Rational Numbers

Question 1:

Using appropriate properties find:

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

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

Answer

(i)

$$-\dfrac{2}{3} \times \dfrac{3}{5} + \dfrac{5}{2} - \dfrac{3}{5} \times \dfrac{1}{6} = -\dfrac{2}{3} \times \dfrac{3}{5} - \dfrac{3}{5} \times \dfrac{1}{6} + \dfrac{5}{2}$$

(Using commutativity of rational numbers)

$$= \left(-\dfrac{3}{5}\right) \times \left(\dfrac{2}{3} + \dfrac{1}{6}\right) + \dfrac{5}{2} \qquad \text{(Distributivity)}$$

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

$$= \left(-\dfrac{3}{6}\right) + \dfrac{5}{2} = \left(\dfrac{-3 + 5 \times 3}{6}\right) = \left(\dfrac{-3 + 15}{6}\right)$$

$$= \dfrac{12}{6} = 2$$

(ii)

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

(By commutativity)

$$= \dfrac{2}{5} \times \left(-\dfrac{3}{7} + \dfrac{1}{14}\right) - \dfrac{1}{4} \qquad \text{(By distributivity)}$$

$$= \dfrac{2}{5} \times \left(\dfrac{-3 \times 2 + 1}{14}\right) - \dfrac{1}{4}$$

$$= \dfrac{2}{5} \times \left(\dfrac{-5}{14}\right) - \dfrac{1}{4}$$

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

$$= \dfrac{-4 - 7}{28} = \dfrac{-11}{28}$$

Question 2:

Write the additive inverse of each of the following:

(i) $\dfrac{2}{8}$ (ii) $\dfrac{-5}{9}$ (iii) $\dfrac{-6}{-5}$ (iv) $\dfrac{2}{-9}$ (v) $\dfrac{19}{-6}$

Answer

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

Additive inverse $= -\dfrac{2}{8}$

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

Additive inverse $= \dfrac{5}{9}$

(iii) $\dfrac{-6}{-5} = \dfrac{6}{5}$

Additive inverse $= \dfrac{-6}{5}$

(iv) $\dfrac{2}{-9} = \dfrac{-2}{9}$

Additive inverse $= \dfrac{2}{9}$

(v) $\dfrac{19}{-6} = \dfrac{-19}{6}$

Additive inverse $= \dfrac{19}{6}$

Question 3:

Verify that $-(-x) = x$ for.

(i) $x = \dfrac{11}{15}$ (ii) $x = -\dfrac{13}{17}$

Answer

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

The additive inverse of $x = \dfrac{11}{15}$ is $-x = -\dfrac{11}{15}$ as $\dfrac{11}{15} + \left(-\dfrac{11}{15}\right) = 0$

This equality $\dfrac{11}{15} + \left(-\dfrac{11}{15}\right) = 0$ represents that the additive inverse of $-\dfrac{11}{15}$ is $\dfrac{11}{15}$ or it can be said that

i.e., $-\left(-\dfrac{11}{15}\right) = \dfrac{11}{15}$ $-(-x) = x$

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

The additive inverse of $x = -\dfrac{13}{17}$ is $-x = \dfrac{13}{17}$ as $-\dfrac{13}{17} + \dfrac{13}{17} = 0$

This equality $-\dfrac{13}{17} + \dfrac{13}{17} = 0$ represents that the additive inverse of $\dfrac{13}{17}$ is $-\dfrac{13}{17}$ i.e., $-(-x) = x$

Question 4:

Find the multiplicative inverse of the following.

(i) −13 (ii) $\dfrac{-13}{19}$ (iii) $\dfrac{1}{5}$

(iv) $\dfrac{-5}{8} \times \dfrac{-3}{7}$ (v) $-1 \times \dfrac{-2}{5}$ (vi) −1

Answer

(i) −13

Multiplicative inverse $= -\dfrac{1}{13}$

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

Multiplicative inverse $= -\dfrac{19}{13}$

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

Multiplicative inverse = 5

(iv) $-\dfrac{5}{8} \times -\dfrac{3}{7} = \dfrac{15}{56}$

Multiplicative inverse $= \dfrac{56}{15}$

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

Multiplicative inverse $= \dfrac{5}{2}$

(vi) −1

Multiplicative inverse $= -1$

Question 5:

Find five rational numbers between
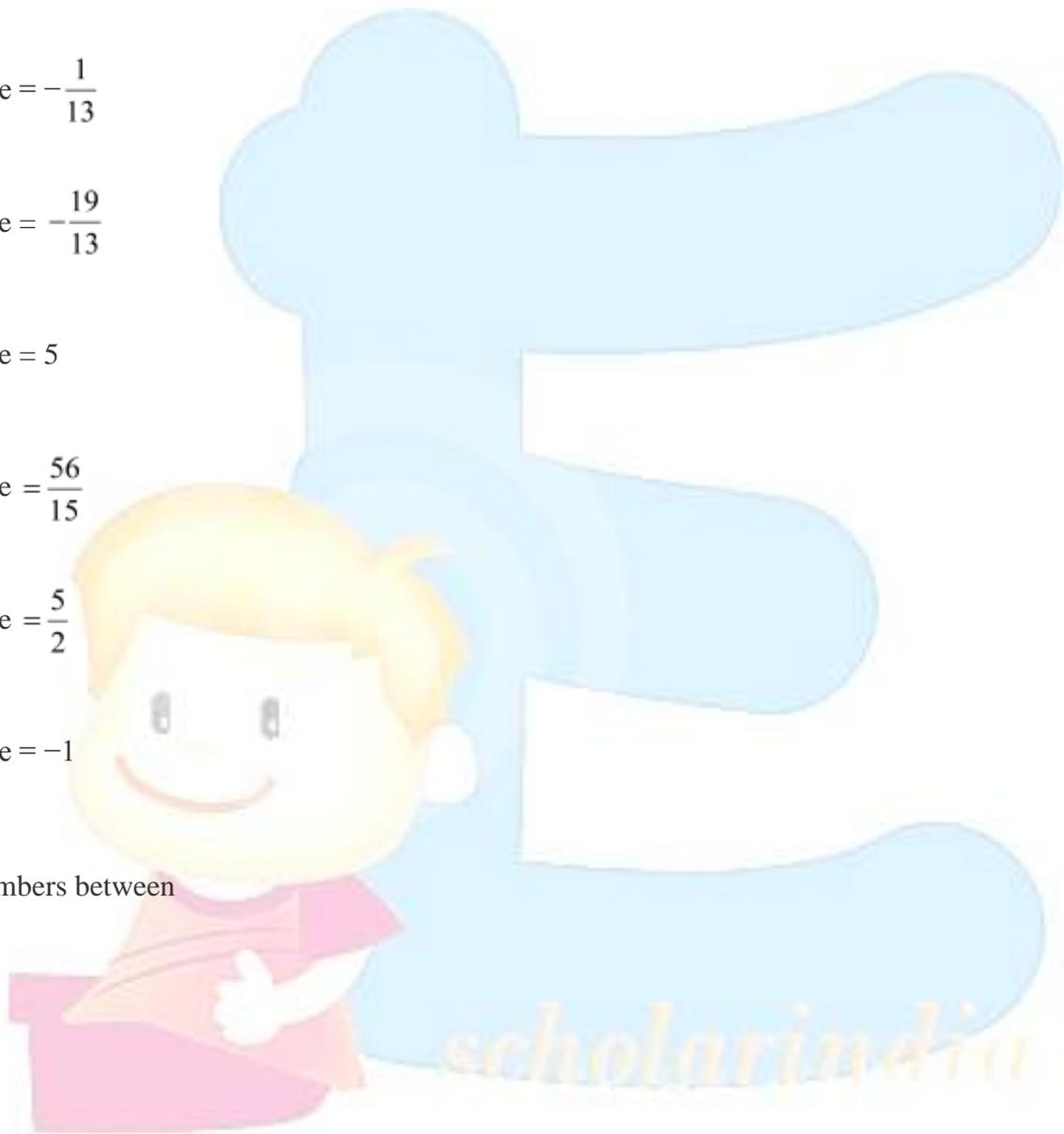
(i) $\dfrac{2}{3}$ and $\dfrac{4}{5}$

(ii) $\dfrac{-3}{2}$ and $\dfrac{5}{3}$

(iii) $\dfrac{1}{4}$ and $\dfrac{1}{2}$

Answer

(i) $\dfrac{2}{3}$ and $\dfrac{4}{5}$ can be represented as $\dfrac{30}{45}$ and $\dfrac{36}{45}$ respectively.

Therefore, five rational numbers between $\dfrac{2}{3}$ and $\dfrac{4}{5}$ are $\dfrac{31}{45}, \dfrac{32}{45}, \dfrac{33}{45}, \dfrac{34}{45}, \dfrac{35}{45}$

(ii) $-\dfrac{3}{2}$ and $\dfrac{5}{3}$ can be represented as $-\dfrac{9}{6}$ and $\dfrac{10}{6}$ respectively.

Therefore, five rational numbers between $-\dfrac{3}{2}$ and $\dfrac{5}{3}$ are

$$-\dfrac{8}{6}, -\dfrac{7}{6}, -1, -\dfrac{5}{6}, -\dfrac{4}{6}$$

(iii) $\dfrac{1}{4}$ and $\dfrac{1}{2}$ can be represented as $\dfrac{8}{32}$ and $\dfrac{16}{32}$ respectively.

Therefore, five rational numbers between $\dfrac{1}{4}$ and $\dfrac{1}{2}$ are

$$\dfrac{9}{32}, \dfrac{10}{32}, \dfrac{11}{32}, \dfrac{12}{32}, \dfrac{13}{32}$$

Question 6:

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

Answer

$$\dfrac{6}{13} \times \left(\text{Reciprocal of } -\dfrac{7}{16} \right) = \dfrac{6}{13} \times -\dfrac{16}{7} = -\dfrac{96}{91}$$

Question 7:

Tell what property allows you to compute $\dfrac{1}{3} \times \left(6 \times \dfrac{4}{3} \right)$ as $\left(\dfrac{1}{3} \times 6 \right) \times \dfrac{4}{3}$

Answer
Associativity

Question 8:

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

Answer

If it is the multiplicative inverse, then the product should be 1.

However, here, the product is not 1 as

$$\dfrac{8}{9} \times \left(-1\dfrac{1}{8} \right) = \dfrac{8}{9} \times \left(-\dfrac{9}{8} \right) = -1 \neq 1$$

Question 9:

Is 0.3 the multiplicative inverse of $3\dfrac{1}{3}$? Why or why not?

Answer:

$$3\frac{1}{3} = \frac{10}{3}$$

$$0.3 \times 3\frac{1}{3} = 0.3 \times \frac{10}{3} = \frac{3}{10} \times \frac{10}{3} = 1$$

Here, the product is 1. Hence, 0.3 is the multiplicative inverse of $3\frac{1}{3}$