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Exercise 1.1

1. **Using appropriate properties find.**

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

Solution:

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

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

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

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

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

$$=\frac{-15}{30}+\frac{5}{2}$$

$$=\frac{-1}{2}+\frac{5}{2}$$

$$=\frac{4}{2}$$

$$=2$$

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

Solution:

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

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

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

$$= \frac{2}{5} \times \left(-\frac{3}{7} + \frac{1}{14}\right) - \frac{3}{12}$$

$$= \frac{2}{5} \times \left(\frac{-6+1}{14}\right) - \frac{1}{4}$$

$$= \frac{2}{5} \times \left(\frac{-6+1}{14}\right) - \frac{1}{4}$$

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

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

$$= \left(\frac{-10}{70}\right) - \frac{1}{4}$$

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

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

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

(by distributivity)

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

Solution:

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

Additive inverse of $\frac{2}{8}$ is $\frac{-2}{8}$

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

Additive inverse of $\frac{-5}{9}$ is $\frac{5}{9}$

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

Additive inverse of $\frac{6}{5}$ is $\frac{-6}{5}$

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

Additive inverse of $\frac{-2}{9}$ is $\frac{2}{9}$

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

Additive inverse of $\frac{-19}{6}$ is $\frac{19}{6}$

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

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

Solution:

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

We have, $x = \frac{11}{15}$

The additive inverse of x is –x (as x+(-x)=0)

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

The same equality $\frac{11}{15} + \left(\frac{-11}{15}\right) = 0$, shows that the additive inverse of $\frac{-11}{15}$ is $\frac{11}{15}$.

Or, $-\left(\frac{-11}{15}\right) = \frac{11}{15}$,

i.e., -(-x)=x.

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

We have, $x = \frac{-13}{17}$

The additive inverse of x is –x (as x+(-x)=0)

Then, the additive inverse of $\frac{-13}{17}$ is $\frac{13}{17}$ (as $\left(\frac{-13}{17} + \frac{13}{17}\right) = 0$

The same equality $\left(\frac{-13}{17} + \frac{13}{17}\right) = 0$, shows that the additive inverse of $\frac{13}{17}$ is $\frac{-13}{17}$.

Or, $-\left(\frac{13}{17}\right) = \frac{-13}{17}$,

i.e., -(-x)=x

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

Solution:

(i) -13

Multiplicative inverse of -13 is $\frac{-1}{13}$

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

Multiplicative inverse of $\frac{-13}{19}$ is $\frac{-19}{13}$

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

Multiplicative inverse of $\frac{1}{5}$ is 5

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3.

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

Multiplicative inverse of $\frac{15}{56}$ is $\frac{56}{15}$

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

Multiplicative inverse of $\frac{2}{5}$ is $\frac{5}{2}$

(vi) -1

Multiplicative inverse of -1 is -1

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

5. **(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) $\frac{-19}{29} \times \frac{29}{-19} = 1$

Solution:

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

Here 1 is the multiplicative identity.

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

The property of commutativity is used in the equation.

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

Multiplicative inverse is the property used in this equation.

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

Solution:

Reciprocal of $\frac{-7}{16} = \frac{16}{-7} = \frac{-16}{7}$

According to the question,

$\frac{6}{13} \times$ (Reciprocal of $\frac{-7}{16}$)

$\Rightarrow \frac{6}{13} \times \frac{-16}{7} = \frac{-96}{91}$

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

Solution:

$\frac{1}{3} \times (6 \times \frac{4}{3}) = (\frac{1}{3} \times 6) \times \frac{4}{3}$

Here, the way in which factors are grouped in a multiplication problem, supposedly, does not change the product. Hence, the Associativity Property is used here.

7.

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

Solution:

$-1\frac{1}{8} = \frac{-7}{8}$

[Multiplicative inverse $\Longrightarrow$ product should be 1]

According to the question,

$\Longrightarrow \quad \frac{8}{9} \times \frac{-7}{8} = \frac{-7}{9} \neq 1$

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

8.

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

Solution:

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

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

[Multiplicative inverse $\Longrightarrow$ product should be 1]

According to the question,

$\Longrightarrow \quad \frac{3}{10} \times \frac{10}{3} = 1$

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

9.

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.

Solution:

(i) The rational number that does not have a reciprocal is **0**.

Reason:

$0 = \frac{0}{1}$

Reciprocal of $0 = \frac{1}{0}$, which is not defined.

(ii) The rational numbers that are equal to their reciprocals are **1** and **-1**.

Reason:

$1 = \frac{1}{1}$

Reciprocal of $1 = \frac{1}{1} = 1$ Similarly, Reciprocal of -1= -1

The rational number that is equal to its

Reason:

(iii) Negative of 0=

negative is **0**.

-0=0

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 ≠ 0 is _____.

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

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

Solution:

(i) Zero has **no** reciprocal.

(ii) The numbers **1** and **-1** are their own reciprocals

(iii) The reciprocal of -5 is $\frac{-1}{5}$.

(iv) Reciprocal of $\frac{1}{x}$, where x ≠ 0 is **x**.

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

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

EDUGROSS
WISDOMISING KNOWLEDGE

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1. Exercise 1.2

Represent these numbers on the number line.

(i) $\frac{7}{4}$

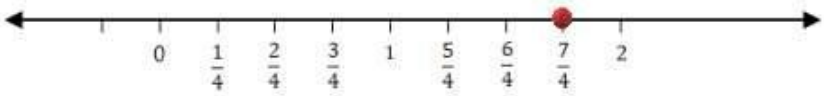
(ii) $\frac{-5}{6}$

Solution:

(i) $\frac{7}{4}$

Divide the line between the whole numbers into 4 parts. i.e, divide the line between 0 and 1 to 4 parts, 1 and 2 to 4 parts and so on.

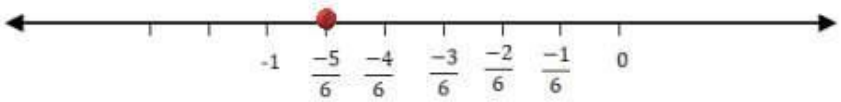
Thus, the rational number $\frac{7}{4}$ lies at a distance of 7 points away from 0 towards positive number line.



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

Divide the line between the integers into 4 parts. i.e, divide the line between 0 and -1 to 6 parts, -1 and -2 to 6 parts and so on. Here since the numerator is less than denominator, dividing 0 to -1 into 6 parts is sufficient.

Thus, the rational number $\frac{-5}{6}$ lies at a distance of 5 points, away from 0, towards negative number line.



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

Solution:

Divide the line between the integers into 11 parts.

Thus, the rational number $\frac{-2}{11}, \frac{-5}{11}, \frac{-9}{11}$ lie at a distance of 2, 5, 9 points, away from 0, towards negative number line respectively.

2.

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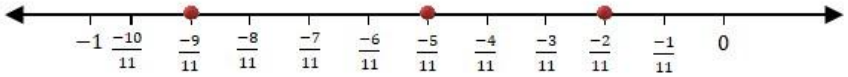

3. Write five rational numbers which are smaller than 2.

Solution:

The number 2 can be written as $\frac{20}{10}$.

Hence, we can say that, the five rational numbers which are smaller than 2 are:

$\frac{2}{10}, \frac{5}{10}, \frac{10}{10}, \frac{15}{10}, \frac{19}{10}$

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

Solution:

Let us make the denominators same, say 50.

$$\frac{-2}{5} \Rightarrow \frac{-2\times10}{5\times10} = \frac{-20}{50}$$

$$\frac{1}{2} \Rightarrow \frac{1\times25}{2\times25} = \frac{25}{50}$$

Ten rational numbers between $\frac{-2}{5}$ and $\frac{1}{2}$ = ten rational numbers between $\frac{-20}{50}$ and $\frac{25}{50}$

$\therefore$, ten rational numbers between $\frac{-20}{50}$ and $\frac{25}{50} = \frac{-18}{50}, \frac{-15}{50}, \frac{-5}{50}, \frac{-2}{50}, \frac{4}{50}, \frac{5}{50}, \frac{8}{50}, \frac{12}{50}, \frac{15}{50}, \frac{20}{50}$

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 $\frac{1}{2}$

4.

Solution:

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

Let us make the denominators same, say 60.

i.e., $\frac{2}{3}$ and $\frac{4}{5}$ can be written as:

$$\frac{2}{3} \Rightarrow \frac{2\times20}{3\times20} = \frac{40}{60}$$

$$\frac{4}{5} \Rightarrow \frac{4\times12}{5\times12} = \frac{48}{60}$$

Five rational numbers between $\frac{2}{3}$ and $\frac{4}{5}$ = five rational numbers between $\frac{40}{60}$ and $\frac{48}{60}$

$\therefore$, Five rational numbers between $\frac{40}{60}$ and $\frac{48}{60} = \frac{41}{60}, \frac{42}{60}, \frac{43}{60}, \frac{44}{60}, \frac{45}{60}$

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

Let us make the denominators same, say 6.

i.e., $\frac{-3}{2}$ and $\frac{5}{3}$ can be written as:

$$\frac{-3}{2} \Rightarrow \frac{-3\times3}{2\times3} = \frac{-9}{6}$$
$$\frac{5}{3} \Rightarrow \frac{5\times2}{3\times2} = \frac{10}{6}$$

Five rational numbers between $\frac{-3}{2}$ and $\frac{5}{3}$ = five rational numbers between $\frac{-9}{6}$ and $\frac{10}{6}$

∴, Five rational numbers between $\frac{-9}{6}$ and $\frac{10}{6} = \frac{-1}{6}, \frac{2}{6}, \frac{3}{6}, \frac{4}{6}, \frac{5}{6}$

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

Let us make the denominators same, say 24.

i.e., $\frac{1}{4}$ and $\frac{1}{2}$ can be written as:

$$\frac{1}{4} \Rightarrow \frac{1\times6}{4\times6} = \frac{6}{24}$$
$$\frac{1}{2} \Rightarrow \frac{1\times12}{2\times12} = \frac{12}{24}$$

Five rational numbers between $\frac{1}{4}$ and $\frac{1}{2}$ = five rational numbers between $\frac{6}{24}$ and $\frac{12}{24}$

∴, Five rational numbers between $\frac{6}{24}$ and $\frac{12}{24} = \frac{7}{24}, \frac{8}{24}, \frac{9}{24}, \frac{10}{24}, \frac{11}{24}$

6. Write five rational numbers greater than -2.

Solution:

-2 can be written as $\frac{-20}{10}$

Hence, we can say that, the five rational numbers greater than -2 are

$\frac{-10}{10}, \frac{-5}{10}, \frac{-1}{10}, \frac{5}{10}, \frac{7}{10}$

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

Solution:

Let us make the denominators same, say 80.

$$\frac{3}{5} \Rightarrow \frac{3\times16}{5\times16} = \frac{48}{80}$$
$$\frac{3}{4} \Rightarrow \frac{3\times20}{4\times20} = \frac{60}{80}$$

Ten rational numbers between $\frac{3}{5}$ and $\frac{3}{4}$ = ten rational numbers between $\frac{48}{80}$ and $\frac{60}{80}$

∴, ten rational numbers between $\frac{48}{80}$ and $\frac{60}{80} = \frac{49}{80}, \frac{50}{80}, \frac{51}{80}, \frac{52}{80}, \frac{54}{80}, \frac{55}{80}, \frac{56}{80}, \frac{57}{80}, \frac{58}{80}, \frac{59}{80}$

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7.