Rational Numbers: Exercise 1.1

Q.1 Using appropriate properties find.

(i) $-\frac{2}{3} \times \frac{3}{5} + \frac{5}{2} - \frac{3}{5} \times \frac{1}{6}$

(ii) $\frac{2}{5} \times \left(-\frac{3}{7}\right) - \frac{1}{6} \times \frac{3}{2} + \frac{1}{14} \times \frac{2}{5}$

Sol. (i) Given: $-\frac{2}{3} \times \frac{3}{5} + \frac{5}{2} - \frac{3}{5} \times \frac{1}{6}$

$= -\frac{2}{3} \times \frac{3}{5} - \frac{3}{5} \times \frac{1}{6} + \frac{5}{2}$ (By using commutative property)

$= \frac{3}{5}\left(-\frac{2}{3} - \frac{1}{6}\right) + \frac{5}{2}$ (By using distributive property)

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

$= \frac{3}{5}\left(\frac{-5}{6}\right) + \frac{5}{2}$

$= -\frac{3}{6} + \frac{5}{2}$

$= \frac{-3+15}{6}$

$= \frac{12}{6}$

$= 2$

(ii) Given: $\frac{2}{5} \times \left(-\frac{3}{7}\right) - \frac{1}{6} \times \frac{3}{2} + \frac{1}{14} \times \frac{2}{5}$

$= \frac{2}{5} \times \left(-\frac{3}{7}\right) + \frac{1}{14} \times \frac{2}{5} - \frac{1}{6} \times \frac{3}{2}$ (By using commutative property)

$= \frac{2}{5} \times \left(-\frac{3}{7} + \frac{1}{14}\right) - \frac{1}{6} \times \frac{3}{2}$ (By using distributive property)

$= \frac{2}{5} \times \left(\frac{-6+1}{14}\right) - \frac{1}{6} \times \frac{3}{2}$

$= \frac{2}{5} \times \left(\frac{-5}{14}\right) - \frac{1}{6} \times \frac{3}{2}$

$= \frac{-1}{7} - \frac{1}{4}$

$$= \frac{-4-7}{28}$$

$$= \frac{-11}{28}$$

Q.2 Write the additive inverse of each of the following.

(i) $\frac{2}{8}$

(ii) $-\frac{5}{9}$

(iii) $\frac{-6}{-5}$

(iv) $\frac{2}{-9}$

(v) $\frac{19}{-6}$

Sol. As we know that Additive inverse of any number is the same number with opposite sign.

(i) Additive inverse of $\frac{2}{8}$:

$$= \frac{2}{8} + \left(-\frac{2}{8}\right)$$

$$= \frac{2}{8} - \frac{2}{8}$$

$$= 0$$

Thus, the additive inverse of $\frac{2}{8}$ is $(-\frac{2}{8})$.

(ii) Additive inverse of $-\frac{5}{9}$:

$$= -\frac{5}{9} + \left(\frac{5}{9}\right)$$

$$= \frac{-5+5}{9}$$

$$= 0$$

Thus, the additive inverse of $-\frac{5}{9}$ is $\frac{5}{9}$.

(iii) Additive inverse of $\frac{-6}{-5}$:

$$= \frac{-6}{-5} = \frac{6}{5}$$

Now, $$= \frac{6}{5} + \left(-\frac{6}{5}\right)$$

$$= 0$$

Thus, the additive inverse of $\frac{-6}{-5}$ is $-\frac{6}{5}$.

(iv) Additive inverse of $\frac{2}{-9}$:

$$= \frac{2}{-9} + \frac{2}{9}$$

$$= \frac{-2+2}{9}$$

$$= 0$$

Thus, the additive inverse of $\frac{2}{-9}$ is $\frac{2}{9}$.

(v) Additive inverse of $\frac{19}{-6}$:

$$= \frac{19}{-6} + \left(\frac{19}{6}\right)$$

$$= 0$$

Hence, the additive inverse of $\frac{19}{-6}$ is $\frac{19}{6}$.

Q.3 Verify that - (-*x*) = *x* for.

(i) $x = \frac{11}{15}$

(ii) $x = -\frac{13}{17}$

Sol. (i) $x = \frac{11}{15}$

The additive inverse of $x = \frac{11}{15}$ is $-x = -\frac{11}{15}$ (Since, x + (-x) = 0)

Therefore, $\frac{11}{15} + (-\frac{11}{15}) = 0$

The additive inverse of $-\frac{11}{15}$ is $\frac{11}{15}$

Thus, $-(-\frac{11}{15}) = \frac{11}{15}$

So, $-(-x) = x$

Hence proved.

(ii) $x = -\frac{13}{17}$

The additive inverse of $x = -\frac{13}{17}$ is $-x = \frac{13}{17}$

Thus, $-\frac{13}{17} + \frac{13}{17} = 0$

The additive inverse of $\frac{13}{17}$ is $-\frac{13}{17}$

So, $-(-x) = x$

Hence proved.

Q.4 Find the multiplicative inverse of the following.

(i) -13

(ii) $\frac{-13}{19}$

(iii) $\frac{1}{5}$

(iv) $-\frac{5}{8} \times \frac{-3}{7}$

(v) $-1 \times \frac{-2}{5}$

(vi) -1

Sol. Since, multiplicative inverse is the reciprocal of the given number.

(i) -13

Therefore, the multiplicative inverse of -13 = $-\frac{1}{13}$

(ii) $\frac{-13}{19}$

Therefore, the multiplicative inverse of $\frac{-13}{19} = \frac{1}{\frac{-13}{19}} = \frac{19}{-13}$

(iii) $\frac{1}{5}$

Therefore, the multiplicative inverse of $\frac{1}{5} = \frac{5}{1} = 5$

(iv) $-\frac{5}{8} \text{x} \frac{-3}{7}$

Therefore, $-\frac{5}{8} \text{x} \frac{-3}{7} = \frac{(-5)\times(-3)}{8\text{x}7} = \frac{15}{56}$

So, multiplicative inverse of $\frac{15}{56} = \frac{1}{\frac{15}{56}} = \frac{56}{15}$

(v) $-1 \times \frac{-2}{5}$

Therefore, $-1 \times \frac{-2}{5} = \frac{2}{5}$

So, multiplicative inverse of $\frac{2}{5} = \frac{5}{2}$

(vi) -1

Since, -1 is equal to $\frac{1}{-1}$ = -1

So, multiplicative inverse of -1 = -1

Q.5 Name the property under multiplication used in each of the following.

(i) $\frac{-4}{5} \text{x} 1 = 1 \text{x} \frac{-4}{5} = \frac{-4}{5}$

(ii) $\frac{-13}{17} \text{x} \frac{-2}{7} = \frac{-2}{7} \text{x} \frac{-13}{17}$

(iii) $\frac{-19}{29} \text{x} \frac{29}{-19} = 1$

Sol. (i) $\frac{-4}{5} \text{x} 1 = 1 \text{x} \frac{-4}{5} = \frac{-4}{5}$

Since, 1 is the multiplicative identity for rational numbers.
So, the property of multiplicative identity is in given expression.

(ii) $\frac{-13}{17} \text{x} \frac{-2}{7} = \frac{-2}{7} \text{x} \frac{-13}{17}$

If rational numbers are swapped between one sign of operators and still their result same, then we can say that the numbers follow the commutative property for that operation.
Thus, commutative property is used in given expression.

(iii) $\frac{-19}{29} \text{x} \frac{29}{-19} = 1$

The reciprocal of $\frac{-19}{29}$ is $\frac{29}{-19}$.

So, multiplicative inverse property is used in given expression.

Q.6 Multiply $\frac{6}{13}$ by the reciprocal of $\frac{-7}{16}$.

Sol. Since, the reciprocal of $\frac{-7}{16}$ is $\frac{16}{-7}$.

So, according to question, $\frac{6}{13} \times \frac{16}{-7} = \frac{6 \times 16}{13x(-7)}$

$= \frac{96}{91}$

Q.7 Tell what property allows you to compute $\frac{1}{3} x \left(6 \times \frac{4}{3}\right)$ as $\left(\frac{1}{3} x 6\right) x \frac{4}{3}$

Sol. If rational numbers are rearranged between one or more same operators and still their result is same then we can say that they follow the associative property for that operation.
Thus, given expression follows the associative property.

Q.8 Is $\frac{8}{9}$ the multiplicative inverse of $-1\frac{1}{8}$? Why or why not?

Sol. Since, we can rewrite, $-1\frac{1}{8} = -\frac{-9}{8}$

Now, by multiplying both the numbers we get, $\frac{8}{9} \times \frac{-9}{8} = -1 \neq 1$

The obtained result is not equal to 1.

Therefore, $-1\frac{1}{8}$ is not the multiplicative inverse of $\frac{8}{9}$.

Q.9 Is 0.3 the multiplicative inverse of $3\frac{1}{3}$? Why or why not?

Sol. Since, we can write that, $0.3 = \frac{3}{10}$ and $3\frac{1}{3} = \frac{10}{3}$.

If we multiply both the numbers $= \frac{3}{10} x \frac{10}{3} = 1 = 1$

Since, obtained result is 1.

So, the multiplicative inverse of $\frac{3}{10}$ is $\frac{10}{3}$

Again, we can write that $\frac{10}{3} = 3\frac{1}{3}$

Thus, $3\frac{1}{3}$ is the multiplicative inverse of 0.3

Q.10 Write.
(i) The rational number that does not have a reciprocal.
(ii) The rational numbers that are equal to their reciprocals.
(iii) The rational number that is equal to its negative.
Sol. (i) Rational number zero (0) does not have a reciprocal.
(ii) Rational numbers 1 and – 1 are equal to their reciprocals.
(iii) Rational number zero (0) is equal to its negative.

Q.11 Fill in the blanks.
(i) Zero has _____ reciprocal.
(ii) The numbers _____ and _____ are their own reciprocals.
(iii) The reciprocal of – 5 is _____.
(iv) Reciprocal of 1/x, where x ≠ 0 is _____.
(v) The product of two rational numbers is always a _____.
(vi) The reciprocal of a positive rational number is _____.
Sol. (i) Zero has **no** reciprocal.
(ii) The numbers **1** and **-1** are their own reciprocals.
(iii) The reciprocal of – 5 is **-1/5**.
(iv) Reciprocal of 1/x, where x ≠ 0 is **X**.
(v) The product of two rational numbers is always a **Rational Number**.
(vi) The reciprocal of a positive rational number is **Positive**.