Pg48 **1.5 Rational Number Operations**

The strategies and order of operations you used for calculations with integers, fractions, and decimals can be extended to all rational numbers.

Calculations with rational number operations may be simpler to perform if you rename mixed numbers as improper fractions, and rewrite negative fractions with the negative sign in the numerator.

Example 1

Evaluate.

$a)\ \frac{-4}{5}+\frac{2}{-3}$

$=\frac{-12}{15}-\frac{10}{15}$

$=\frac{-12-10}{15}$

$=-\frac{22}{15}$

$b)\ -2\frac{1}{2}x \div y \text{ when } x=5\frac{1}{3} \text{ and } y=-1\frac{7}{9}$

$=-2\frac{1}{2}\left(5\frac{1}{3}\right)\div\left(-1\frac{7}{9}\right)$

$=\frac{-5}{2}\left(\frac{16}{3}\right)\div\left(-\frac{16}{9}\right)$

$=-\frac{40}{3}\times\left(-\frac{9}{16}\right)$

$=\frac{15}{2}$

Example 2

Matthew was chatting online with his friend Bruce, who lives in the United States. Bruce said that the temperature outside was degrees Fahrenheit. Matthew was not sure how cold that was because he was used to temperature readings measured in degrees Celsius. He found the following conversion formula from a weather website: $C=\frac{5}{9}(F-32)$ where C is the temperature in degrees Celsius and F is the temperature in degrees Fahrenheit. Determine the Celsius temperature equivalent to $-5.5^0\ F$.

$C=\frac{5}{9}(-5.5-32)$

$C=\frac{5}{9}(-37.5)$

$C=-20.8\bar{3}^0\ C$

Example 3

These temperatures were recorded at noon on January 1 from 1998 to 2006 at Ottawa MacDonald-Cartier International Airport. Determine the average noon temperature on January 1 for the years given.

Year	Temperature (°C)
1998	−20.9
1999	−22.7
2000	−5.4
2001	−11.4
2002	−10.9
2003	−5.0
2004	−4.7
2005	−2.8
2006	−9.6

$$Avg = \frac{-20.9 - 22.7 - 5.4 - 11.4 - 10.9 - 5 - 4.7 - 2.8 - 9.6}{9}$$

$$Avg = -10.3\overline{7}$$

Practice

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10. Yaroslav takes $\frac{3}{4}$ h to cut his family's front lawn and $1\frac{1}{3}$ h to cut the back lawn. How much longer does it take Yaroslav to cut the back lawn?

11. Determine the value that makes each equation true.

a) $-1\frac{3}{4} + \blacksquare = 1$

b) $-1\frac{3}{4} - \blacksquare = 1$

c) $-1\frac{3}{4} \times \blacksquare = 1$

d) $-1\frac{3}{4} \div \blacksquare = 1$

12. **a)** In each case, determine the numbers represented by the rectangle and the triangle.

i) $-3\frac{1}{2} + 5\frac{2}{3} = \square$

$\square - 5\frac{2}{3} = \triangle$

ii) $-6\frac{4}{5} \times \left(-2\frac{1}{4}\right) = \square$

$\square \div \left(-2\frac{1}{4}\right) = \triangle$

b) Describe the connection between the number represented by the rectangle and the number represented by the triangle.

c) Create a similar question that demonstrates this connection.

14. Evaluate each expression.

a) $-\frac{2}{5} + \frac{3}{-4} - 2\frac{2}{3}$

b) $-\frac{15}{16} \times 3\frac{1}{5} \div \left(-1\frac{2}{3}\right)$

c) $-2\frac{1}{3} + \left(\frac{3}{-4}\right) \times \left(-1\frac{5}{6}\right)$

d) $-2\frac{1}{4} \times \left(1\frac{3}{4} - 5\frac{1}{2}\right)$

15. The formula to convert temperatures between degrees Fahrenheit and degrees Celsius is $C = \frac{5}{9}(F - 32)$. Apply the formula to convert the following.

a) Miami, Florida's record high of 98 °F to degrees Celsius

b) Anchorage, Alaska's record low of −38 °F to degrees Celsius

c) 0 °C to degrees Fahrenheit