)\\&=26\end{aligned}$$

Evaluate each expression if $w=0.2, x=10, y=\frac{1}{2},$ **and** $z=-4$

15. z^2+xy

SOLUTION:

$$\begin{aligned}z^2+xy&=(-4)^2+(10)\left(\frac{1}{2}\right)\\&=16+5\\&=21\end{aligned}$$

Name the sets of numbers to which each value belongs.

18. $1.\overline{3}$

SOLUTION:

The number $1.\overline{3}$ is a real number. Since $1.\overline{3}$ can be expressed as a ratio $\frac{a}{b}$ where *a* and *b* are integers and *b* is not 0 it is also a rational number. It is not a part of the set {…–2, –1, 0, 1, 2, …} so it is not an integer. Since it is not a part of the set {…0, 1, 2, 3, …} it is not a whole number or a natural number.
Q, R

Simplify each expression.

21. $4x-3y+7x+5y$

SOLUTION:

$$\begin{aligned}4x-3y+7x+5y&=4x+7x-3y+5y\\&=(4+7)x+(-3+5)y\\&=11x+2y\end{aligned}$$

24. **MONEY** At Fun City Amusement Park, hot dogs sell for $3.50 and sodas sell for $2.50. Dion bought 3 hot dogs and 3 sodas during one day at the park.
a. Illustrate the Distributive Property by writing two expressions to represent the cost of the hot dogs and the sodas.
b. Use the Distributive Property to find how much money Dion spent on food and drinks.

SOLUTION:

a. Since Dion bought 3 of each, you can write the expression in two ways. Either add the costs of 1 hot dog and 1 soda together and multiply by 3 or multiply the cost of each item by 3 and then add. The expressions are: 3(3.50 + 2.50) or 3(3.50) + 3(2.50).
b.

$$\begin{aligned} 3(3.50+2.50) &= 3(3.50)+3(2.50) \\ &= 10.50+7.50 \\ &= 18 \end{aligned}$$

Dion spent $18 on food and drinks.

Solve each equation. Check your solution.

27. $\frac{x}{6}+\frac{x}{3}=\frac{3}{4}$

SOLUTION:

$$\frac{x}{6}+\frac{x}{3}=\frac{3}{4}$$
$$\frac{x+x(2)}{6}=\frac{3}{4}$$
$$\frac{3x}{6}=\frac{3}{4}$$
$$\frac{x}{2}=\frac{3}{4}$$
$$2\left(\frac{x}{2}\right)=2\left(\frac{3}{4}\right)$$
$$x=\frac{3}{2}$$

Check:

$$\frac{\left(\frac{3}{2}\right)}{6}+\frac{\left(\frac{3}{2}\right)}{3}\stackrel{?}{=}\frac{3}{4}$$
$$\frac{3}{2}\left(\frac{1}{6}\right)+\frac{3}{2}\left(\frac{1}{3}\right)\stackrel{?}{=}\frac{3}{4}$$
$$\frac{1}{4}+\frac{1}{2}\stackrel{?}{=}\frac{3}{4}$$
$$\frac{1+1(2)}{3}\stackrel{?}{=}\frac{3}{4}$$
$$\frac{1+2}{4}\stackrel{?}{=}\frac{3}{4}$$
$$\frac{3}{4}=\frac{3}{4}\checkmark$$

So, the solution of the equation is $x=\frac{3}{2}$.

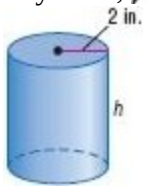
Solve each equation or formula for the specified variable.

30. $2k - 3m = 16$ for k

SOLUTION:

$$\begin{aligned} 2k - 3m &= 16 \\ 2k - 3m + 3m &= 16 + 3m \\ 2k &= 16 + 3m \\ \frac{2k}{2} &= \frac{16 + 3m}{2} \\ k &= \frac{16 + 3m}{2} \end{aligned}$$

33. **GEOMETRY** Yu-Jun wants to fill the water container at the right. He knows that the radius is 2 inches and the volume is 100.48 cubic inches. What is the height of the water bottle? Use the formula for the volume of a cylinder, $V = \pi r^2 h$, to find the height of the bottle.



SOLUTION:

Substitute $r = 2$, and $V = 100.48$ in the formula $V = \pi r^2 h$.

$$\begin{aligned} V &= \pi r^2 h \\ 100.48 &= \pi(2)^2 h \\ 100.48 &= 4\pi h \\ \frac{100.48}{4\pi} &= \frac{4\pi h}{4\pi} \\ h &\approx 8 \end{aligned}$$

The height of the bottle is about 8 inches.

Solve each equation. Check your solution.

36. $|3x + 7| = -15$

SOLUTION:

Case 1:

$$\begin{aligned} 3x + 7 &= -15 \\ 3x + 7 - 7 &= -15 - 7 \\ 3x &= -22 \\ \frac{3x}{3} &= -\frac{22}{3} \\ x &= -\frac{22}{3} \end{aligned}$$

Case 2:

$$\begin{aligned} 3x + 7 &= 15 \\ 3x + 7 - 7 &= 15 - 7 \\ 3x &= 8 \\ \frac{3x}{3} &= \frac{8}{3} \\ x &= \frac{8}{3} \end{aligned}$$

There appear to be two solutions, $-\frac{22}{3}$ and $\frac{8}{3}$.

Check: Substitute each value in the original equation.

$$\begin{aligned} |3x + 7| &= -15 \\ \left|3\left(-\frac{22}{3}\right) + 7\right| &\stackrel{?}{=} -15 \\ |-22 + 7| &\stackrel{?}{=} -15 \\ |-15| &\stackrel{?}{=} -15 \\ 15 &\neq -15 \end{aligned}$$

$$\begin{aligned} |3x + 7| &= -15 \\ \left|3\left(\frac{8}{3}\right) + 7\right| &\stackrel{?}{=} -15 \\ |8 + 7| &\stackrel{?}{=} -15 \\ |15| &\stackrel{?}{=} -15 \\ 15 &\neq -15 \end{aligned}$$

Because $15 \neq -15$, the solution set is $\varnothing$.

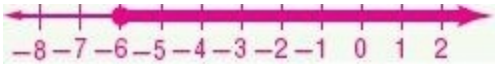
Solve each inequality. Then graph the solution set on a number line.

39. $-4a \le 24$

SOLUTION:

$$-4a \le 24$$
$$\frac{-4a}{-4} \ge \frac{24}{-4}$$
$$a \ge -6$$

To graph this inequality, draw a solid circle at –6 and draw an arrow extending to the right.



42. $-p - 13 < 3(5 + 4p) - 2$

SOLUTION:

$$-p - 13 < 3(5 + 4p) - 2$$
$$-p - 13 < 3(5) + 3(4p) - 2$$
$$-p - 13 < 15 + 12p - 2$$
$$-p - 13 < 13 + 12p$$
$$-p - 13 + 13 < 13 + 12p + 13$$
$$-p < 12p + 26$$
$$-p - 12p < 12p + 26 - 12p$$
$$-13p < 26$$
$$\frac{-13p}{-13} > \frac{26}{-13}$$
$$p > -2$$

To graph this inequality, draw an open circle at –2 and draw an arrow extending to the right.

Solve each inequality. Graph the solution set on a number line.

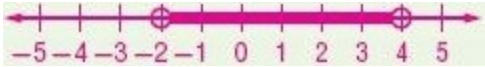
45. $-5 < 4x + 3 < 19$

SOLUTION:

$$\begin{aligned} -5 < 4x + 3 &< 19 \\ -5 - 3 < 4x + 3 - 3 &< 19 - 3 \\ -8 < 4x &< 16 \\ \frac{-8}{4} < \frac{4x}{4} &< \frac{16}{4} \\ -2 < x &< 4 \end{aligned}$$

The solution set is $\{x \mid -2 < x < 4\}$.

To graph, draw an open circle at –2 and an open circle at 4 and draw a line to connect the circles.



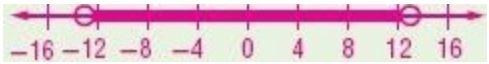
48. $|a| + 2 < 15$

SOLUTION:

$$\begin{aligned} |a| + 2 &< 15 \\ |a| + 2 - 2 &< 15 - 2 \\ |a| &< 13 \\ -13 < a &< 13 \end{aligned}$$

The solution set is $\{a \mid -13 < a < 13\}$.

To graph, draw an open circle at –13 and an open circle at 13 and draw a line to connect the circles.



51. $|2r + 7| < -1$

SOLUTION:

Since the absolute value of a number is always positive, the solution set of the inequality is $\varnothing$.
Since there are no solutions, leave the graph blank.