

**EXERCISE 1.1**

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1. Using appropriate properties, find:

(i) $-2/3 \times 3/5 + 5/2 - 3/5 \times 1/6$

Solution:

$$-2/3 \times 3/5 + 5/2 - 3/5 \times 1/6$$

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

$$= 3/5 (-2/3 - 1/6) + 5/2$$

$$= 3/5 ((-4 - 1)/6) + 5/2$$

$$= 3/5 ((-5)/6) + 5/2 \text{ (by distributivity)}$$

$$= -15/30 + 5/2$$

$$= -1/2 + 5/2$$

$$= 4/2$$

$$= 2$$

(ii) $2/5 \times (-3/7) - 1/6 \times 3/2 + 1/14 \times 2/5$

Solution:

$$2/5 \times (-3/7) - 1/6 \times 3/2 + 1/14 \times 2/5$$

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

$$= 2/5 \times (-3/7 + 1/14) - 3/12$$

$$= 2/5 \times ((-6 + 1)/14) - 3/12$$

$$= 2/5 \times ((-5)/14) - 1/4$$

$$= (-10/70) - 1/4$$

$$= -1/7 - 1/4$$

$$= (-4 - 7)/28$$

$$= -11/28$$

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

Solution:

(i) $2/8$



The Additive inverse of $2/8$ is $-2/8$

(ii) $-5/9$

The additive inverse of $-5/9$ is $5/9$

(iii) $-6/-5 = 6/5$

The additive inverse of $6/5$ is $-6/5$

(iv) $2/-9 = -2/9$

The additive inverse of $-2/9$ is $2/9$

(v) $19/-16 = -19/16$

The additive inverse of $-19/16$ is $19/16$

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

(i) $x = 11/15$ (ii)

$x = -13/17$

Solution:

(i) $x = 11/15$

We have, $x = 11/15$

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

Then, the additive inverse of $11/15$ is $-11/15$ (as $11/15 + (-11/15) = 0$).

The same equality, $11/15 + (-11/15) = 0$, shows that the additive inverse of $-11/15$ is $11/15$. Or,

$$-(-11/15) = 11/15$$

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

(ii) $-13/17$

We have, $x = -13/17$

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

Then, the additive inverse of $-13/17$ is $13/17$ (as $13/17 + (-13/17) = 0$).

The same equality $(-13/17 + 13/17) = 0$, shows that the additive inverse of $13/17$ is $-13/17$.

Or, $-(13/17) = -13/17$,



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

4. Find the multiplicative inverse of the following: (i) -13 (ii)

-13/19 (iii) 1/5 (iv) $-5/8 \times (-3/7)$ (v) $-1 \times (-2/5)$ (vi) -1

Solution:

(i) -13

Multiplicative inverse of -13 is $-1/13$.

(ii) -13/19

Multiplicative inverse of -13/19 is $-19/13$.

(iii) 1/5

Multiplicative inverse of 1/5 is 5.

(iv) $-5/8 \times (-3/7) = 15/56$

Multiplicative inverse of 15/56 is $56/15$.

(v) $-1 \times (-2/5) = 2/5$

Multiplicative inverse of 2/5 is $5/2$.

(vi) -1

Multiplicative inverse of -1 is -1.

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

(i) $-4/5 \times 1 = 1 \times (-4/5) = -4/5$

(ii) $-13/17 \times (-2/7) = -2/7 \times (-13/17)$

(iii) $-19/29 \times 29/-19 = 1$

Solution:

(i) $-4/5 \times 1 = 1 \times (-4/5) = -4/5$

Here 1 is the multiplicative identity.

(ii) $-13/17 \times (-2/7) = -2/7 \times (-13/17)$

The property of commutativity is used in the equation.

(iii) $-19/29 \times 29/-19 = 1$



The multiplicative inverse is the property used in this equation.

6. Multiply $6/13$ by the reciprocal of $-7/16$.

Solution:

$$\text{Reciprocal of } -7/16 = 16/-7 = -16/7$$

According to the question,

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

$$6/13 \times (-16/7) = -96/91$$

7. Tell what property allows you to compute $1/3 \times (6 \times 4/3)$ as $(1/3 \times 6) \times 4/3$.

Solution:

$$1/3 \times (6 \times 4/3) = (1/3 \times 6) \times 4/3$$

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.

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

Solution:

$$-1\frac{1}{8} = -9/8$$

[Multiplicative inverse \Rightarrow product should be 1]

According to the question,

$$8/9 \times (-9/8) = -1 \neq 1$$

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

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

Solution:

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

$$0.3 = 3/10$$

[Multiplicative inverse \Rightarrow product should be 1]

According to the question,

$$3/10 \times 10/3 = 1$$



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

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:

$$0 = 0/1$$

Reciprocal of $0 = 1/0$, which is not defined.

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

Reason:

$$1 = 1/1$$

Reciprocal of $1 = 1/1 = 1$, similarly, reciprocal of $-1 = -1$.

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

Reason:

Negative of $0 = -0 = 0$

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 $1/x$, where $x \neq 0$ is _____.
- (v) The product of two rational numbers is always a _____.
- (vi) The reciprocal of a positive rational number is _____.

Solution:



- (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 $x \neq 0$ is x .
- (v) The product of two rational numbers is always a rational number.
- (vi) The reciprocal of a positive rational number is positive.

EXERCISE 1.2

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1. Represent these numbers on the number line.

- (i) $7/4$
- (ii) $-5/6$

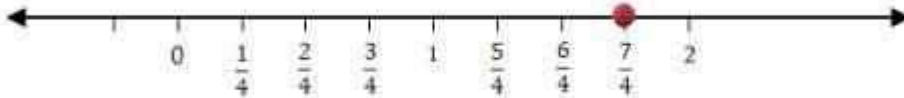


Solution:

(i) $7/4$

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.

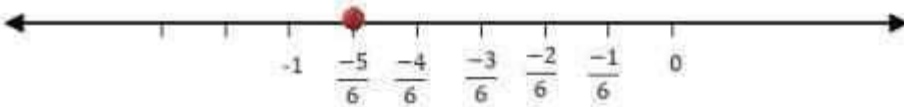
Thus, the rational number $7/4$ lies at a distance of 7 points away from 0 towards the positive number line.



(ii) $-5/6$

Divide the line between the integers into 6 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 the denominator, dividing 0 to -1 into 6 parts is sufficient.

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

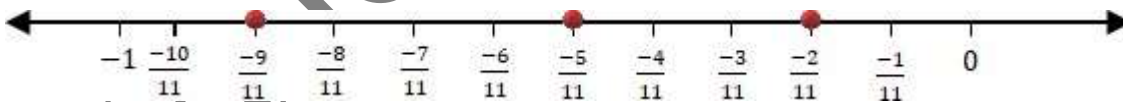


2. Represent $-2/11$, $-5/11$, $-9/11$ on a number line.

Solution:

Divide the line between the integers into 11 parts.

Thus, the rational numbers $-2/11$, $-5/11$, and $-9/11$ lie at a distance of 2, 5, and 9 points away from 0, towards the negative number line, respectively.



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

Solution:

The number 2 can be written as $20/10$

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

$2/10$, $5/10$, $10/10$, $15/10$, $19/10$

**4. Find the rational numbers between $-2/5$ and $1/2$.**

Solution:

Let us make the denominators the same, say 50.

$$-2/5 = (-2 \times 10)/(5 \times 10) = -20/50$$

$$1/2 = (1 \times 25)/(2 \times 25) = 25/50$$

Ten rational numbers between $-2/5$ and $1/2$ = ten rational numbers between $-20/50$ and $25/50$.Therefore, ten rational numbers between $-20/50$ and $25/50$ = $-18/50, -15/50, -5/50, -2/50, 4/50, 5/50, 8/50, 12/50, 15/50, 20/50$.**5. Find five rational numbers between:****(i) $2/3$ and $4/5$** **(ii) $-3/2$ and $5/3$** **(iii) $1/4$ and $1/2$ Solution:****(i) $2/3$ and $4/5$**

Let us make the denominators the same, say 60

i.e., $2/3$ and $4/5$ can be written as: $2/3$

$$= (2 \times 20)/(3 \times 20) = 40/60$$

$$4/5 = (4 \times 12)/(5 \times 12) = 48/60$$

Five rational numbers between $2/3$ and $4/5$ = five rational numbers between $40/60$ and $48/60$.Therefore, five rational numbers between $40/60$ and $48/60$ = $41/60, 42/60, 43/60, 44/60, 45/60$.**(ii) $-3/2$ and $5/3$**

Let us make the denominators the same, say 6

i.e., $-3/2$ and $5/3$ can be written as:

$$-3/2 = (-3 \times 3)/(2 \times 3) = -9/6$$

$$5/3 = (5 \times 2)/(3 \times 2) = 10/6$$

Five rational numbers between $-3/2$ and $5/3$ = five rational numbers between $-9/6$ and $10/6$.Therefore, five rational numbers between $-9/6$ and $10/6$ = $-1/6, 2/6, 3/6, 4/6, 5/6$.**(iii) $1/4$ and $1/2$**



Let us make the denominators the same, say 24

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

$$= (1 \times 6)/(4 \times 6) = 6/24$$

$$\frac{1}{2} = (1 \times 12)/(2 \times 12) = 12/24$$

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

Therefore, five rational numbers between $6/24$ and $12/24$ = $7/24, 8/24, 9/24, 10/24, 11/24$.

6. Write five rational numbers greater than -2.

Solution:

-2 can be written as $-20/10$

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

$-10/10, -5/10, -1/10, 5/10, 7/10$

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

Solution:

Let us make the denominators the same, say 80.

$$\frac{3}{5} = (3 \times 16)/(5 \times 16) = 48/80$$

$$\frac{3}{4} = (3 \times 20)/(4 \times 20) = 60/80$$

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

Therefore, ten rational numbers between $48/80$ and $60/80$ = $49/80, 50/80, 51/80, 52/80, 54/80, 55/80, 56/80, 57/80, 58/80, 59/80$.