

Chapter 1

Rational Numbers

Exercise 1.1

Ex 1.1 Question 1:

Using appropriate properties find:

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

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

Answer:

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

(Using commutativity of rational numbers)

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

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

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

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

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

$$\begin{aligned} &= \frac{2}{5} \times \left(-\frac{3}{7} + \frac{1}{14} \right) - \frac{1}{4} && \text{(By distributivity)} \\ &= \frac{2}{5} \times \left(\frac{-3 \times 2 + 1}{14} \right) - \frac{1}{4} \\ &= \frac{2}{5} \times \left(\frac{-5}{14} \right) - \frac{1}{4} \\ &= -\frac{1}{7} - \frac{1}{4} \\ &= \frac{-4-7}{28} = \frac{-11}{28} \end{aligned}$$

Ex 1.1 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) $\frac{2}{-9} = \frac{-2}{9}$

$$\text{Additive inverse} = \frac{2}{9}$$

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

$$\text{Additive inverse} = \frac{19}{6}$$

Ex 1.1 Question 3:

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

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

Answer:

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

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

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

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

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

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

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

Ex 1.1 Question 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

Answer:

(i) -13

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

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

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

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

Multiplicative inverse = 5

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

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

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

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

(vi) -1

Multiplicative inverse = -1

Ex 1.1 Question 5:

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

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

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

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

Answer:

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

1 is the multiplicative identity.

(ii) Commutativity

(iii) Multiplicative inverse

Ex 1.1 Question 6:

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

Answer:

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

Ex 1.1 Question 7:

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

Answer:

Associativity

Ex 1.1 Question 8:

Is $\frac{8}{9}$ the multiplicative inverse of $-1\frac{1}{8}$? 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

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

Ex 1.1 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 $3\frac{1}{3}$.

Ex 1.1 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.

Ex 1.1 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) $-\frac{1}{5}$
- (iv) x
- (v) Rational number
- (vi) Positive rational number

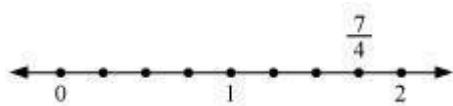
Exercise 1.2**Ex 1.2 Question 1:**

Represent these numbers on the number line.

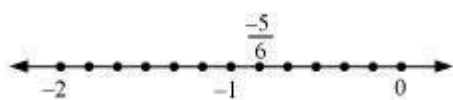
- (i) $\frac{7}{4}$ (ii) $\frac{-5}{6}$

Answer:

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



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

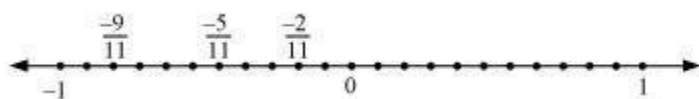


Ex 1.2 Question 2:

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

Answer:

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



Ex 1.2 Question 3:

Write five rational numbers which are smaller than 2.

Answer:

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

Therefore, five rational numbers smaller than 2 are

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

Ex 1.2 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

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

Ex 1.2 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) $-\frac{3}{2}$ and $\frac{5}{3}$ can be represented as $-\frac{9}{6}$ and $\frac{10}{6}$ respectively.

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

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

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

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

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

Ex 1.2 Question 6:

Write five rational numbers greater than -2 .

Answer:

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

Therefore, five rational numbers greater than -2 are

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

Ex 1.2 Question 7:

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

Answer:

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

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

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