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)

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

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

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

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

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

Question 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) $\frac{19}{-6}$

Answer:

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

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

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

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

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

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

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

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

(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:

Name the property under multiplication used in each of the following:

(i) $\dfrac{-4}{5} \times 1 = 1 \times \dfrac{-4}{5} = -\dfrac{4}{5}$

(ii) $-\dfrac{13}{17} \times \dfrac{-2}{7} = \dfrac{-2}{7} \times \dfrac{-13}{17}$

(iii) $\dfrac{-19}{29} \times \dfrac{29}{-19} = 1$

Answer:

(i) $-\dfrac{4}{5} \times 1 = 1 \times -\dfrac{4}{5} = -\dfrac{4}{5}$

1 is the multiplicative identity.

(ii) Commutativity

(iii) Multiplicative inverse

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 $3\frac{1}{3}$? 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 $3\frac{1}{3}$.

Question 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.

Answer:

(i) 0 is a rational number but its reciprocal is not defined.

(ii) 1 and −1 are the rational numbers that are equal to their reciprocals.

(iii) 0 is the rational number that is equal to its negative.

Question 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 $\frac{1}{x}$, where $x \neq 0$ is _____.

(v) The product of two rational numbers is always a _____.

(vi) The reciprocal of a positive rational number is _____.

Answer:

 (i) No

(ii) 1, −1

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

(iv) x

(v) Rational number
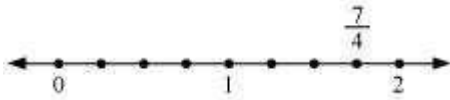
(vi) Positive rational number

Exercise 1.2

Question 1:
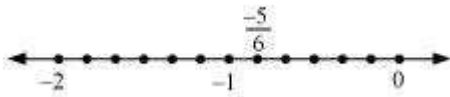
Represent these numbers on the number line.

(i) $\dfrac{7}{4}$ (ii) $\dfrac{-5}{6}$

Answer:

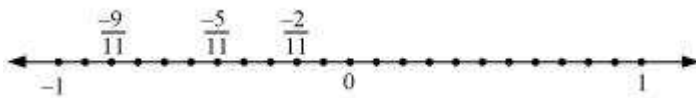(i) $\dfrac{7}{4}$ can be represented on the number line as follows.

(ii) $-\dfrac{5}{6}$ can be represented on the number line as follows.

Question 2:

Represent $\dfrac{-2}{11}, \dfrac{-5}{11}, \dfrac{-9}{11}$ on the number line.

Answer:

$\dfrac{-2}{11}, \dfrac{-5}{11}, \dfrac{-9}{11}$ can be represented on the number line as follows.

Question 3:

Write five rational numbers which are smaller than 2.

Answer:

2 can be represented as $\dfrac{14}{7}$.

Therefore, five rational numbers smaller than 2 are

$$\frac{13}{7}, \frac{12}{7}, \frac{11}{7}, \frac{10}{7}, \frac{9}{7}$$

Question 4:

Find ten rational numbers between $\frac{-2}{5}$ and $\frac{1}{2}$.

Answer:

$\frac{-2}{5}$ and $\frac{1}{2}$ can be represented as $-\frac{8}{20}$ and $\frac{10}{20}$ respectively.

Therefore, ten rational numbers between $\frac{-2}{5}$ and $\frac{1}{2}$ are

$$-\frac{7}{20}, -\frac{6}{20}, -\frac{5}{20}, -\frac{4}{20}, -\frac{3}{20}, -\frac{2}{20}, -\frac{1}{20}, 0, \frac{1}{20}, \frac{2}{20}$$

Question 5:

Find five rational numbers between

(i) $\frac{2}{3}$ and $\frac{4}{5}$

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

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

Answer:

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

Therefore, five rational numbers between $\frac{2}{3}$ and $\frac{4}{5}$ are

$$\frac{31}{45}, \frac{32}{45}, \frac{33}{45}, \frac{34}{45}, \frac{35}{45}$$

(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:

Write five rational numbers greater than -2.

Answer:

-2 can be represented as $-\dfrac{14}{7}$.

Therefore, five rational numbers greater than -2 are

$$-\dfrac{13}{7}, -\dfrac{12}{7}, -\dfrac{11}{7}, -\dfrac{10}{7}, -\dfrac{9}{7}$$

Question 7:

Find ten rational numbers between $\dfrac{3}{5}$ and $\dfrac{3}{4}$.

Answer:

$\dfrac{3}{5}$ and $\dfrac{3}{4}$ can be represented as $\dfrac{48}{80}$ and $\dfrac{60}{80}$ respectively.

Therefore, ten rational numbers between $\dfrac{3}{5}$ and $\dfrac{3}{4}$ are

$$\frac{49}{80}, \frac{50}{80}, \frac{51}{80}, \frac{52}{80}, \frac{53}{80}, \frac{54}{80}, \frac{55}{80}, \frac{56}{80}, \frac{57}{80}, \frac{58}{80}$$