

### Questions

- Find the additive inverse (opposite) of 8.
- Find the absolute value  $|-1.3|$ .
- Add  $-6 + (-5)$ .
- Add  $-\frac{2}{13} + \left(-\frac{5}{13}\right)$ .
- Add  $-\frac{1}{10} + \frac{1}{2}$ .
- Add  $-\frac{2}{3} + \left(-\frac{1}{4}\right)$ .
- Add  $4 + (-8) + 16$ .
- Aaron owes \$258 to a credit card company. He makes a purchase of \$32 with the card and then makes a payment of \$150. What is his current balance on the credit card?
- Explain in words who you would find  $-8 - (-3)$ .
- Subtract  $\frac{3}{4} - \left(-\frac{3}{5}\right)$ .
- Subtract  $-\frac{3}{4} - \frac{5}{6}$ .
- Subtract  $2.64 - (-1.83)$ .
- Combine  $-6.4 - (-2.7) + 5.3$ .
- Combine  $42 - (-30) - 65 - (-11) + 20$ .
- What is the temperature after a rise of  $13^{\circ}\text{C}$  from a start of  $-21^{\circ}\text{C}$ ?
- Multiply and simplify  $\left(-\frac{3}{5}\right)\left(-\frac{15}{11}\right)$ .
- Multiply and simplify  $\left(\frac{12}{13}\right)\left(\frac{-5}{24}\right)$ .
- Divide  $-36 \div (-9)$ .
- Divide  $-48 \div (-8)$ .
- Simplify  $\frac{-6}{\left(-\frac{3}{7}\right)}$ .
- Simplify  $\frac{\left(-\frac{2}{3}\right)}{\left(\frac{8}{15}\right)}$ .
- Simplify  $\left(-\frac{3}{4}\right)\left(-\frac{7}{15}\right)\left(-\frac{8}{21}\right)\left(-\frac{5}{9}\right)$ .
- Evaluate  $3^3$ .
- Evaluate  $\left(\frac{2}{5}\right)^3$ .
- Evaluate  $(-16)^2$ .
- Evaluate  $-16^2$ .
- Evaluate  $2^5 - (-3)^2$ .
- Evaluate  $(-4)^3(-3)^2$ .
- Evaluate  $(2 - 5)^2 \div 3 \times 4$ .
- Evaluate  $2(3 - 5 + 6) + 5$ .
- Evaluate  $3(5 - 7)^2 - 6(3)$ .
- Evaluate  $5 \cdot 6 - (3 - 5)^2 + 8 \cdot 2$ .
- Evaluate  $\frac{3}{4}\left(-\frac{2}{5}\right) - \left(-\frac{3}{5}\right)$ .
- Multiply using the Distributive Property  $\frac{5}{6}(12x^2 - 24x + 18)$ .
- Multiply using the Distributive Property  $\frac{x}{5}(x + 10y - 4)$ .
- Multiply using the Distributive Property  $(2x - 3)(-2)$ .
- Multiply using the Distributive Property  $(6x + y - 1)(3x)$ .
- Multiply using the Distributive Property  $(3x + 2y - 1)(-xy)$ .
- Multiply using the Distributive Property  $\frac{1}{2}x\left(\frac{3}{5}x + \frac{4}{5}y - 5\right)$ .

40. The price of a cell phone was  $2x$ . A manager's special reduced the price by \$5. If the store sold  $4y$  cell phones, use the distributive property to find the value of the cell phones sold.
41. The Beverly Airport runway is  $4x$  feet wide. The airport was supposed to have a 3000 ft long runway, however some of the land was too wet to build on so the length of the runway was decreased by  $2y$  feet. Use the distributive property to find the area of the runway.
42. Combine like terms  $3x + 2y - 8x - 7y$ .
43. Combine like terms  $2x^2 - 3x - 5 - 7x + 8 - x^2$ .
44. Combine like terms  $\frac{1}{3}x - \frac{2}{3}y - \frac{2}{5}x + \frac{4}{7}y$ .
45. Combine like terms  $\frac{3}{4}a^2 - \frac{1}{3}b - \frac{1}{5}a^2 - \frac{1}{2}b$ .
46. Combine like terms  $ab - 7a - 9ab + 4a - 6b$ .
47. Simplify  $-3b(5a - 3b) + 4(-3ab - 5b^2)$ .
48. Simplify  $4(2 - x) - 3(-5 - 12x)$ .
49. Evaluate  $3x^2 - 5x$  when  $x = -3$ .
50. Evaluate  $x^2 - 7x + 3$  when  $x = 3$ .
51. Evaluate  $\frac{a^2 + ab}{3b}$  when  $a = -1$  and  $b = -2$ .
52. A park has a triangular piece of land on the border. The altitude of the triangle is 400 ft. The base of the triangle is 280 ft. What is the area of this piece of land?
53. The radius of a circular opening on a chemistry flask is 4cm. What is the area of the opening?
54. Find the total cost of making a triangular sail that has a base dimension of 12 ft and a height of 20 ft if the price of making the sail is \$19.50 per square ft.
55. Dry ice is sold as carbon dioxide. Dry ice does not melt, it goes directly from solid state to gaseous state. Dry ice changes from a solid to a gas at  $-109.3^\circ\text{F}$ . What is this temperature in Celsius?
56. Rewrite  $-3x - 2y$  using a negative sign and parentheses.
57. Simplify  $6x - 3(x - 2y)$ .
58. Simplify  $2x[4x^2 - 2(x - 3)]$ .
59. Simplify  $6a(2a^2 - 3a - 4) - a(a - 2)$ .
60. Simplify  $3a^2 - 4[2b - 3b(b + 2)]$ .
61. Simplify  $2\{3x^2 + 4[2x - (3 - x)]\}$ .
62. Simplify  $-4\{3a^2 - 2[4a^2 - (b + a^2)]\}$ .
63. Simplify  $-2\{x^2 - 3[x - (x - 2x^2)]\}$ .
64. The base of an office building is in the shape of a trapezoid. The altitude is 400 ft, and the bases are 700 ft and 800 ft. What is the area of the base of the office building? If the base has a marble floor that costs \$55 per  $\text{ft}^2$ , what was the cost of the floor?
65. Replace the ? with either  $<$  or  $>$  in  $-3? - 6$ .
66. Replace the ? with either  $<$  or  $>$  in  $-\frac{5}{8}? - \frac{3}{5}$ .
67. Graph the inequality on a number line  $x \leq -5.3$ .
68. Graph the inequality on a number line  $x > -3.5$ .
69. Convert the inequality  $4 < x < 10$  to interval notation.
70. Convert the inequality  $-5/2 \leq x$  to interval notation.
71. Convert the inequality  $x > 0$  to interval notation.
72. Convert the inequality  $12x < 6$  to interval notation.
73. Convert the inequality  $-7 > x$  to interval notation.

**Solutions**

1.  $-8$ .

2.  $|-1.3| = 1.3$

3.  $-6 + (-5) = -11$

4.  $-\frac{2}{13} + \left(-\frac{5}{13}\right) = \frac{-2 + (-5)}{13} = \frac{-7}{13}$

5.  $-\frac{1}{10} + \frac{1}{2} = \frac{-1}{10} + \frac{5}{10} = \frac{-1 + 5}{10} = \frac{4}{10} = \frac{2}{5}$

6.  $-\frac{2}{3} + \left(-\frac{1}{4}\right) = \frac{-2}{3} + \frac{-1}{4} = \frac{-8}{12} + \frac{-3}{12} = \frac{-8 - 3}{12} = \frac{-11}{12}$ .

7.  $4 + (-8) + 16 = -4 + 16 = 12$ .

8.  $\$258 + \$32 - \$150 = \$140$ .

9. First, change subtracting negative three to adding positive three. Then use the rules for adding two real numbers with different signs.  $-8 - (-3) = -8 + 3 = -5$ .

10.

$$\begin{aligned} \frac{3}{4} - \left(-\frac{3}{5}\right) &= \frac{3}{4} + \frac{3}{5} && \text{(subtract by adding the opposite)} \\ &= \frac{3 \times 5}{4 \times 5} + \frac{3 \times 4}{5 \times 4} && \text{(common denominator)} \\ &= \frac{15}{20} + \frac{12}{20} && \text{(simplify)} \\ &= \frac{15 + 12}{20} \\ &= \frac{27}{20} \end{aligned}$$

11.

$$\begin{aligned} -\frac{3}{4} - \frac{5}{6} &= -\frac{3 \times 3}{4 \times 3} - \frac{5 \times 2}{6 \times 2} \\ &= -\frac{9}{12} - \frac{10}{12} \\ &= \frac{-9}{12} + \frac{-10}{12} \\ &= \frac{-9 - 10}{12} \\ &= \frac{-19}{12} \end{aligned}$$

12.  $2.64 - (-1.83) = 2.64 + 1.83 = 4.47.$

13.  $-6.4 - (-2.7) + 5.3 = -6.4 + 2.7 + 5.3 = 1.6.$

14.  $42 - (-30) - 65 - (-11) + 20 = 42 + 30 - 65 + 11 + 20 = 38.$

15.  $-21^{\circ}\text{C} + 13^{\circ}\text{C} = 8^{\circ}\text{C}.$

16.

$$\begin{aligned} \left(-\frac{3}{5}\right)\left(-\frac{15}{11}\right) &= \left(\frac{3}{5}\right)\left(\frac{15}{11}\right) && \text{(multiplying two negatives gives a positive)} \\ &= \frac{3 \times 15}{5 \times 11} \\ &= \frac{3 \times \cancel{5} \times 3}{\cancel{5} \times 11} \\ &= \frac{9}{11} \end{aligned}$$

17. Multiply and simplify  $\left(\frac{12}{13}\right)\left(\frac{-5}{24}\right).$

$$\begin{aligned} \left(\frac{12}{13}\right)\left(\frac{-5}{24}\right) &= -\left(\frac{12}{13}\right)\left(\frac{5}{24}\right) && \text{(multiplying a negative and a positive gives a negative)} \\ &= -\frac{12 \times 5}{13 \times 24} \\ &= -\frac{\cancel{12} \times 5}{13 \times 2 \times \cancel{12}} \\ &= -\frac{5}{26} \end{aligned}$$

18.

$$\begin{aligned} -36 \div (-9) &= \frac{-36}{-9} && \text{(dividing two negatives gives a positive)} \\ &= \frac{36}{9} = 4 \end{aligned}$$

19.

$$\begin{aligned} -48 \div (-8) &= \frac{-48}{-8} && \text{(dividing two negatives gives a positive)} \\ &= \frac{48}{8} = 6 \end{aligned}$$

20.

$$\begin{aligned} \frac{-6}{\left(-\frac{3}{7}\right)} &= (-6) \left(-\frac{7}{3}\right) && \text{(instead of dividing, invert divisor and multiply)} \\ &= (6) \left(\frac{7}{3}\right) && \text{(multiplying two negatives gives a positive)} \\ &= \frac{6 \times 7}{3} \\ &= \frac{2 \times \cancel{3} \times 7}{\cancel{3}} = 14 \end{aligned}$$

21. Simplify  $\frac{\frac{-2}{3}}{\frac{8}{15}}$ .

$$\begin{aligned} \frac{\left(\frac{-2}{3}\right)}{\left(\frac{8}{15}\right)} &= \left(\frac{-2}{3}\right) \left(\frac{15}{8}\right) && \text{(instead of dividing, invert divisor and multiply)} \\ &= -\left(\frac{2}{3}\right) \left(\frac{15}{8}\right) && \text{(multiplying a negative and a positive gives a negative)} \\ &= -\frac{2 \times 15}{3 \times 8} \\ &= -\frac{\cancel{2} \times 5 \times \cancel{3}}{\cancel{3} \times \cancel{2} \times 4} = -\frac{5}{4} \end{aligned}$$

22.

$$\begin{aligned} \left(-\frac{3}{4}\right) \left(-\frac{7}{15}\right) \left(-\frac{8}{21}\right) \left(-\frac{5}{9}\right) &= \left(\frac{3}{4}\right) \left(\frac{7}{15}\right) \left(\frac{8}{21}\right) \left(\frac{5}{9}\right) && \text{(overall sign is positive)} \\ &= \frac{3 \times 7 \times 8 \times 5}{4 \times 15 \times 21 \times 9} \\ &= \frac{\cancel{3} \times \cancel{7} \times 2 \times \cancel{4} \times \cancel{5}}{\cancel{4} \times \cancel{3} \times \cancel{5} \times 3 \times 7 \times 9} \\ &= \frac{2}{27} \end{aligned}$$

23.  $3^3 = (3)(3)(3) = 27$ .

24.  $\left(\frac{2}{5}\right)^3 = \left(\frac{2}{5}\right) \left(\frac{2}{5}\right) \left(\frac{2}{5}\right) = \frac{2 \times 2 \times 2}{5 \times 5 \times 5} = \frac{8}{125}$ .

25.  $(-16)^2 = (-16)(-16) = (16)(16) = 256$ .

26.  $-16^2 = -(16)(16) = -256$ .

27.  $2^5 - (-3)^2 = (2)(2)(2)(2)(2) - (-3)(-3) = 32 - (3)(3) = 32 - 9 = 23$ .

28.  $(-4)^3(-3)^2 = (-4)(-4)(-4)(-3)(-3) = -(4)(4)(4)(3)(3) = -576$ .

29. Order of Operations

$$\begin{aligned}(2 - 5)^2 \div 3 \times 4 &= (-3)^2 \div 3 \times 4 && \text{(brackets)} \\ &= 9 \div 3 \times 4 && \text{(powers)} \\ &= 3 \times 4 && \text{(multiplication/division from left to right)} \\ &= 12 && \text{(multiplication/division from left to right)}\end{aligned}$$

30. Order of Operations

$$\begin{aligned}2(3 - 5 + 6) + 5 &= 2(4) + 5 && \text{(brackets)} \\ &= 8 + 5 && \text{(multiplication)} \\ &= 13 && \text{(addition)}\end{aligned}$$

31. Order of Operations

$$\begin{aligned}3(5 - 7)^2 - 6(3) &= 3(-2)^2 - 6(3) && \text{(brackets)} \\ &= 3(4) - 6(3) && \text{(powers)} \\ &= 12 - 18 && \text{(multiplication)} \\ &= -6 && \text{(subtraction)}\end{aligned}$$

32. Order of Operations

$$\begin{aligned}5 \cdot 6 - (3 - 5)^2 + 8 \cdot 2 &= 5 \cdot 6 - (-2)^2 + 8 \cdot 2 && \text{(brackets)} \\ &= 5 \cdot 6 - 4 + 8 \cdot 2 && \text{(powers)} \\ &= 30 - 4 + 16 && \text{(multiplication)} \\ &= 42 && \text{(addition/subtraction)}\end{aligned}$$

33.

$$\begin{aligned}\frac{3}{4} \left( -\frac{2}{5} \right) - \left( -\frac{3}{5} \right) &= -\frac{3 \times 2}{4 \times 5} + \frac{3}{5} \\ &= -\frac{6}{20} + \frac{3}{5} \\ &= -\frac{6}{20} + \frac{3 \times 4}{5 \times 4} \\ &= \frac{-6}{20} + \frac{12}{20} \\ &= \frac{-6 + 12}{20} \\ &= \frac{6}{20} = \frac{\cancel{2} \times 3}{\cancel{2} \times 10} = \frac{3}{10}\end{aligned}$$

34.

$$\begin{aligned} \frac{5}{6}(12x^2 - 24x + 18) &= \frac{5}{6} \cdot 12x^2 - \frac{5}{6} \cdot 24x + \frac{5}{6} \cdot 18 && \text{(distributive property)} \\ &= \frac{5 \cdot 12x^2}{6} - \frac{5 \cdot 24x}{6} + \frac{5 \cdot 18}{6} && \text{(simplify, multiplication of fractions)} \\ &= \frac{5 \cdot \cancel{2} \cdot \cancel{6}x^2}{\cancel{6}} - \frac{5 \cdot \cancel{6} \cdot 4x}{\cancel{6}} + \frac{5 \cdot \cancel{6} \cdot 3}{\cancel{6}} && \text{(simplify, prime factor and cancel)} \\ &= 10x^2 - 20x + 15 && \text{(simplify, multiplication)} \end{aligned}$$

35.

$$\begin{aligned} \frac{x}{5}(x + 10y - 4) &= \frac{x}{5} \cdot x + \frac{x}{5} \cdot 10y - \frac{x}{5} \cdot 4 && \text{(distributive property)} \\ &= \frac{x \cdot x}{5} + \frac{x \cdot 10y}{5} - \frac{x \cdot 4}{5} && \text{(simplify, multiplication of fractions)} \\ &= \frac{x^2}{5} + \frac{2 \cdot \cancel{5}xy}{\cancel{5}} - \frac{4x}{5} && \text{(simplify, prime factor and cancel)} \\ &= \frac{x^2}{5} + 2xy - \frac{4x}{5} \end{aligned}$$

36.

$$\begin{aligned} (2x - 3)(-2) &= 2x \cdot (-2) - 3 \cdot (-2) && \text{(distributive property)} \\ &= -4x + 6 && \text{(simplify, multiplication)} \end{aligned}$$

37.

$$\begin{aligned} (6x + y - 1)(3x) &= 6x \cdot (3x) + y \cdot (3x) - 1 \cdot (3x) && \text{(distributive property)} \\ &= 18x^2 + 3xy - 3x && \text{(simplify, multiplication)} \end{aligned}$$

38.

$$\begin{aligned} (3x + 2y - 1)(-xy) &= 3x \cdot (-xy) + 2y \cdot (-xy) - 1 \cdot (-xy) && \text{(distributive property)} \\ &= -3xy - 2xy^2 + xy && \text{(simplify, multiplication)} \end{aligned}$$

39.

$$\begin{aligned} \frac{1}{2}x \left( \frac{3}{5}x + \frac{4}{5}y - 5 \right) &= \frac{1}{2}x \cdot \frac{3}{5}x + \frac{1}{2}x \cdot \frac{4}{5}y - \frac{1}{2}x \cdot 5 && \text{(distributive property)} \\ &= \frac{1 \cdot x \cdot 3 \cdot x}{2 \cdot 5} + \frac{1 \cdot x \cdot 4 \cdot y}{2 \cdot 5} - \frac{1 \cdot x \cdot 5}{2} && \text{(simplify, multiplication)} \\ &= \frac{3x^2}{10} + \frac{4xy}{10} - \frac{5x}{2} \end{aligned}$$

40.

$$\begin{aligned} \text{value sold} &= (\text{number sold})(\text{original price} - \text{price reduction}) \\ &= (4y)(2x - 5) = (4y)(2x) - (4y)(5) = 8xy - 20y \text{ dollars} \end{aligned}$$

41.

$$\begin{aligned} \text{area} &= (\text{length})(\text{width}) \\ &= (4x)(3000 - 2y) = (4x)(3000) - (4x)(2y) = 12000x - 8xy \text{ ft}^2 \end{aligned}$$

42. Underline the like terms using a different style for each. Remember to include the sign!

$$\underline{3x+2y-8x-7y} = -5x - 5y$$

If you need to include extra steps to see the simplification do so:

$$\begin{aligned} \underline{3x+2y-8x-7y} &= \underline{3x-8x+2y-7y} && \text{(rearrange so like terms are together)} \\ &= (3-8)x + (+2-7)y && \text{(use distributive property "in reverse" (which is factoring))} \\ &= -5x - 5y && \text{(simplify)} \end{aligned}$$

43.

$$\begin{aligned} \underline{2x^2-3x-5-7x+8-x^2} &= \underline{2x^2-x^2-3x-7x-5+8} \\ &= (2-1)x^2 + (-3-7)x + (-5+8) \\ &= (1)x^2 + (-10)x + (+3) \\ &= x^2 - 10x + 3 \end{aligned}$$

44.

$$\begin{aligned} \underline{\frac{1}{3}x - \frac{2}{3}y - \frac{2}{5}x + \frac{4}{7}y} &= \underline{\frac{1}{3}x - \frac{2}{5}x - \frac{2}{3}y + \frac{4}{7}y} \\ &= \left(\frac{1}{3} - \frac{2}{5}\right)x + \left(-\frac{2}{3} + \frac{4}{7}\right)y \\ &= \left(\frac{1 \times 5}{3 \times 5} - \frac{2 \times 3}{5 \times 3}\right)x + \left(\frac{-2 \times 7}{3 \times 7} + \frac{4 \times 3}{7 \times 3}\right)y \\ &= \left(\frac{5}{15} - \frac{6}{15}\right)x + \left(\frac{-14}{21} + \frac{12}{21}\right)y \\ &= \left(\frac{5-6}{15}\right)x + \left(\frac{-14+12}{21}\right)y \\ &= \left(\frac{-1}{15}\right)x + \left(\frac{-2}{21}\right)y \\ &= -\frac{1}{15}x - \frac{2}{21}y \end{aligned}$$



45.

$$\begin{aligned}
 \frac{3}{4}a^2 - \frac{1}{3}b - \frac{1}{5}a^2 - \frac{1}{2}b &= \frac{3}{4}a^2 - \frac{1}{5}a^2 - \frac{1}{3}b - \frac{1}{2}b \\
 &= \left(\frac{3}{4} - \frac{1}{5}\right)a^2 + \left(-\frac{1}{3} - \frac{1}{2}\right)b \\
 &= \left(\frac{3 \times 5}{4 \times 5} - \frac{1 \times 4}{5 \times 4}\right)a^2 + \left(\frac{-1 \times 2}{3 \times 2} + \frac{-1 \times 3}{2 \times 3}\right)b \\
 &= \left(\frac{15}{20} - \frac{4}{20}\right)a^2 + \left(\frac{-2}{6} + \frac{-3}{6}\right)b \\
 &= \left(\frac{15-4}{20}\right)a^2 + \left(\frac{-2-3}{6}\right)b \\
 &= \left(\frac{11}{20}\right)a^2 + \left(\frac{-5}{6}\right)b \\
 &= \frac{11}{20}a^2 - \frac{5}{6}b
 \end{aligned}$$

46. The underlining is not required if you can do the arithmetic in your head (but make sure you get the arithmetic done correctly!)

$$ab - 7a - 9ab + 4a - 6b = -8ab - 3a - 6b$$

47.

$$\begin{aligned}
 -3b(5a - 3b) + 4(-3ab - 5b^2) &= (-3b)(5a) - (-3b)(3b) + 4(-3ab) - 4(5b^2) && \text{(distribute)} \\
 &= -15ab + 9b^2 - 12ab - 20b^2 && \text{(multiplication)} \\
 &= (-15 - 12)ab + (9 - 20)b^2 && \text{(collect like terms)} \\
 &= -27ab - 11b^2 && \text{(simplify)}
 \end{aligned}$$

48.

$$\begin{aligned}
 4(2 - x) - 3(-5 - 12x) &= 4 \times 2 - 4x + (-3)(-5) - (-3)(12x) && \text{(distribute)} \\
 &= 8 - 4x + 15 + 36x \\
 &= (8 + 15) + (-4x + 36x) \\
 &= 23 + (-4 + 36)x \\
 &= 23 + 32x
 \end{aligned}$$

49. Write the equation using brackets where there are  $x$ :

$$\begin{aligned}
 \text{value} &= 3(\quad)^2 - 5(\quad) \\
 &= 3(-3)^2 - 5(-3) && \text{(put } -3 \text{ in the brackets)} \\
 &= 3(9) + 15 && \text{(simplify)} \\
 &= 27 + 15 = 42
 \end{aligned}$$

50. Evaluate  $x^2 - 7x + 3$  when  $x = 3$ .

$$\begin{aligned}\text{value} &= ( \quad )^2 - 7( \quad ) + 3 \\ &= (\mathbf{3})^2 - 7(\mathbf{3}) + 3 \\ &= 9 - 21 + 3 = -9\end{aligned}$$

51. If you have trouble doing two variables, do it in two steps.

$$\begin{aligned}\text{value} &= \frac{( \quad )^2 + ( \quad )b}{3b} && \text{(do } a \text{ first)} \\ &= \frac{(-\mathbf{1})^2 + (-\mathbf{1})b}{3b} && \text{(put in } a = -1\text{)} \\ &= \frac{1 - b}{3b} && \text{(simplify)} \\ &= \frac{1 - ( \quad )}{3( \quad )} && \text{(now do } b\text{)} \\ &= \frac{1 - (-\mathbf{2})}{3(-\mathbf{2})} && \text{(put in } b = -2\text{)} \\ &= -\frac{3}{3(2)} && \text{(simplify)} \\ &= -\frac{\cancel{3}}{\cancel{3}(2)} && \text{(cancel common factor)} \\ &= -\frac{1}{2}\end{aligned}$$

52. Include the units.

$$\begin{aligned}\text{Area of triangle} &= \frac{1}{2}(\text{base})(\text{perpendicular height}) \\ &= \frac{1}{2}(280 \text{ ft})(400 \text{ ft}) \\ &= 56000 \text{ ft}^2\end{aligned}$$

53.

$$\begin{aligned}\text{Area of Circle} &= \pi(\text{radius})^2 \\ &= \pi(4 \text{ cm})^2 \\ &= \pi(16 \text{ cm}^2) \\ &= 16\pi \text{ cm}^2 \sim 50.2 \text{ cm}^2\end{aligned}$$

54. First, find the area of the sail.

$$\begin{aligned} \text{Area of triangle} &= \frac{1}{2}(\text{base})(\text{perpendicular height}) \\ &= \frac{1}{2}(12 \text{ ft})(20 \text{ ft}) \\ &= 120 \text{ ft}^2 \\ \text{Total Cost} &= (\text{area})(\text{cost per square ft}) \\ &= (120 \cancel{\text{ft}^2})(\$19.50 \frac{1}{\cancel{\text{ft}^2}}) \\ &= \$2340 \end{aligned}$$

55.

$$\begin{aligned} T_C &= \frac{5}{9}(T_F - 32) \\ &= \frac{5}{9}(-109.3 - 32) \\ &= -78.5^\circ\text{C} \end{aligned}$$

56.  $-3x - 2y = -(3x + 2y)$ .

57.

$$\begin{aligned} 6x - 3(x - 2y) &= 6x + (-3)(x) - (-3)(2y) && \text{(distribute)} \\ &= 6x - 3x + 6y && \text{(multiply)} \\ &= 3x + 6y && \text{(collect like terms)} \end{aligned}$$

58.

$$\begin{aligned} 2x[4x^2 - 2(x - 3)] &= 2x[4x^2 - 2x - (-2)(3)] && \text{(distribute)} \\ &= 2x[4x^2 - 2x + 6] && \text{(simplify,multiplication)} \\ &= (2x)4x^2 - (2x)2x + (2x)6 && \text{(distribute)} \\ &= 8x^3 - 4x^2 + 12x && \text{(multiply)} \end{aligned}$$

59.

$$\begin{aligned} 6a(2a^2 - 3a - 4) - a(a - 2) &= 12a^3 - 18a^2 - 24a - a^2 + 2a \\ &= 12a^3 - \underline{18a^2 - 24a - a^2 + 2a} \\ &= 12a^3 - 19a^2 - 22a \end{aligned}$$

60.

$$\begin{aligned} 3a^2 - 4[2b - 3b(b + 2)] &= 3a^2 - 8b + 12b(b + 2) \\ &= 3a^2 - 8b + 12b^2 + 24b \\ &= 3a^2 + 12b^2 + 16b \end{aligned}$$

61.

$$\begin{aligned}
 2\{3x^2 + 4[2x - (3 - x)]\} &= 6x^2 + 8[2x - (3 - x)] && \text{(distribute the 2)} \\
 &= 6x^2 + 8[2x - 3 + x] && \text{(no change, just highlighting number)} \\
 &= 6x^2 + 16x - 8(3 - x) && \text{(distribute the 8)} \\
 &= 6x^2 + 16x - 24 + 8x && \text{(no change, just highlighting number)} \\
 &= 6x^2 + 16x - 24 + 8x && \text{(distribute the } -8\text{)} \\
 &= 6x^2 + 24x - 24 && \text{(collect like terms)}
 \end{aligned}$$

62.

$$\begin{aligned}
 -4\{3a^2 - 2[4a^2 - (b + a^2)]\} &= -12a^2 + 8[4a^2 - (b + a^2)] && \text{(distribute the } -4\text{)} \\
 &= -12a^2 + 8[4a^2 - b - a^2] && \\
 &= -12a^2 + 32a^2 - 8(b + a^2) && \text{(distribute the 8)} \\
 &= -12a^2 + 32a^2 - 8(b + a^2) && \\
 &= -12a^2 + 32a^2 - 8b - 8a^2 && \text{(distribute the } -8\text{)} \\
 &= 12a^2 - 8b && \text{(collect like terms)}
 \end{aligned}$$

63.

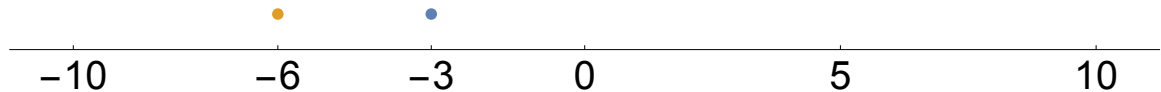
$$\begin{aligned}
 -2\{x^2 - 3[x - (x - 2x^2)]\} &= -2x^2 + 6[x - (x - 2x^2)] && \text{(distribute the } -2\text{)} \\
 &= -2x^2 + 6[x - x + 2x^2] && \\
 &= -2x^2 + 6x - 6(x - 2x^2) && \text{(distribute the 6)} \\
 &= -2x^2 + 6x - 6x + 12x^2 && \\
 &= 10x^2 && \text{(collect like terms)}
 \end{aligned}$$

64.

$$\begin{aligned}
 \text{Area of trapezoid} &= \frac{1}{2}(\text{altitude})[(\text{base 1}) + (\text{base 2})] \\
 &= \frac{1}{2}(400 \text{ ft})(700 \text{ ft} + 800 \text{ ft}) \\
 &= (200 \text{ ft})(1500 \text{ ft}) \\
 &= 300,000 \text{ ft}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{Cost of marble floor} &= (\text{area})(\text{cost per square ft}) \\
 &= (300,000 \cancel{\text{ft}^2})(\$55 \frac{1}{\cancel{\text{ft}^2}}) \\
 &= \$16,500,000
 \end{aligned}$$

65.  $-3 > -6$  since  $-6$  is to the left of  $-3$  on the number line.



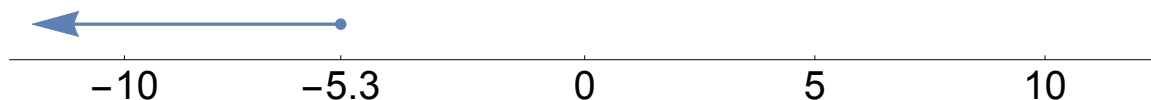
66. To compare fractions, we need a common denominator. The common denominator is 40.

$$\begin{aligned} -\frac{5}{8} &= -\frac{25}{40} \\ -\frac{3}{5} &= -\frac{24}{40} \end{aligned}$$

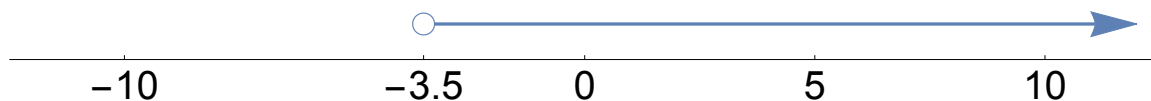


So we see  $-\frac{5}{8} < -\frac{3}{5}$ .

67. Note the closed circle, since we are including the endpoint in the inequality.



68. Note the open circle, since we are not including the endpoint in the inequality.



69.  $(4, 10)$

70.  $(-\infty, -5/2]$ , with square bracket since  $-5/2$  is included.

71.  $(0, \infty)$

72.  $(-\infty, 1)$

73.  $(-\infty, -7)$