NCERT Solutions for Class 8 Maths Chapter 1 - Rational Numbers

Chapter 1 - Rational Numbers Exercise Ex. 1.1

Solution 1

(i)

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

(Using commutativity of rational numbers)

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

$$=\left(-\frac{3}{5}\right)\times\left(\frac{2\times2+1}{6}\right)+\frac{5}{2}=\left(-\frac{3}{5}\right)\times\left(\frac{5}{6}\right)+\frac{5}{2}$$

$$=\left(-\frac{3}{6}\right)+\frac{5}{2}=\left(\frac{-3+5\times3}{6}\right)=\left(\frac{-3+15}{6}\right)$$

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

(ii)

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

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

$$=\frac{2}{5}\times\left(\frac{-3\times2+1}{14}\right)-\frac{1}{4}$$

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

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

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

Concept Insight:-

The idea behind introducing this question is to identify whether the student has understood the logical sequences that should be performed while performing any type of calculation.
These are of very basic level questions where the focus is to understand the importance of a mathematical operator, based on its position. If a + , – , x, ÷ sign comes before a number then it has entirely different significance from what it gives when comes after the number.
This is where the practice of BODMAS is required.

Solution 2

(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 $=\frac{2}{9}$

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

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

Concept Insight:-

The Idea behind introducing these types of problems is to understand the standard results which can be seen when a pair of numbers is added. Here one number is found to complement (known as additive inverse) of the other. Also for all such type of pair of numbers the results do not change.

Solution 3

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

Concept Insight:-

The primary reason behind introducing these types of problems is to explain how a number changes when the additive inverse of a number is provided a –ve sign before it. It can be seen that when a number is inversed twice or even number of times, the result is the same number.

Solution 4

(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 $= -1$

Concept Insight:-

The multiplicative inverse of a number is reciprocal of the number. Please note that the multiplicative inverse of zero does not exist. The purpose behind these type of question is to understand how to find the reciprocal of a number and the results when a number is multiplied by its reciprocal.

While making the reciprocal of a number it should be noted that

1. The sign of the number should not change.
2. The reciprocal so formed should not have zero as it's denominator.

Solution 5

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

1 is the multiplicative identity.

(ii) Commutativity

(iii) Multiplicative inverse

Concept insight:-

The basic idea behind this question is to check whether a student has understood the basic properties of rational number and can recall those properties while looking at the results shown. Also it should be observed from the results that during multiplication the results do not change by changing the order of multiplication.

While answering it should be noted that commutative property is different from associative property or distributive property of multiplication over addition.

Solution 6

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

Concept insight:-

This is a very basic problem based on the understanding of the terms such as reciprocal. While solving it should be noted that the reciprocal of a number does not mean that the sign of the number gets changed. Remember that while taking reciprocal of a number, the sign of the number does not change.

Solution 7

Associativity

Concept insight:-

This is to check whether the student understood the meaning of associativity. While answering this question the student should be careful about operand inside the bracket, if it is not same as that of outside (i.e. multiplication), the property is not associativity.

Solution 8

If it is the multiplicative inverse, then the product should be 1.
However, here, the product is not 1 as

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

Concept insight:-

In order to solve such problem, multiply the two numbers given and see if the answer is 1 or not. If you get one number as the reciprocal of the other the product will be 1.

At a first look since the 2nd number is not having the same sign as that of the 1st, obviously the answer should come out as "No".

Solution 9

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

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

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

Concept insight:-

Same problem, as above.

Solution 10

(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.

Solution 11

(i) No

(ii) 1, −1

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

(iv) x

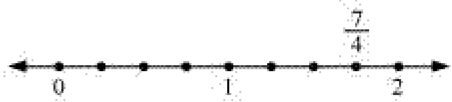
(v) Rational number

(vi) Positive rational number

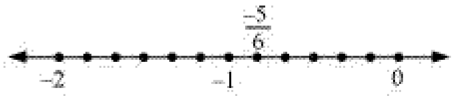
Chapter 1 - Rational Numbers Exercise Ex. 1.2

Solution 1

(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.

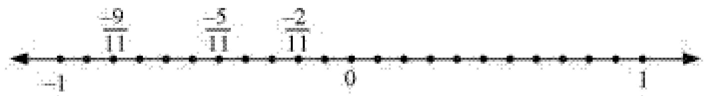


Concept Insight:-

The concept used here is to explain how a number can be places on number line, To solve such type of problem the 1st step is to check whether the number lies between -1 and 1 or not. Else look at the integral part of the number and then place it accordingly.

Solution 2

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



Concept Insight:-

The concept used here is to explain how a number can be places on number line, To solve such type of problem the 1st step is to check whether the number lies between -1 and 1 or not. Else look at the integral part of the number and then place it accordingly.

Solution 3

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

Therefore, five rational numbers smaller than 2 are

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

Concept Insight:-

The basic idea behind the question is to do comparison of numbers and identify the numbers which are relatively less than the given number.

Solution 4

$\frac{-2}{5}$ 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

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

Concept Insight:

This is one of the basic problems asked in exam. The idea behind this question is to explain that there will always exist at least one rational number between two rational numbers and to find out such numbers this problem can be taken as a puzzle.

The first and foremost important thing to remember is to check/Identify

1. The denominator of each of the given number should be same, If they are not same, replace each of them by their L.C.M.

2. Convert the numerator of each of the number by appropriate factor so that the actual number does not get change.

To solve this problem, the following algorithm could be helpful.

Assume we have to find one or more rational numbers between **a/b and c/d**, then convert each of these numbers into the numbers having same denominator such as **ad/bd and bc/bd.**

Now write each of the integer that lies between **ad and bc** on number line and assign each of these integers **bd** as denominator.

Note:- If the number of integers found are less than the desired number of rational numbers we can take the next multiple of each ad, bd, bc and bd for example the given pair of numbers can be written as 4ad/4bd and 4bc/4bd, this will increase the gap between the numerator and hence we can find more integers between the two numerators.

Solution 5

(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

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

Concept Insight:

This is one of the basic problems asked in exam. The idea behind this question is to explain that there will always exist at least one rational number between two rational numbers and to find out such numbers this problem can be taken as a puzzle.

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1. The denominator of each of the given number should be same, If they are not same, replace each of them by their L.C.M.

2. Convert the numerator of each of the number by appropriate factor so that the actual number does not get change.

To solve this problem, the following algorithm could be helpful.

Assume we have to find one or more rational numbers between **a/b and c/d**, then convert each of these numbers into the numbers having same denominator such as **ad/bd and bc/bd.**

Now write each of the integer that lies between **ad and bc** on number line and assign each of these integers **bd** as denominator.

Note:- If the number of integers found are less than the desired number of rational numbers we can take the next multiple of each ad, bd, bc and bd for example the given pair of numbers can be written as 4ad/4bd and 4bc/4bd, this will increase the gap between the numerator and hence we can find more integers between the two numerators.

Solution 6

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

Therefore, five rational numbers greater than -2 are

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

Concept Insight:

This is one of the basic problems asked in exam. The idea behind this question is to explain that there will always exist at least one rational number between two rational numbers and to find out such numbers this problem can be taken as a puzzle.

The first and foremost important thing to remember is to check/Identify

1. The denominator of each of the given number should be same, If they are not same, replace each of them by their L.C.M.

2. Convert the numerator of each of the number by appropriate factor so that the actual number does not get change.

To solve this problem, the following algorithm could be helpful.

Assume we have to find one or more rational numbers between **a/b and c/d**, then convert each of these numbers into the numbers having same denominator such as **ad/bd and bc/bd.**

Now write each of the integer that lies between **ad and bc** on number line and assign each of these integers **bd** as denominator.

Note:- If the number of integers found are less than the desired number of rational numbers we can take the next multiple of each ad, bd, bc and bd for example the given pair of numbers can be written as 4ad/4bd and 4bc/4bd, this will increase the gap between the numerator and hence we can find more integers between the two numerators.

Solution 7

$\frac{3}{5}$ 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

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

Concept Insight:

This is one of the basic problems asked in exam. The idea behind this question is to explain that there will always exist at least one rational number between two rational numbers and to find out such numbers this problem can be taken as a puzzle.

The first and foremost important thing to remember is to check/Identify

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Now write each of the integer that lies between **ad and bc** on number line and assign each of these integers **bd** as denominator.

Note:- If the number of integers found are less than the desired number of rational numbers we can take the next multiple of each ad, bd, bc and bd for example the given pair of numbers can be written as 4ad/4bd and 4bc/4bd, this will increase the gap between the numerator and hence we can find more integers between the two numerators.