Unit 1(Rational Numbers)

Multiple Choice Questions

Question . 1 A number which can be expressed as $\frac{p}{q}$, where p and q are integers and $q \neq 0$ is
(a) natural number (b) whole number
(c) integer (d) rational number

Solution. (d) A number which can be expressed as $\frac{p}{q}$, where p and q are integers and $q \neq 0$ is a rational number.

Question . 2 A number of the form $\frac{p}{q}$ is said to be a rational number, if
(a) p, q are integers (b) p, q are integers and $q \neq 0$
(c) p, q are integers and $p \neq 0$ (d) p, q are integers and $p \neq 0$, also $q \neq 0$

Solution. (b) A number of the form $\frac{p}{q}$ is said to be a rational number, if p and q are integers and

Question . 3 The numerical expression $\frac{3}{8} + \frac{(-5)}{7} = \frac{-19}{56}$ shows that
(a)rational numbers are closed under addition
(b) rational numbers are not closed under addition
(c) rational numbers are closed under multiplication
(d) addition of rational numbers is not commutative

Solution. (b) We have $\frac{3}{8} + \frac{(-5)}{7} = \frac{-19}{56}$
Show that rational numbers are closed under addition.
[$\frac{3}{8}$ and $\frac{-5}{7}$ are rational numbers and their addition is $\frac{-19}{56}$ which is also a rational number]
Note The sum of any two rational numbers is always a rational number.

Question . 4 Which of the following is not true?
(a) rational numbers are closed under addition
(b) rational numbers are closed under subtraction
(c) rational numbers are closed under multiplication
(d) rational numbers are closed under division

Solution. (d) Rational numbers are not closed under division.
As, 1 and 0 are the rational numbers but $\frac{1}{0}$ is not defined.

Question . 5 $-\frac{3}{8}+\frac{1}{7}=\frac{1}{7}+[\frac{-3}{8}]$ is an example to show that
(a) addition of rational numbers is commutative
(b) rational numbers are closed under addition
(c) addition of rational numbers is associative
(d) rational numbers are distributive under addition

Solution.

(a) Given, $\frac{-3}{8}+\frac{1}{7}=\frac{1}{7}+\left(\frac{-3}{8}\right)$

Let two rational numbers, $a=\frac{-3}{8}, b=\frac{1}{7}$

$\therefore \quad a+b=\frac{-3}{8}+\frac{1}{7}=\frac{-21+8}{56}=\frac{-13}{56}$

and $\quad b+a=\frac{1}{7}+\frac{-3}{8}=\frac{8-21}{56}=\frac{-13}{56}$

Clearly, a + b = b + a
So, addition is communication for rational numbers

Question . 6 Which of the following expressions shows that rational numbers are associative under multiplication.

(a) $\frac{2}{3}\times\left(\frac{-6}{7}\times\frac{3}{5}\right)=\left(\frac{2}{3}\times\frac{-6}{7}\right)\times\frac{3}{5}$ (b) $\frac{2}{3}\times\left(\frac{-6}{7}\times\frac{3}{5}\right)=\frac{2}{3}\times\left(\frac{3}{5}\times\frac{-6}{7}\right)$

(c) $\frac{2}{3}\times\left(\frac{-6}{7}\times\frac{3}{5}\right)=\left(\frac{3}{5}\times\frac{2}{3}\right)\times\frac{-6}{7}$ (d) $\left(\frac{2}{3}\times\frac{-6}{7}\right)\times\frac{3}{5}=\left(\frac{-6}{7}\times\frac{2}{3}\right)\times\frac{3}{5}$

Solution.

(a) Given, $\frac{2}{3}\times\left(-\frac{6}{7}\times\frac{3}{5}\right)=\left(\frac{2}{3}\times\frac{-6}{7}\right)\times\frac{3}{5}$ $\quad$ [by associative property under multiplication, $a\times(b\times c)=(a\times b)\times c$]

$\Rightarrow \quad \frac{2}{3}\times\frac{-18}{35}=\frac{-12}{21}\times\frac{3}{5}$

So, a x (b x c) = (a x b) x c
Hence, the given expression shows that rational numbers are associative under multiplication.

Question . 7 Zero (0) is
(a) the identity for addition of rational numbers
(b) the identity for subtraction of rational numbers
(c) the identity for multiplication of rational numbers
(d) the identity for division of rational numbers

Solution . (a) Zero (0) is the identity for addition of rational numbers.
That means,
If a is a rational number.
Then, a+0=0+a = a
Note Zero (0) is also the additive identity for integers and whole number as well.

Question . 8 One (1) is

(a) the identity for addition of rational numbers

(b) the identity for subtraction of rational numbers

(c) the identity for multiplication of rational numbers

(d) the identity for division of rational numbers

Solution . (c) One (1) is the identity for multiplication of rational numbers.

That means,

If a is a rational number.

Then, a-1 = 1-a = a

Note One (1) is the multiplication identity for integers and whole number also.

Question . 9 The additive inverse of $\frac{-7}{19}$ is

(a) $\frac{-7}{19}$ (b) $\frac{7}{19}$ (c) $\frac{19}{7}$ (d) $\frac{-19}{7}$

Solution . (b) We know that, if a and b are the additive inverse of each other, then a + b = 0

Suppose, x is the additive inverse of $\frac{-7}{19}$

Then, $x - \frac{7}{19} = 0 \Rightarrow x = \frac{7}{19}$

Hence, additive inverse of $\frac{-7}{19}$ is $\frac{7}{19}$.

Question . 10 Multiplicative inverse of a negative rational number is

(a) a positive rational number (b) a negative rational number

(c) 0 (d) 1

Solution. (b) We know that, the product of two rational numbers is 1, taken they are multiplication inverse of each other, e.g.

Suppose, p is negative rational number, i.e.

$\frac{1}{p}$ is the multiplicative inverse of-p, then, -p x $\frac{1}{-p}$ = 1

Hence, multiplicative inverse of a negative rational number is a negative rational number.

Question. 11 If x + 0 = 0 + x = x, which is rational number, then 0 is called

(a) identity for addition of rational numbers

(b) additive inverse of x

(c) multiplicative inverse of x

(d) reciprocal of x

Solution . (a) We know that, the sum of any rational number and zero (0) is the rational number itself.

Now, x + 0 = 0+ x= x, which is a rational number, then 0 is called identity for addition of rational numbers.

Question . 12 To get the product 1, we should multiply $\frac{8}{21}$ by

(a) $\frac{8}{21}$ (b) $\frac{-8}{21}$ (c) $\frac{21}{8}$ (d) $\frac{-21}{8}$

Solution .

(c) Let we should multiply $\frac{8}{21}$ by x. Then, according to question, $x \times \frac{8}{21} = 1$

Hence, we should multiply $\frac{8}{21}$ by $\frac{21}{8}$, for getting the product 1.

Question . 13 – (-x) is same as

(a)-x (b)x (c)$\frac{1}{x}$ (d)$\frac{-1}{x}$

Solution . (b) -(-x) = x

Negative of negative rational number is equal to positive rational number.

Question . 14 The multiplicative inverse of $-1\frac{1}{7}$ is

(a) $\frac{8}{7}$ (b) $\frac{-8}{7}$ (c) $\frac{7}{8}$ (d) $\frac{7}{-8}$

Solution . (d) We know that, if the product of two rational numbers is 1, then they are multiplicative inverse of each other.

Given number is $-1\frac{1}{7}$, i.e. $\frac{-8}{7}$.

Let the multiplicative inverse of $-\frac{8}{7}$ be x.

$$\Rightarrow \quad \frac{-8}{7} \times x = 1$$

$$\Rightarrow \quad x = 1 \times \left(-\frac{7}{8}\right) \quad \text{[by cross-multiplication]}$$

$$= \frac{-7}{8} \text{ or } \frac{7}{-8}$$

Hence, $\frac{7}{-8}$ is the multiplicative inverse of $-\frac{8}{7}$.

Question . 15 If x is any rational number, then x + 0 is equal to
(a)x (b) 0 (c)-x (d) Not defined
Solution . (a) If x is any rational number, then x + 0 = x [0 is the additive identity]

Question . 16 The reciprocal of 1 is ;
(a) 1 (b) -1 (c) 0 (d) Not defined
Solution . (a) The reciprocal of 1 is the number itself.

Question . 17 The reciprocal of -1 is
(a) 1 (b) -1 (c) 0 (d) Not defined
Solution . (b) The reciprocal of -1 is the number itself.

Question . 18 The reciprocal of 0 is
(a) 1 (b) -1 (c) 0 (d) Not defined
Solution . (d) The reciprocal of 0 is not defined.

Question . 19 The reciprocal of any rational number $\frac{p}{q}$, where p and q are integers and $q \neq 0$ is
(a)$\frac{p}{q}$ (b)1 (c)0 (d)$\frac{q}{p}$
Solution . (d) The reciprocal of any rational number $\frac{p}{q}$, where p and q are integers and $q \neq 0$ is $\frac{q}{p}$

Question . 20 If y is the reciprocal of rational number x, then the reciprocal of y will be
(a)x (b) y (c) $\frac{x}{y}$ (d) $\frac{y}{x}$
Solution . (a) If y be the reciprocal of rational number x, i.e. y = $\frac{1}{x}$ or x = $\frac{1}{y}$.
Hence, the reciprocal of y will be x.

Question .21

The reciprocal of $\frac{-3}{8} \times \left(\frac{-7}{13}\right)$ is

(a) $\frac{104}{21}$ (b) $\frac{-104}{21}$ (c) $\frac{21}{104}$ (d) $\frac{-21}{104}$

Solution .

(a) Given number is $\frac{-3}{8} \times \left(\frac{-7}{13}\right)$

The product of $-\frac{3}{8} \times \left(\frac{-7}{13}\right) = \frac{21}{104}$.

Hence, the multiplicative inverse of $\frac{21}{104}$ is $\frac{104}{21}$.

Question . 22 Which of the following is an example of distributive property of multiplication over addition for rational numbers.

(a) $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left[-\frac{1}{4} \times \frac{2}{3}\right] + \left[-\frac{1}{4} \times \left(\frac{-4}{7}\right)\right]$

(b) $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left[\frac{1}{4} \times \frac{2}{3}\right] - \left(\frac{-4}{7}\right)$

(c) $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \frac{2}{3} + \left(-\frac{1}{4}\right) \times \frac{-4}{7}$

(d) $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} - \frac{1}{4}$

Solution . We know that, the distributive property of multiplication over addition for rational numbers can be expressed as a x (b + c) = ab + ac, where a, b and c are rational numbers.

Here, $\frac{-1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left[\frac{-1}{4} \times \frac{2}{3}\right] + \left[\frac{-1}{4} \times \left(\frac{-4}{7}\right)\right]$

is the example of distributive property of multiplication over addition for rational numbers.

Question . 23 Between two given rational numbers, we can find

(a) one and only one rational number

(b) only two rational numbers

(c) only ten rational numbers

(d) infinitely many rational numbers

Solution . (d) We can find infinite many rational numbers between two given rational numbers.

Question .24

$\frac{x+y}{2}$ **is a rational number.**

(a) Between x and y

(b) Less than x and y both

(c) Greater than x and y both

(d) Less than x but greater than y

Solution .

(a) Let x and y be two numbers.

Case I If $x < y$

Then, $\frac{x+y}{2}$ lies in between x and y such that

Case II If $y < x$

Then, $\frac{x+y}{2}$ lies in between x and y such that

Question . 25 Which of the following statements is always true?

(a) $\frac{x-y}{2}$ is a rational number between x and y

(b) $\frac{x+y}{2}$ is a rational number between x and y

(c) $\frac{x \times y}{2}$ is a rational number between x and y

(d) $\frac{x+y}{2}$ is a rational number between x and y

Solution .

(b) Here, $\frac{x+y}{2}$ is a rational number.

Then, it always lies in between x and y either $x < y$ or $y < x$.

Fill in the Blanks

In questions 26 to 47, fill in the blanks to make the statements true.

Question . 26 The equivalent of $\frac{5}{7}$ whose numerator is 45, is —.

Solution .

$\left(\frac{45}{63}\right)$

Take $\frac{5}{7}$, $\frac{5}{7} \times \frac{9}{9}$ [on multiplying numerator and denominator by 9]

$= \frac{45}{63}$

Hence, $\frac{45}{63}$ is equivalent to $\frac{5}{7}$.

Question . 27 The equivalent rational number of $\frac{7}{9}$, whose denominator is 45 is——————.

Solution .

$\left(\frac{35}{45}\right)$

Take $\frac{7}{9}$, $\frac{7}{9} \times \frac{5}{5}$ [on multiplying numerator and denominator by 5]

$= \frac{35}{45}$

Hence, $\frac{35}{45}$ is equivalent to $\frac{7}{9}$.

Question . 28 Between the numbers $\frac{15}{20}$ and $\frac{35}{40}$, the greater number is———————-.

Solution .

$\left(\frac{35}{40}\right)$

Given numbers are $\frac{15}{20}$ and $\frac{35}{40}$.

LCM of 20 and 40 $= 2 \times 2 \times 2 \times 5 = 40$

Now, $\frac{15}{20} = \frac{15}{20} \times \frac{2}{2}$ [on multiplying and dividing by 2]

$= \frac{30}{40}$

2	20, 40
2	10, 20
2	5, 10
5	5, 5
	1, 1

On comparing,

$$\frac{35}{40} > \frac{30}{40}$$

$\Rightarrow$ $$\frac{35}{40} > \frac{15}{20}$$

Hence, $\frac{35}{40}$ is greater.

Question . 29 The reciprocal of a positive rational number is—————.
Solution .

positive rational number

The positive rational number is of the form $\frac{p}{q}$, where p and q both belongs to I^+ (positive integers) or I^- (negative integers).

Hence, the reciprocal is of the form $\frac{q}{p}$, where p and q both belongs to I^+ or I^-.

Question . 30 The reciprocal of a negative rational number is———————.
Solution .

negative rational number

The negative rational number is of the form $\frac{p}{q}$, where $p \in I^+, q \in I^-$ or $p \in I^-, q \in I^+$

Hence, the reciprocal is of the form $\frac{q}{p}$, where $p \in I^+, q \in I^-$ or $p \in I^-, q \in I^+$

Question. 31 Zero has————reciprocal.
Solution .

no

The reciprocal of 0 is $\frac{1}{0}$ and $\frac{1}{0}$ is not defined.

Question. 32 The numbers —————and—————are their own reciprocal.
Solution .

1, – 1

The reciprocal of 1 and – 1 are $\frac{1}{1}$ and $\frac{1}{-1}$, i.e. 1 and – 1 respectively.

Question . 33 If y is the reciprocal of x, then the reciprocal of y^2 in terms of x will be——————.
Solution .

x^2

Given, $\frac{1}{x} = y$ ... (i)

Now, reciprocal of $y^2 = \frac{1}{y^2} = \frac{1}{\left(\frac{1}{x}\right)^2}$ [from Eq. (i)]

$= x^2$

Question . 34

The reciprocal of $\frac{2}{5} \times \left(\frac{-4}{9}\right)$ is____.

Solution .

$\frac{-45}{8}$

Here, $\frac{2}{5} \times \left(\frac{-4}{9}\right) = \frac{-8}{45}$

Hence, the reciprocal of $-\frac{8}{45}$ is $\frac{-45}{8}$.

Question . 35

$(213 \times 657)^{-1} = (213)^{-1} \times$ ______.

Solution .

$\frac{1}{657}$

Suppose, $(213 \times 657)^{-1} = (213)^{-1} \times x$

$$\Rightarrow \quad \frac{1}{213 \times 657} = \frac{1}{213} \times x$$

$$\Rightarrow \quad x = \frac{213}{213 \times 657} \Rightarrow x = \frac{1}{657}$$

Question . 36 The negative of 1 is—————-.

Solution . -1 The negative of 1 is -1.

Question . 37

For rational numbers $\frac{a}{b}$, $\frac{c}{d}$ and $\frac{e}{f}$, we have $\frac{a}{b} \times \left(\frac{c}{d} + \frac{e}{f}\right) =$ ___+

Solution .

$\frac{ac}{bd}, \frac{ae}{bf}$

If $\frac{a}{b} \times \left(\frac{c}{d} + \frac{e}{f}\right) = \frac{a}{b} \times \frac{c}{d} + \frac{a}{b} \times \frac{e}{f} = \frac{ac}{bd} + \frac{ae}{bf}$

Question . 38 $\frac{-5}{7}$ is———————than -3.

Solution .

greater

First, we convert the given rational number into like denominator. Now, LCM of 7 and 1 = 7.

$$-3 = \frac{-3 \times 7}{7} \quad \text{[on multiplying and dividing by 7]}$$

$$= \frac{-21}{7}$$

As, $\frac{-5}{7} > \frac{-21}{7}$

i.e. $\frac{-5}{7} > -3$

Hence, $-\frac{5}{7}$ is greater than –3.

Question . 39 There are rational numbers between any two rational numbers.

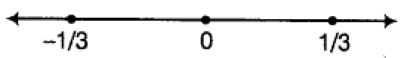
Solution . Infinite

There are infinite rational numbers between any two rational numbers.

Question . 40 The rational numbers $\frac{1}{3}$ and $\frac{-1}{3}$ are on the sides of zero on the number line.

Solution .

opposite



Question . 41 The negative of a negative rational number is always a—————-rational number.

Solution. positive

Let x be a positive rational number.

Then, – x be a negative rational number.

Now, negative of a negative rational number = – (- x)= x =positive rational number.

Question . 42 Rational numbers can be added or multiplied in any————-.

Solution . order

Rational numbers can be added or multiplied in any order and this concept is known as commutative property.

Question . 43 The reciprocal of $\frac{-5}{7}$ is——————.

Solution .

$\frac{-7}{5}$

The reciprocal of $\frac{-5}{7}$ is $\frac{1}{\left(\frac{-5}{7}\right)}$, i.e. $\frac{-7}{5}$.

Question . 44 The multiplicative inverse of $\frac{4}{3}$ is————.

Solution .

$\frac{3}{4}$

Let x be the multiplicative inverse of $\frac{4}{3}$.

By the definition,

i.e. $x \times \frac{4}{3} = 1 \Rightarrow x = \frac{3}{4}$

Hence, the multiplication inverse of $\frac{4}{3}$ is $\frac{3}{4}$.

Question . 45 The rational number 10.11 in the form $\frac{p}{q}$ is ———.

Solution .

$\frac{1011}{100}$

Let $x = 10.11$

$\Rightarrow$ $100x = 10.11 \times 100$ [multiplying both sides by 100]

$\Rightarrow$ $100x = 1011$

$\Rightarrow$ $\frac{100x}{100} = \frac{1011}{100}$ [dividing both sides by 100]

$\Rightarrow$ $x = \frac{1011}{100}$

Hence, the rational number 10.11 in the form $\frac{p}{q}$ is $\frac{1011}{100}$.

Question .46

$$\frac{1}{5} \times \left[\frac{2}{7} + \frac{3}{8}\right] = \left[\frac{1}{5} \times \frac{2}{7}\right] + \_\_\_\_.$$

Solution .

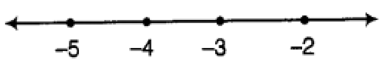
$\frac{1}{5} \times \frac{3}{8}$

$$\frac{1}{5} \times \left[\frac{2}{7} + \frac{3}{8}\right] = \frac{1}{5} \times \frac{2}{7} + \frac{1}{5} \times \frac{3}{8}$$

Question . 47 The two rational numbers lying between -2 and -5 with denominator as 1 are ————and————.

Solution .

$-3, -4$



-3 and -4 are the two rational numbers lie between -2 and -5 with denominator 1.

True/False

In questions 48 to 99, state whether the given statements are True or False.

Question . 48 If $\frac{x}{y}$ is a rational number, then y is always a whole number.

Solution .

False

If $\frac{x}{y}$ is a rational number.

Then, x and y are integers, where $y \neq 0$

Hence, y is always a non-zero integer.

Question . 49 If $\frac{p}{q}$ is a rational number, then p Cannot be equal to zero.

Solution .

False

If $\frac{p}{q}$ is a rational number.

Then, p can be equal to any integer.

i.e. p can be zero.

Question . 50 If $\frac{r}{s}$ is a rational number, then s cannot be equal to zero.

Solution .

True

If $\frac{r}{s}$ is a rational number.

Then, s can be any non-zero integer.

Hence, s cannot be equal to zero.

Question . 51 $\frac{5}{6}$ lies between $\frac{2}{3}$ and 1.

Solution .

True

First, we convert the given rational numbers with denominator as 6, we get

$$\frac{2}{3} = \frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$$

$$1 = 1 \times \frac{6}{6} = \frac{6}{6}$$

$$\because \quad \frac{4}{6} < \frac{5}{6} < \frac{6}{6}$$

$$\therefore \quad \frac{2}{3} < \frac{5}{6} < 1$$

Therefore, $\frac{5}{6}$ lies between $\frac{2}{3}$ and 1.

Note *We know that, if a and b are two rational numbers, then* $\frac{a+b}{2}$ *is a rational number between a and b such that* $a < \frac{a+b}{2} < b$.

Question . 52 $\frac{5}{10}$ lies between $\frac{1}{2}$ and 1.

Solution .

False

First, we convert the given rational numbers with denominator as 10, we get

$$\frac{1}{2}=\frac{1}{2}\times\frac{5}{5}=\frac{5}{10}$$

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

$$\frac{1}{2}\text{ is equal to }\frac{5}{10}.$$

Therefore, $\frac{5}{10}$ does not lie between $\frac{1}{2}$ and 1.

Question . 53 $\frac{5}{10}$ lies between -3 and 4.

Solution .

True

First, we convert the given rational numbers with denominator as 2, then we get

$$-3=-3\times\frac{2}{2}=\frac{-6}{2}$$

$$-4=-4\times\frac{2}{2}=\frac{-8}{2}$$

$$\because \quad \frac{-8}{2}<\frac{-7}{2}<\frac{-6}{2}$$

$$\therefore \quad -4<\frac{-7}{2}<-3$$

Therefore, $\frac{-7}{2}$ lies between -3 and -4.

Question . 54 $\frac{9}{6}$ lies between 1 and 2.

Solution .

True

First, we convert the given rational numbers with denominator as 6, we get

$$1=1\times\frac{6}{6}=\frac{6}{6}$$

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

$$\because \quad \frac{6}{6}<\frac{9}{6}<\frac{12}{6}$$

$$\therefore \quad 1<\frac{9}{6}<2$$

Therefore, $\frac{9}{6}$ lies between 1 and 2.

Question . 55 If $a \neq 0$ the multiplicative inverse of $\frac{a}{b}$ is $\frac{b}{a}$.

Solution .

True

If $a = 0$, then multiplicative inverse of $\frac{a}{b}$ is not defined.

So, if $a \neq 0$, then multiplicative inverse of $\frac{a}{b}$ is $\frac{b}{a}$.

Question . 56 The multiplicative inverse of $\frac{-3}{5}$ is $\frac{5}{3}$.

Solution .

False

The multiplicative inverse of $\frac{-3}{5}$ is $\frac{1}{\left(\frac{-3}{5}\right)}$, i.e. $\frac{-5}{3}$.

Question . 57 The additive inverse of $\frac{1}{2}$ is -2.

Solution .

False

Let additive inverse of $\frac{1}{2}$ be x.

i.e. $\frac{1}{2} + x = 0 \Rightarrow x = \frac{-1}{2}$

Hence, additive inverse of $\frac{1}{2}$ is $\frac{-1}{2}$.

Question . 58

If $\frac{x}{y}$ is the additive inverse of $\frac{c}{d}$, then $\frac{x}{y} + \frac{c}{d} = 0$.

Solution .

True

If $\frac{x}{y}$ is the additive inverse of $\frac{c}{d}$.

i.e. $\frac{x}{y} + \frac{c}{d} = 0$

Question . 59 For every rational number x, x + 1 = x.

Solution . False

For every rational number , x + 0 = x

Question . 60

If $\frac{x}{y}$ is the additive inverse of $\frac{c}{d}$, then $\frac{x}{y} - \frac{c}{d} = 0$

Solution .

False

If $\frac{x}{y}$ is the additive inverse of $\frac{c}{d}$.

i.e. $\frac{x}{y} + \frac{c}{d} = 0$

Question . 61 The reciprocal of a non-zero rational number $\frac{q}{p}$ is the rational number $\frac{q}{p}$.

Solution . False

The reciprocal of a non-zero rational number $\frac{q}{p}$. is the rational number $\frac{p}{q}$

Question . 62 If x + y = 0, then -y is known as the negative of x, where x and y are rational numbers.

Solution . False

If x and y are rational numbers and x+ y = 0.

Then, y is known as the negative of x.

Question . 63 The negative of the negative of any rational number is the number itself.

Solution . True

Let x be a positive rational number. Then, -x be a negative rational number.

Now, negative of negative rational number = -(-x)= x = Positive rational number

Question . 64 The negative of 0 does not exist.

Solution . True

Since, zero is neither a positive integer nor a negative integer.

Question . 65 The negative of 1 is 1 itself.

Solution . False

The negative of 1 is -1.

Question . 66 For all rational numbers x and y,x-y = y- x

Solution . False

For all rational numbers x and y,

x-y = -(y-x)

Question . 67 For all rational numbers x and y, x x y = y x x.

Solution . True

For all rational numbers x and y,

x x y= y x x

Question . 68 For every rational number x, x x 0 = x.

Solution . False

For every rational number x,

x x 0 = 0

Question . 69 For every rational numbers x, y and z, x + (y x z) = (x + y) x (x + z)

Solution . False

For all rational numbers a, b and c.

a(b + c) = ab+ ac

Question . 70 For all rational numbers a, b and c,a (b + c) = ab + bc.

Solution . False

As, addition is not distributive over multiplication.

Question . 71 1 is the only number which is its own reciprocal.

Solution . False

Reciprocal of 1 is 1 and reciprocal of -1 is -1.

Question . 72 -1 is not the reciprocal of any rational number.

Solution . False

-1 is the reciprocal of -1.

Question . 73 For any rational number x, x + (-1) = – x.

Solution . False

For every rational number x,

x x (-1) = – x

Question . 74 For rational numbers x and y, if x < y, then x – y is a positive rational number.

Solution .

False

For rational numbers x and y,

if $x < y$, then $x - y$ is a negative rational number.

e.g. Let $x = \frac{1}{2}$, $y = \frac{1}{3}$ are two rational numbers.

Then, according to equation,

$$x - y = \frac{1}{2} - \frac{1}{3} = \frac{3-2}{6} = \frac{1}{6}$$

Question . 75 If x and y are negative rational numbers, then so is x + y.

Solution .

True

e.g. $\left(-\frac{1}{2}\right)+\left(-\frac{1}{2}\right)=-1$, which is again a negative rational number.

Note *Sum of two negative rational numbers is equal to a negative rational number.*

Question . 76 Between any two rational numbers there are exactly ten rational . numbers.
Solution . False
There are infinite rational numbers between any two rational numbers.

Question . 77 Rational numbers are closed under addition and multiplication but not under subtraction.
Solution . False
Rational numbers are closed under addition, subtraction and multiplication.

Question . 78 Subtraction of rational number is commutative.
Solution . False
Subtraction of rational numbers is not commutative, i.e. $a-b \neq b-a$
where, a and b are rational numbers.

Question . 79 $-\frac{3}{4}$ is smaller than -2 .
Solution .

False

Here, $\frac{-3}{4}$ and -2 (like)

First, we do same denominator.

We get, $-\frac{3}{4}$ and $\frac{-2\times 4}{1\times 4}$

$\Rightarrow \quad \frac{-3}{4}$ and $\frac{-8}{4}$

Now, comparing both numbers,

$$\frac{-3}{4}>\frac{-8}{4} \Rightarrow \frac{-3}{4}>-2$$

So, $-\frac{3}{4}$ is greater than -2.

Question . 80 0 is a rational number.
Solution .

True

$0=\frac{0}{1}$ is a rational number.

Question . 81 All positive rational numbers lie between 0 and 1000.
Solution . False
Infinite positive rational numbers lie on the right side of 0 on the number line.

Question. 82 The population of India in 2004-05 is a rational number.
Solution. True
The population of India in 2004-05 is a rational number.

Question. 83 There are countless rational numbers between $-\frac{5}{6}$ and $-\frac{8}{9}$.
Solution.

True

$\frac{5}{6}$ and $\frac{8}{9}$ are rational numbers and there are infinite (countless) rational numbers lie between $\frac{5}{6}$ and $\frac{8}{9}$.

Note *We know that there are infinite rational numbers lie between two rational numbers.*

Question. 84

The reciprocal of x^{-1} is $\frac{1}{x}$.

Solution.

False

$x^{-1} = \frac{1}{x}$

$\therefore$ Reciprocal of $\frac{1}{x}$ is x.

Question. 85 The rational number $-\frac{57}{23}$ lies to the left of zero on the number line.

Solution. False

Since, $-\frac{57}{23}$ is a positive rational number.

So, it lies on the right of zero on the number line.

Question .86 The rational number $-\frac{7}{-4}$ lies to the right of zero on the number line.

Solution . False

Since, $-\frac{7}{-4}$ is a negative rational number.

So, it lies on the left of zero on the number line.

Question .87 The rational number $-\frac{-8}{-3}$ lies neither to the right nor to the left of zero on the number line.

Solution . False

$-\frac{-8}{-3} = -\frac{8}{3}$ is a positive rational number.

Hence, it lies on the right of zero on the number line.

Question . 88 The rational numbers $-\frac{1}{2}$ and -1 are on the opposite sides of zero on the number tine.

Solution . True

Since, positive rational number and negative rational number are on the opposite sides of zero on the number line.'

Hence, $-\frac{1}{2}$ and -1 are on the opposite sides of zero on the number line.

Question . 89 Every fraction is a rational number.

Solution .

True

A fraction is a part or portion of the whole which can be expressed in the form of $\frac{p}{q}$, (positive rational number) where $p, q \in I^+$.

Hence, every fraction is a rational number but *vice-versa* is not true.

Question . 90 Every integer is a rational number.

Solution . True

Every integer is a rational number whose denominator remain 1.

Question . 91 The rational numbers can be represented on the number line.

Solution . True

The rational numbers can be represented on the number line.

Question . 92 The negative of a negative rational number is a positive rational number.
Solution . True
Let be a positive rational number.
Then, – x be the negative rational number.
Hence, negative of negative rational number = – (- x)= x = Positive rational number

Question . 93 If x and y are two rational numbers such that x > y, then x – y is always a positive rational number.
Solution . True
If x and y are two rational numbers such that x > y.
Then, there are three possible cases, i.e.
Case I x and y both are positive. ‘
Case II x is positive and y is negative.
Case III x and y both are negative.
In all three cases, x – y is always a positive rational number.

Question . 94 0 is the smallest rational number.
Solution . False
As the smallest rational number does not exist.

Question .95 Every whole number is an integer.
Solution . True
W (whole numbers) = {0,1,2, 3 }
Z (integers) = {...- 3, – 2, -1, 0,1,2, 3,...}
Every whole number is an integer, but every integer is not a whole number.

Question .96 Every whole number is a rational number.
Solution . True
Every whole number can be written in the form of $-\frac{p}{q}$, where p, q are integers and $q \neq 0$.
Hence, every whole number is a rational number.

Question . 97 0 is whole number but it is not a rational number.
Solution . False
0 is a whole number and also a rational number.

Question . 98 The rational numbers $-\frac{1}{2}$and $-\frac{-}{5}2$ are on the opposite sides of zero on the number line.
Solution . True
Positive rational number and negative rational number remain on opposite sides of zero on the number line.

Question .99 Rational numbers can be added (or multiplied) in any order
$$\frac{-4}{5} \times \frac{-6}{5} = \frac{-6}{5} \times \frac{-4}{5}$$

Solution .

True

We know, $\frac{-4}{5} \times \frac{-6}{5} = \frac{-6}{5} \times \frac{-4}{5} \Rightarrow \frac{24}{25} = \frac{24}{25}$

So, rational number can be added (or multiplied) in any order.

Note *Let a and b are two rational numbers.*

Then, $ab = ba$ [commutative under multiplication]

$a + b = b + a$ [commutative under addition]

Hence, rational numbers can be added (or multiplied) in any order.

Question . 100 Solve the following, select the rational numbers from the list which are also the integers.

$$\frac{9}{4}, \frac{8}{4}, \frac{7}{4}, \frac{6}{4}, \frac{9}{3}, \frac{8}{3}, \frac{7}{3}, \frac{6}{3}, \frac{5}{2}, \frac{4}{2}, \frac{3}{1}, \frac{3}{2}, \frac{1}{1}, \frac{0}{1}, \frac{-1}{1}, \frac{-2}{2}, \frac{-3}{2}, \frac{-4}{2}, \frac{-5}{2}, \frac{-6}{2}$$

Solution . From the given rational numbers, the numbers whose denominator is 1 and the numbers whose numerator is the multiple of denominator are the integers.

Hence, $\frac{8}{4}, \frac{9}{3}, \frac{6}{3}, \frac{4}{2}, \frac{3}{1}, \frac{1}{1}, \frac{-1}{1}, \frac{-2}{2}, \frac{-4}{2}, \frac{-6}{2}$ are the integers.

Question . 101 Select those which can be written as a rational number with denominator 4 in their lowest form

$$\frac{7}{8}, \frac{64}{16}, \frac{36}{-12}, \frac{-16}{17}, \frac{5}{-4}, \frac{140}{28}$$

Solution . From the given rational numbers, the number with denominator 4 in their lowest form is $-\frac{5}{-4}$

Question . 102 Using suitable rearrangement and find the sum

(a) $\frac{4}{7} + \left(\frac{-4}{9}\right) + \frac{3}{7} + \left(\frac{-13}{9}\right)$

(b) $-5 + \frac{7}{10} + \frac{3}{7} + (-3) + \frac{5}{14} + \frac{-4}{5}$

Solution .

(a) Here, $\frac{4}{7} + \left(\frac{-4}{9}\right) + \frac{3}{7} + \left(\frac{-13}{9}\right) = \frac{4}{7} + \frac{3}{7} + \left(\frac{-4}{9}\right) + \left(\frac{-13}{9}\right)$

$= \frac{7}{7} - \frac{17}{9} = 1 - \frac{17}{9} = \frac{9-17}{9} = \frac{-8}{9}$

(b) Here, $-5 + \frac{7}{10} + \frac{3}{7} + (-3) + \frac{5}{14} + \left(\frac{-4}{5}\right) = -5 + (-3) + \frac{7}{10} + \left(\frac{-4}{5}\right) + \frac{3}{7} + \frac{5}{14}$

$= -8 + \frac{7-8}{10} + \frac{6+5}{14} = -8 - \frac{1}{10} + \frac{11}{14}$

$= \frac{-560 - 7 + 55}{70} = \frac{-512}{70} = \frac{-256}{35}$

Question . 103 Verify – (-x) = x for

(i) $x = \frac{3}{5}$ (ii) $x = \frac{-7}{9}$ (iii) $x = \frac{13}{-15}$

Solution .

(i) Given, $x = \frac{3}{5} \Rightarrow -x = \frac{-3}{5} \Rightarrow -(-x) = -\left(\frac{-3}{5}\right) \Rightarrow -(-x) = \frac{3}{5} = x$

(ii) Given, $x = \frac{-7}{9} \Rightarrow -x = -\left(\frac{-7}{9}\right) \Rightarrow -x = \frac{7}{9} \Rightarrow -(-x) = \frac{-7}{9} = x$

(iii) Given, $x = \frac{13}{-15} \Rightarrow -x = -\left(\frac{13}{-15}\right) \Rightarrow -x = \frac{13}{15} \Rightarrow -(-x) = \frac{-13}{15} = x$

Question . 104 Give one example each to show that the rational numbers are closed under addition, subtraction and multiplication. Are rational numbers closed under division? Give two examples in support of your answer.

Solution . We know that, rational numbers are closed under addition, subtraction and multiplication. We can understand this from the following examples.

Rational numbers are closed under addition

e.g. $\frac{4}{7}+\frac{1}{2}=\frac{8+7}{14}=\frac{15}{14}$, which is a rational number.

Subtraction

e.g. $\frac{4}{7}-\frac{1}{2}=\frac{8-7}{14}=\frac{1}{14}$, which is a rational number.

Multiplication

e.g. $\frac{4}{7}\times\frac{1}{2}=\frac{4}{14}=\frac{2}{7}$, which is a rational number.

But rational are not closed under division. If zero is excluded from the collection of rational numbers, then we can say that rational numbers are closed under division.

Now, we see the examples given below:

$$\frac{4}{7}\div\frac{1}{2}=\frac{4}{7}\times 2=\frac{8}{7}, \text{ which is a rational number.}$$

But $\frac{4}{7}\div 0=\frac{4}{7}\times\frac{1}{0}$,

which is not defined and so, it is not a rational number.

Also, $\frac{1}{2}\div 0=\frac{1}{2}\times\frac{1}{0}$,

which is not defined and so, it is not a rational number.

Question . 105 Verify the property x + y = y + x of rational numbers by taking

(a) $x=\frac{1}{2}$ and $y=\frac{1}{2}$ (b) $x=\frac{-2}{3}$ and $y=\frac{-5}{6}$

(c) $x=\frac{-3}{7}$ and $y=\frac{20}{21}$ (d) $x=\frac{-2}{5}$ and $y=\frac{-9}{10}$

Solution .

(a) Given, $x=\frac{1}{2}$ and $y=\frac{1}{2}$

Then, $\text{LHS}=x+y=\frac{1}{2}+\frac{1}{2}=1$

$\text{RHS}=y+x=\frac{1}{2}+\frac{1}{2}=1$

$\therefore$ LHS = RHS

Hence, $x+y=y+x$

(b) Given, $x=\frac{-2}{3}$ and $y=\frac{-5}{6}$

Then, $\text{LHS}=x+y=\frac{-2}{3}+\frac{-5}{6}=\frac{-2}{3}-\frac{5}{6}=\frac{-4-5}{6}=\frac{-9}{6}$

and $\text{RHS}=y+x=\frac{-5}{6}+\frac{-2}{3}=\frac{-5}{6}-\frac{2}{3}=\frac{-5-4}{6}=\frac{-9}{6}$

$\therefore$ LHS = RHS

Hence, $x+y=y+x$

(c) Given, $x=\frac{-3}{7}$ and $y=\frac{20}{21}$

Then, $\text{LHS}=x+y=\frac{-3}{7}+\frac{20}{21}=\frac{-9+20}{21}=\frac{11}{21}$

$\text{RHS}=y+x=\frac{20}{21}-\frac{3}{7}=\frac{20-9}{21}=\frac{11}{21}$

$\therefore$ LHS = RHS

Hence, $x+y=y+x$

(d) Given, $x = \frac{-2}{5}$ and $y = \frac{-9}{10}$

Then, $\text{LHS} = x + y = \frac{-2}{5} + \frac{-9}{10} = \frac{-2}{5} - \frac{9}{10} = \frac{-4-9}{10} = \frac{-13}{10}$

$\text{RHS} = y + x = \frac{-9}{10} + \frac{-2}{5} = \frac{-9}{10} - \frac{2}{5} = \frac{-9-4}{10} = \frac{-13}{10}$

$\therefore$ LHS = RHS

Hence, $x + y = y + x$

Question . 106 Simplify each of the following by using suitable property. Also, name the property.

(a) $\left[\frac{1}{2} \times \frac{1}{4}\right] + \left[\frac{1}{2} \times 6\right]$ (b) $\left[\frac{1}{5} \times \frac{2}{15}\right] - \left[\frac{1}{5} \times \frac{2}{5}\right]$

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

Solution .

(a) Given, $\left[\frac{1}{2} \times \frac{1}{4}\right] + \left[\frac{1}{2} \times 6\right] = \frac{1}{2}\left[\frac{1}{4} + 6\right] = \frac{1}{2}\left[\frac{1+24}{4}\right] = \frac{25}{8}$

[using distributive property over addition]

(b) Given, $\left[\frac{1}{5} \times \frac{2}{15}\right] - \left[\frac{1}{5} \times \frac{2}{5}\right] = \frac{1}{5}\left[\frac{2}{15} - \frac{2}{5}\right]$ [using distributive property over addition]

$= \frac{1}{5}\left[\frac{2-6}{15}\right] = \frac{-4}{75}$

(c) Given, $\frac{-3}{5} \times \left\{\frac{3}{7} + \left(\frac{-5}{6}\right)\right\} = \frac{-3}{5} \times \frac{3}{7} + \left(\frac{-3}{5}\right) \times \left(\frac{-5}{6}\right)$

[using distributive property of multiplication over addition]

$= \frac{-9}{35} + \frac{15}{30} = \frac{-54+105}{210} = \frac{51}{210} = \frac{17}{70}$

Question . 107

Tell which property allows you to compute $\frac{1}{5} \times \left[\frac{5}{6} \times \frac{7}{9}\right]$ as $\left[\frac{1}{5} \times \frac{5}{6}\right] \times \frac{7}{9}$.

Solution .

$\frac{1}{5} \times \left[\frac{5}{6} \times \frac{7}{9}\right]$ can be written as $\left[\frac{1}{5} \times \frac{5}{6}\right] \times \frac{7}{9}$ by the help of associative property for multiplication.

Question . 108 Verify the property x x y = y x x of rational numbers by using

(a) $x = 7$ and $y = \frac{1}{2}$ (b) $x = \frac{2}{3}$ and $y = \frac{9}{4}$

(c) $x = \frac{-5}{7}$ and $y = \frac{14}{15}$ (d) $x = \frac{-3}{8}$ and $y = \frac{-4}{9}$

Solution .

(a) Given, $x = 7$ and $y = \frac{1}{2}$

Then, $\text{LHS} = x \times y = 7 \times \frac{1}{2} = \frac{7}{2}$

$$RHS = y \times x = \frac{1}{2} \times 7 = \frac{7}{2}$$

$\therefore$ LHS = RHS

Hence, $xy = yx$

(b) Given, $x = \frac{2}{3}$ and $y = \frac{9}{4}$

Then, $LHS = x \times y = \frac{2}{3} \times \frac{9}{4} = \frac{18}{12} = \frac{3}{2}$

$$RHS = y \times x = \frac{9}{4} \times \frac{2}{3} = \frac{18}{12} = \frac{3}{2}$$

$\therefore$ LHS = RHS

Hence, $xy = yx$

(c) Given, $x = \frac{-5}{7}$ and $y = \frac{14}{15}$

Then, $LHS = x \times y = \frac{-5}{7} \times \frac{14}{15} = \frac{-2}{3}$

$$RHS = y \times x = \frac{14}{15} \times \frac{-5}{7} = \frac{-2}{3}$$

$\therefore$ LHS = RHS

Hence, $xy = yx$

(d) Given, $x = \frac{-3}{8}$ and $y = \frac{-4}{9}$

Then, $LHS = x \times y = \frac{-3}{8} \times \frac{-4}{9} = \frac{1}{3 \times 2} = \frac{1}{6}$

$$RHS = y \times x = \frac{-4}{9} \times \frac{-3}{8} = \frac{1}{6}$$

$\therefore$ LHS = RHS

Hence, $xy = yx$

Question . 109 Verify the property x x (y x z)=i.(x x y) x z of rational numbers by using

(a) $x = 1, y = \frac{-1}{2}$ and $z = \frac{1}{4}$ (b) $x = \frac{2}{3}, y = \frac{-3}{7}$ and $z = \frac{1}{2}$

(c) $x = \frac{-2}{7}, y = \frac{-5}{6}$ and $z = \frac{1}{4}$ (d) $x = 0, y = \frac{1}{2}$ and $z = \frac{1}{4}$

and what is the name of this property?

Solution .

(a) Given, $x = 1, y = \frac{-1}{2}$ and $z = \frac{1}{4}$

Now, $LHS = x \times (y \times z) = 1 \times \left(\frac{-1}{2} \times \frac{1}{4}\right) = 1 \times \frac{-1}{8} = \frac{-1}{8}$

and $RHS = (x \times y) \times z = \left(1 \times \frac{-1}{2}\right) \times \frac{1}{4} = \frac{-1}{2} \times \frac{1}{4} = \frac{-1}{8}$

LHS = RHS

Hence, $x \times (y \times z) = (x \times y) \times z$

(b) Given, $x = \frac{2}{3}, y = \frac{-3}{7}$ and $z = \frac{1}{2}$

Now, $\quad \text{LHS} = x \times (y \times z) = \frac{2}{3} \times \left(\frac{-3}{7} \times \frac{1}{2}\right) = \frac{2}{3} \times \left(\frac{-3}{14}\right) = \frac{-2}{14} = \frac{-1}{7}$

and $\quad \text{RHS} = (x \times y) \times z = \left(\frac{2}{3} \times \frac{-3}{7}\right) \times \frac{1}{2} = \frac{-2}{7} \times \frac{1}{2} = \frac{-1}{7}$

LHS = RHS

Hence, $x \times (y \times z) = (x \times y) \times z$

(c) Given, $x = \frac{-2}{7}, y = \frac{-5}{6}$ and $z = \frac{1}{4}$

Now, $\quad \text{LHS} = x \times (y \times z) = \frac{-2}{7} \times \left(\frac{-5}{6} \times \frac{1}{4}\right) = \frac{-2}{7} \times \frac{-5}{24} = \frac{5}{84}$

and $\quad \text{RHS} = (x \times y) \times z = \left(\frac{-2}{7} \times \frac{-5}{6}\right) \times \frac{1}{4} = \frac{5}{21} \times \frac{1}{4} = \frac{5}{84}$

LHS = RHS

Hence, $x \times (y \times z) = (x \times y) \times z$

(d) Question is incomplete.

The name of the verified property is associative property for multiplication.

Question . 110 Verify the property x x (y + z) = x x y + x x z of rational numbers by taking

(a) $x = \frac{-1}{2}, y = \frac{3}{4}$ and $z = \frac{1}{4}$ (b) $x = \frac{-1}{2}, y = \frac{2}{3}$ and $z = \frac{3}{4}$

(c) $x = \frac{-2}{3}, y = \frac{-4}{6}$ and $z = \frac{-7}{9}$ (d) $x = \frac{-1}{5}, y = \frac{2}{15}$ and $z = \frac{-3}{10}$

Solution .

(a) Given, $x = \frac{-1}{2}, y = \frac{3}{4}$ and $z = \frac{1}{4}$

Now, $\quad \text{LHS} = x \times (y + z) = \frac{-1}{2} \times \left(\frac{3}{4} + \frac{1}{4}\right) = \frac{-1}{2} \times \frac{4}{4} = \frac{-1}{2}$

and $\quad \text{RHS} = x \times y + x \times z = \frac{-1}{2} \times \frac{3}{4} + \left(\frac{-1}{2}\right) \times \frac{1}{4} = \frac{-3}{8} - \frac{1}{8} = \frac{-3-1}{8} = \frac{-4}{8} = \frac{-1}{2}$

LHS = RHS

Hence, $x \times (y + z) = x \times y + x \times z$

(b) Given, $x = \frac{-1}{2}, y = \frac{2}{3}$ and $z = \frac{3}{4}$

Now, $\quad \text{LHS} = x \times (y + z) = \frac{-1}{2} \times \left(\frac{2}{3} + \frac{3}{4}\right) = \frac{-1}{2} \times \left(\frac{8+9}{12}\right) = \frac{-1}{2} \times \frac{17}{12} = \frac{-17}{24}$

and $\quad \text{RHS} = x \times y + x \times z = \frac{-1}{2} \times \frac{2}{3} + \left(\frac{-1}{2}\right) \times \frac{3}{4} = \frac{-1}{3} - \frac{3}{8} = \frac{-8-9}{24} = \frac{-17}{24}$

LHS = RHS

Hence, $x \times (y + z) = x \times y + x \times z$

(c) Given, $x = \frac{-2}{3}$, $y = \frac{-4}{6}$ and $z = \frac{-7}{9}$

Now, $\text{LHS} = x \times (y + z) = \frac{-2}{3} \times \left(\frac{-4}{6} + \frac{-7}{9}\right) = \frac{-2}{3} \times \left(\frac{-4}{6} - \frac{7}{9}\right)$

$$= \frac{-2}{3} \times \left(\frac{-12-14}{18}\right) = \frac{-2}{3} \times \frac{-26}{18} = \frac{26}{27}$$

and $\text{RHS} = x \times y + x \times z = \frac{-2}{3} \times \left(\frac{-4}{6}\right) + \left(\frac{-2}{3}\right) \times \left(\frac{-7}{9}\right) = \frac{4}{9} + \frac{14}{27} = \frac{12+14}{27} = \frac{26}{27}$

$\text{LHS} = \text{RHS}$

Hence, $x \times (y + z) = x \times y + x \times z$

(d) Given, $x = \frac{-1}{5}$, $y = \frac{2}{15}$ and $z = \frac{-3}{10}$

Now, $\text{LHS} = x \times (y + z) = \frac{-1}{5} \times \left(\frac{2}{15} + \frac{-3}{10}\right) = \frac{-1}{5} \times \left(\frac{2}{15} - \frac{3}{10}\right) = \frac{-1}{5} \times \left(\frac{4-9}{30}\right)$

$$= \frac{-1}{5} \times \frac{-5}{30} = \frac{1}{30}$$

and $\text{RHS} = x \times y + x \times z = \frac{-1}{5} \times \frac{2}{15} + \left(\frac{-1}{5}\right) \times \left(\frac{-3}{10}\right)$

$$= \frac{-2}{75} + \frac{3}{50} = \frac{-4+9}{150} = \frac{5}{150} = \frac{1}{30}$$

$\text{LHS} = \text{RHS}$

Hence, $x \times (y + z) = x \times y + x \times z$

Question . 111 Use the distributivity of multiplication of rational numbers over addition to simplify

(a) $\frac{3}{5} \times \left[\frac{35}{24} + \frac{10}{1}\right]$ (b) $\frac{-5}{4} \times \left[\frac{8}{5} + \frac{16}{15}\right]$

(c) $\frac{2}{7} \times \left[\frac{7}{16} - \frac{21}{4}\right]$ (d) $\frac{3}{4} \times \left[\frac{8}{9} - 40\right]$

Solution .

(a) Given, $\frac{3}{5} \times \left(\frac{35}{24} + \frac{10}{1}\right) = \frac{3}{5} \times \frac{35}{24} + \frac{3}{5} \times \frac{10}{1}$ [by using distributive property over addition]

$$= \frac{7}{8} + \frac{6}{1} = \frac{7+48}{8} = \frac{55}{8}$$

(b) Given, $\frac{-5}{4} \times \left(\frac{8}{5} + \frac{16}{15}\right) = \frac{-5}{4} \times \frac{8}{5} + \left(\frac{-5}{4}\right) \times \left(\frac{16}{15}\right)$

[by using distributive property over addition]

$$= -2 - \frac{4}{3} = \frac{-6-4}{3} = \frac{-10}{3}$$

(c) Given, $\frac{2}{7} \times \left(\frac{7}{16} - \frac{21}{4}\right) = \frac{2}{7} \times \frac{7}{16} - \frac{2}{7} \times \frac{21}{4}$ [by using distributive property over addition]

$$= \frac{1}{8} - \frac{3}{2} = \frac{1-12}{8} = \frac{-11}{8}$$

(d) Given, $\frac{3}{4} \times \left(\frac{8}{9} - 40\right) = \frac{3}{4} \times \frac{8}{9} + \left(\frac{3}{4}\right) \times (-40)$

[by using distributive property over addition]

$$= \frac{2}{3} - 30 = \frac{2-90}{3} = \frac{-88}{3}$$

Question. 112 Simplify

(a) $\frac{32}{5} + \frac{23}{11} \times \frac{22}{15}$ (b) $\frac{3}{7} \times \frac{28}{15} \div \frac{14}{5}$

(c) $\frac{3}{7} + \frac{-2}{21} \times \frac{-5}{6}$ (d) $\frac{7}{8} + \frac{1}{16} - \frac{1}{12}$

Solution .

(a) Given, $\frac{32}{5}+\frac{23}{11}\times\frac{22}{15}=\frac{32}{5}+\frac{46}{15}=\frac{96+46}{15}=\frac{142}{15}$

(b) Given, $\frac{3}{7}\times\frac{28}{15}\div\frac{14}{5}=\frac{4}{5}\div\frac{14}{5}=\frac{4}{5}\times\frac{5}{14}=\frac{2}{7}$

(c) Given, $\frac{3}{7}+\frac{-2}{21}\times\frac{-5}{6}=\frac{3}{7}+\frac{5}{63}=\frac{27+5}{63}=\frac{32}{63}$

(d) Given, $\frac{7}{8}+\frac{1}{16}-\frac{1}{12}=\frac{14+1}{16}-\frac{1}{12}=\frac{15}{16}-\frac{1}{12}=\frac{45-4}{48}=\frac{41}{48}$

Question. 113 Identify the rational number that does not belong with the other three. Explain your reasoning

$$\frac{-5}{11},\frac{-1}{2},\frac{-4}{9},\frac{-7}{3}.$$

Solution . does not belong with the other three. Since, $\frac{-7}{3}$ as it is smaller than -1 whereas rest of the numbers are greater than -1.

Question. 114 The cost of $\frac{19}{4}$ m of wire is Rs $\frac{171}{2}$ Find the cost of one metre of the wire.
Solution .

The cost of $\frac{19}{4}$ m of wire = ₹ $\frac{171}{2}$.

$\therefore$ Cost of 1 m of wire $=\frac{171}{2}\div\frac{19}{4}=\frac{171}{2}\times\frac{4}{19}=9\times2=$ ₹ 18

Hence, the cost of 1 m of wire is ₹ 18.

Question. 115 A train travels $\frac{1445}{2}$ km in $\frac{17}{2}$ h. Find the speed of the train in km/h.
Solution .

Here, distance travelled by trian $=\frac{1445}{2}$ km

Time taken by trian $=\frac{17}{2}$ h

$\because$ Speed of train $=\frac{\text{Distance travelled by train}}{\text{Time taken by train}}$

$$=\frac{\frac{1445}{2}}{\frac{17}{2}}=\frac{1445}{2}\times\frac{2}{17}\text{ km/h}$$

$$=85\text{ km/h}$$

Hence, the speed of the train is 85 km/h.

Question. 116 If 16 shirts of equal size can be made out of 24m of cloth, how much cloth is needed for making one shirt?

Solution . If 16 shirts are to be made by cloth of 24 m

Then, 1 shirt is to be made by cloth of = $\frac{24}{16}$ m = $\frac{3}{2}$ m = 1.5 m

Hence, 1.5 m cloth is needed for making one shirt.

Question. 117 $\frac{7}{11}$ of all the money in Hamid's bank account is Rs 77000. How much money does Hamid have in his bank account?
Solution .

Let money in Hamid's bank account be ₹ x.

Given, $\frac{7}{11}$ of all the money in Hamid's bank account = ₹ 77000

$$\Rightarrow \quad \frac{7}{11} \times x = 77000$$

$$\Rightarrow \quad x = \frac{77000 \times 11}{7}$$

$$\Rightarrow \quad x = 11000 \times 11$$

$$\Rightarrow \quad x = 121000$$

Hence, Hamid has ₹ 121000 in his bank account.

Question. 118 A $117\frac{1}{3}$ m long rope is cut into equal pieces measuring $7\frac{1}{3}$ m each. How many such small pieces are these?

Solution .

We have, length of rope = $117\frac{1}{3}$ m

$$= \frac{117 \times 3 + 1}{3} \text{m} = \frac{352}{3} \text{m}$$

Length of each piece = $7\frac{1}{3}$ m = $\frac{22}{3}$ m

So, the number of pieces of the rope = $\dfrac{\text{Total length of the rope}}{\text{Length of each piece}}$

$$= \frac{\frac{352}{3}}{\frac{22}{3}} = \frac{352}{3} \div \frac{22}{3} = \frac{352}{3} \times \frac{3}{22} = 16$$

Hence, number of small pieces cut from the $117\frac{1}{3}$ m long rope is 16.

Question. 119 $\frac{1}{6}$ of the class students are above average, $\frac{1}{4}$ are average and rest are below average. If there are 48 students in all, how many students are below average in the class?

Solution . Number of above average students = $\frac{1}{6}$ of the class students

Number of average students = $\frac{1}{4}$of the class students

$\therefore$ Number of below average students = $1 - \left[\frac{1}{6} + \frac{1}{4}\right]$ of the class students

$$= 1 - \left[\frac{2+3}{12}\right]$$

$$= 1 - \frac{5}{12} = \frac{7}{12} \text{ of the class students}$$

Since, number of students in the class = 48 [given]

$\therefore$ Number of below average students = $\frac{7}{12} \times 48 = 28$

So, number of below average students are 28.

Question. 120 $\frac{2}{5}$of total number of students of a school come by car while $\frac{1}{4}$ of students come by bus to school. All the other students walk to school of which $\frac{1}{3}$walk on their own and the rest are escorted by their parents. If 224 students come to school walking on their own, how many students study in that school?

Solution .

Let the number of students study in school be x.

Number of students come by car $= \frac{2}{5} \times x = \frac{2}{5}x$

Number of students come by bus $= \frac{1}{4} \times x = \frac{1}{4}x$

Remaining students walk to school $= x - \left(\frac{2}{5}x + \frac{1}{4}x\right) = x - \left(\frac{8x + 5x}{20}\right)$

$$= x - \frac{13x}{20} = \frac{20x - 13x}{20} = \frac{7x}{20}$$

Now, number of students walk to school on their own $= \frac{1}{3}$ of $\frac{7x}{20} = \frac{7x}{60}$.

Since, 224 students come to school on their own.

According to the question,

$$\frac{7x}{60} = 224$$

$$\Rightarrow \quad x = \frac{224 \times 60}{7}$$

$$= 32 \times 60 = 1920$$

Hence, 1920 students study in that school.

Question. 121 Huma, Hubna and Seema received a total of Rs 2016 as monthly allowance from their mother such that Seema gets $\frac{1}{2}$ of what Hubna gets and Huma gets $1\frac{2}{3}$ times Seema's share. How much money do the three sisters get individually?

Solution .

Seema gets allowance $= \frac{1}{2}$ of Huma's share

Hubna gets allowance $= 1\frac{2}{3}$ of Seema's share

$= \frac{5}{3}$ of Seema's share

$= \frac{5}{3}$ of $\frac{1}{2}$ of Huma's share [$\because$ Seema's share $= \frac{1}{2}$ of Huma's share]

$= \frac{5}{3} \times \frac{1}{2}$ of Huma's share

$= \frac{5}{6}$ of Huma's share

But Huma, Hubna and Seema received total monthly allowance from their mother $=$ ₹ 2016

$\therefore$ Huma's share + Hubna's share + Seema's share = ₹ 2016

1 of Huma's share + $\frac{5}{6}$ of Huma's share + $\frac{1}{2}$ of Huma's share = ₹ 2016

So, $\left(1 + \frac{5}{6} + \frac{1}{2}\right)$ of Huma's share = ₹ 2016

$\Rightarrow$ $\left(\frac{6 + 5 + 3}{6}\right)$ of Huma's share = ₹ 201 6

$\Rightarrow$ $\frac{14}{6}$ of Huma's share = ₹ 2016

$\therefore$ Huma's share = ₹ $2016 + \frac{14}{6}$

= ₹ $2016 \times \frac{6}{14} = 144 \times 6 =$ ₹ 864

So, Seema's share $= \frac{1}{2}$ of $864 = \frac{1}{2} \times 864 =$ ₹ 432

and share $= \frac{5}{6}$ of $864 = 5 \times 144 =$ ₹ 720

Hence, Huma, Hubna and Seema get ₹ 864, ₹ 432 and ₹ 720, respectively.

Question. 122 A mother and her two daughters got a room constructed for Rs 62000. The

elder daughter contributes $\frac{3}{8}$of her mother's contribution while the younger daughter contributes $\frac{1}{2}$of her mother's share. How much do the three contribute individually?
Solution .

Let the mother's share be ₹ x.
Now, elder daughter's share = ₹ $\frac{3}{8}x$
and younger daughter's share = ₹ $\frac{1}{2}x$
According to the question,

$$x + \frac{3}{8}x + \frac{x}{2} = 62000$$

$$\Rightarrow \quad \frac{8x + 3x + 4x}{8} = 62000$$

$$\Rightarrow \quad 15x = 62000 \times 8$$

$$\Rightarrow \quad x = \frac{62000 \times 8}{15}$$

$$\Rightarrow \quad x = \frac{12400 \times 8}{3}$$

$$\Rightarrow \quad x = \frac{99200}{3} = 33066.6$$

So, mother's share = ₹ 33066.6
Elder daughter's share = $\frac{3}{8} \times \frac{99200}{3}$ = ₹ 12400
Younger daughter's share = $\frac{1}{2} \times \frac{99200}{3}$ = ₹ 16533.3
Hence, mother and her two daughters contributed ₹ 33066.6, ₹ 12400 and ₹ 16533.3, respectively.

Question. 123 Tell which property allows you to compare

$$\frac{2}{3} \times \left[\frac{3}{4} \times \frac{5}{7}\right] \text{and} \left[\frac{2}{3} \times \frac{5}{7}\right] \times \frac{3}{4}.$$

Solution .

$$\frac{2}{3} \times \left[\frac{3}{4} \times \frac{5}{7}\right] = \frac{2}{3} \times \left(\frac{5}{7} \times \frac{3}{4}\right) \quad \text{[by commutative property over multiplication]}$$

$$= \left(\frac{2}{3} \times \frac{5}{7}\right) \times \frac{3}{4} \quad \text{[by associative property over multiplication]}$$

Hence, $\frac{2}{3} \times \left(\frac{3}{4} \times \frac{5}{7}\right)$ can be compared with $\left(\frac{2}{3} \times \frac{5}{7}\right) \times \frac{3}{4}$ with the help of associative and commutative property.

Question. 124 Name the property used in each of the following:

(i) $-\frac{7}{11} \times \frac{-3}{5} = \frac{-3}{5} \times \frac{-7}{11}$

(ii) $-\frac{2}{3} \times \left[\frac{3}{4} + \frac{-1}{2}\right] = \left[\frac{-2}{3} \times \frac{3}{4}\right] + \left[\frac{-2}{3} \times \frac{-1}{2}\right]$

(iii) $\frac{1}{3} + \left[\frac{4}{9} + \left(\frac{-4}{3}\right)\right] = \left[\frac{1}{3} + \frac{4}{9}\right] + \left[\frac{-4}{3}\right]$

(iv) $\frac{-2}{7} + 0 = 0 + \frac{-2}{7} = -\frac{2}{7}$

(v) $\frac{3}{8} \times 1 = 1 \times \frac{3}{8} = \frac{3}{8}$

Solution . (i) Commutative property over multiplication
(ii) Distributive property over addition

(iii) Associative property over addition
(iv) Existence of additive identity
(v) Existence of multiplicative identity

Question. 125 Find the multiplicative inverse of(i)-1 $\frac{1}{8}$ (ii)3 $\frac{1}{3}$
Solution .

(i) Given number is $-1\frac{1}{8}$, i.e. $\frac{-9}{8}$.

The multiplicative inverse of $\frac{-9}{8}$ is $\frac{-8}{9}$.

(ii) Given number is $3\frac{1}{3}$, i.e. $\frac{10}{3}$.

The multiplicative inverse of $\frac{10}{3}$ is $\frac{3}{10}$.

Question. 126 Arrange the numbers is $\frac{1}{4}$, $\frac{13}{16}$, $\frac{5}{8}$in the descending order.
Solution .

Given numbers are $\frac{1}{4}, \frac{13}{16}$ and $\frac{5}{8}$.

First, we convert the number as like denominator.

Taking LCM of 4, 16, $8 = 2\times2\times2\times2 = 16$

2	4,	16,	8
2	2,	8,	4
2	1,	4,	2
2	1,	2,	1
	1,	1,	1

Now,
$$\frac{1}{4} = \frac{1}{4}\times\frac{4}{4} = \frac{4}{16},$$
$$\frac{5}{8} = \frac{5}{8}\times\frac{2}{2} = \frac{10}{16}$$
$$\frac{13}{16} > \frac{10}{16} > \frac{4}{16}$$
i.e.
$$\frac{13}{16} > \frac{5}{8} > \frac{1}{4}$$

Question. 127 The product of two rational numbers is $\frac{-14}{27}$ If one of the numbers be $\frac{7}{9}$ find the other.
Solution .

Let other number be x.

Given, one number $= \frac{7}{9}$

According to the question,

One number $\times$ Other number = Product of two numbers
$$\frac{7x}{9} = \frac{-14}{27}$$
$$x = \frac{-14}{27}\times\frac{9}{7}$$
$$x = \frac{-2}{3}$$
Hence, the other number is $\frac{-2}{3}$.

Question. 128 By what numbers should we multiply $\frac{-15}{20}$ so that the product may be $\frac{-5}{7}$?
Solution .

Let the required number be x.
According to the question,

$$x \times \frac{-15}{20} = \frac{-5}{7}$$

$$x = \frac{-5}{7} \times \frac{20}{-15} = \frac{20}{21}$$

Hence, the required number is $\frac{20}{21}$.

Question. 129 By what number should we multiply $\frac{-8}{13}$ so that the product may be 24?
Solution .
Let the required number be x.
According to the question,

$$\frac{-8x}{13} = 24$$

$$x = -\frac{13 \times 24}{8}$$

$$x = -13 \times 3 = -39$$

Hence, $\frac{-8}{13}$ should be multiplied by -39 to get the product 24.

Question. 130 The product of two rational numbers is -7. If one of the number is -5, find the other?
Solution .
Given, one number $= -5$
Suppose, the other number be x.
According to the question,

$$-5x = -7$$

$$\Rightarrow \quad x = \frac{-7}{-5} \Rightarrow x = \frac{7}{5}$$

Hence, the other number is $\frac{7}{5}$.

Question. 131 Can you find a rational number whose multiplicative inverse is -1?
Solution . No, we cannot find a rational number whose multiplicative inverse is -1.

Question. 132 Find five rational numbers between 0 and 1.
Solution .

$$\because \quad 0 < 1 < 2 < 3 < 4 < 5 < 6$$

$$\Rightarrow \quad 0 < \frac{1}{6} < \frac{2}{6} < \frac{3}{6} < \frac{4}{6} < \frac{5}{6} < \frac{6}{6}$$

Hence, $\frac{1}{6}, \frac{2}{6}, \frac{3}{6}, \frac{4}{6}, \frac{5}{6}$ are the rational numbers lying between 0 and 1.

Question. 133 Find the two rational numbers whose absolute value is $\frac{1}{5}$.
Solution .

Given, absolute value of two rational numbers is $\frac{1}{5}$.

One rational number is $\frac{1}{5}$, so $\left|\frac{1}{5}\right| = \frac{1}{5}$

and other rational number is $-\frac{1}{5}$, so $\left|\frac{-1}{5}\right| = \frac{1}{5}$

Question. 134 From a rope 40 m long, pieces of equal size are cut. If the length of one piece is $\frac{10}{3}$ m, find the number of such pieces.

Solution .

Total length of rope = 40 m

Length of one piece = $\frac{10}{3}$ m

Let the number of pieces be x.

Then, according to the question,

$$\frac{10x}{3} = 40$$

$$\Rightarrow \quad x = \frac{40 \times 3}{10}$$

$$\Rightarrow \quad x = 12$$

Hence, number of pieces cut from the rope are 12.

Question. 135 $5\frac{1}{2}$ m long rope is cut into 12 equal pieces. What is the length of each piece?

Solution .

Total length of the rope = $5\frac{1}{2}$ m = $\frac{11}{2}$ m

Total number of pieces = 12

Let the length of each piece be x m.

According to the question,

$$12x = \frac{11}{2}$$

$$x = \frac{11}{2 \times 12}$$

$$x = \frac{11}{24} \text{ m}$$

Hence, the length of each piece is $\frac{11}{24}$ m.

Question. 136 Write the following rational numbers in the descending order.

$$\frac{8}{7}, \frac{-9}{8}, \frac{-3}{2}, 0, \frac{2}{5}$$

Solution .

Given numbers are $\frac{8}{7}, \frac{-9}{8}, \frac{-3}{2}, 0, \frac{2}{5}$.

First, we convert the given numbers as like denominators.

LCM of 7, 8, 2, 5 = $2 \times 7 \times 4 \times 5 = 280$

Now,

$$\frac{8}{7} = \frac{8}{7} \times \frac{40}{40} = \frac{320}{280}$$

$$\frac{-9}{8} = \frac{-9}{8} \times \frac{35}{35} = \frac{-315}{280}$$

$$\frac{-3}{2} = \frac{-3}{2} \times \frac{140}{140} = \frac{-420}{280}$$

$$\frac{2}{5} = \frac{2}{5} \times \frac{56}{56} = \frac{112}{280}$$

In descending order,

$$\because \quad \frac{320}{280} > \frac{112}{280} > 0 > \frac{-315}{280} > \frac{-420}{280}$$

$$\Rightarrow \quad \frac{8}{7} > \frac{2}{5} > 0 > \frac{-9}{8} > \frac{-3}{2}$$

Question. 137 Find

(i) $0 \div \frac{2}{3}$

(ii) $\frac{1}{3} \times \frac{-5}{7} \times \frac{-21}{10}$

Solution .

(i) $0 \div \frac{2}{3} = \frac{0}{2} \times 3 = 0$

(ii) $\frac{1}{3} \times \frac{-5}{7} \times \frac{-21}{10} = \frac{1}{3} \times \frac{3}{2} = \frac{1}{2}$

Question. 138 On a winter day the temperature at a place in Himachal Pradesh was -16°C. Convert it in degree Fahrenheit (°F) by using the formula

$$\frac{C}{5} = \frac{F-32}{9}$$

Solution .

Given, temperature of Himachal Pradesh = – 16 °C

$$\because \quad \frac{C}{5} = \frac{F-32}{9}$$

$$\Rightarrow \quad \frac{-16}{5} = \frac{F-32}{9}$$

$$\Rightarrow \quad F - 32 = -\frac{144}{5}$$

$$\Rightarrow \quad F = 32 - \frac{144}{5}$$

$$\Rightarrow \quad F = \frac{160-144}{5}$$

$$= \frac{16}{5} = 3.2°F$$

Question. 139 Find the sum of additive inverse and multiplicative inverse of 7.

Solution .

The additive inverse of 7 = – 7

The multiplicative inverse of 7 = $\frac{1}{7}$

$\therefore$ Required sum $= -7 + \frac{1}{7} = \frac{-49+1}{7}$

$= \frac{-48}{7} = -6\frac{6}{7}$

Question. 140 Find the product of additive inverse and multiplicative inverse of $-\frac{1}{3}$.

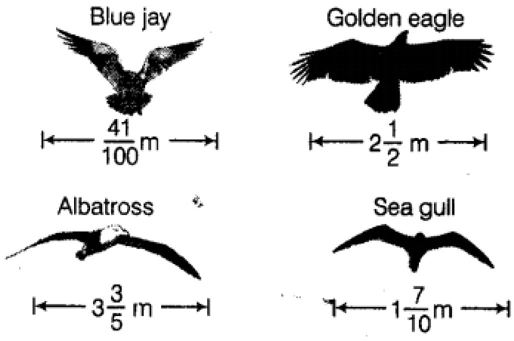
Solution .

The additive inverse of $\frac{-1}{3} = \frac{1}{3}$

The multiplicative inverse of $\frac{-1}{3} = -3$

$\therefore$ Required product $= \frac{1}{3} \times -3 = -1$

Question. 141 The diagram shows the wingspans of different species of birds. Use the diagram to answer the question given below



(a) How much longer is the wingspan of an Albatross than the wingspan of a Sea gull?
(b) How much longer is the wingspan of a Golden eagle than the wingspan of a Blue jay?
Solution .

(a) We have, length of the wingspan of Albatross = $3\frac{3}{5}$ m

and length of the wingspan of a Sea gull = $1\frac{7}{10}$ m

$$\therefore \quad \text{Difference} = 3\frac{3}{5} - 1\frac{7}{10} = \frac{18}{5} - \frac{17}{10} = \frac{36-17}{10} = \frac{19}{10}\text{ m}$$

Hence, the wingspan of an Albatross is $\frac{19}{10}$ m longer than the wingspan of a Sea gull.

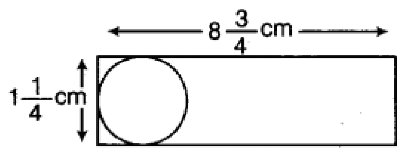
(b) We have, length of the wingspan of Golden eagle = $2\frac{1}{2}$ m

and the length the wingspan of a Blue jay = $\frac{41}{100}$ m

$$\therefore \quad \text{Difference} = 2\frac{1}{2} - \frac{41}{100} = \frac{5}{2} - \frac{41}{100} = \frac{250-41}{100} = \frac{209}{100}\text{ m}$$

Hence, the wingspan of a Golden eagle is $\frac{209}{100}$ m longer than the wingspan of a Blue jay.

Question. 142 Shalini has to cut out circles of diameter 1 $^{-\frac{1}{4}}$ cm from an aluminium strip of dimensions 8$^{-\frac{3}{4}}$ cm by 1 $^{-\frac{1}{4}}$ cm. How many full circles can Shalini cut? Also, calculate the wastage of the aluminium strip.



Solution .

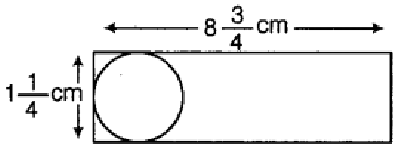
Breadth of the circle = Diameter of one circle $1\frac{1}{4}$ cm = $\frac{5}{4}$ cm

Length of aluminium strip = $8\frac{3}{4}$ cm = $\frac{35}{4}$ cm

∴ Number of full circles cut from the aluminium strip

$$= \frac{35}{4} \div \frac{5}{4} = \frac{35}{4} \times \frac{4}{5} = 7$$

Hence, the number of circle 7.



Now, diameter of circle = $\frac{5}{4}$ cm

Radius of circle = $\frac{5}{4 \times 2} = \frac{5}{8}$ cm

Now, area to be cut by one circle = $\pi r^2 = \frac{22}{7} \times \left(\frac{5}{8}\right)^2$

$$= \frac{22}{7} \times \frac{25}{64} \text{ cm}^2$$

∴ Area to be cut by 7 full circles = $7 \times \frac{22}{7} \times \frac{25}{64} = \frac{22 \times 25}{64}$

Also, area of the aluminium strip = Length × Breadth

$$= \frac{35}{4} \times \frac{5}{4} \text{ cm}^2$$

∴ Wastage of aluminium strip = $\left(\frac{35}{4} \times \frac{5}{4}\right) - \left(\frac{22 \times 25}{64}\right)$

$$= \frac{175}{16} - \frac{550}{64}$$

$$= \frac{700 - 550}{64} = \frac{150}{64}$$

$$= \frac{75}{32} = 2\frac{11}{32} \text{ cm}^2$$

Hence, the wastage of aluminium strip is $2\frac{11}{32}$ cm^2.

Question. 143 One fruit salad recipe requires $-\frac{1}{2}$ cup of sugar. Another recipe for the same fruit salad requires 2 tablespoons of sugar. If 1 tablespoon is 1 equivalent to $-\frac{1}{16}$ cup, how much more sugar does the first recipe require?

Solution .

Given, sugar required for one fruit salad = $\frac{1}{2}$ cup

Sugar required for another salad = $2 \times \frac{1}{16} = \frac{2}{16}$ cup

∴ Required sugar = $\frac{1}{2} - \frac{2}{16} = \frac{8-2}{16} = \frac{6}{16} = \frac{3}{8}$ cup

Question. 144 Four friends had a competition to see how far could they hop on one foot. The table given shows the distance covered by each.

Name	Distance covered (in km)
Seema	$\frac{1}{25}$
Nancy	$\frac{1}{32}$
Megha	$\frac{1}{40}$
Soni	$\frac{1}{20}$

(a) How farther did Soni hop than Nancy?
(b) What is the total distance covered by Seema and Megha?
(c) Who walked farther, Nancy or Megha?
Solution .

We have, $\frac{1}{25}, \frac{1}{32}, \frac{1}{40}, \frac{1}{20}$

First, we convert the numbers as like denominators.

Taking LCM of 25, 32, 40 and 20 $= 2 \times 2 \times 2 \times 5 \times 5 \times 4 = 800$

2	25, 32, 40, 20
2	25, 16, 20, 10
2	25, 8, 10, 5
5	25, 4, 5 5
	5, 4, 1 1

we get

$\frac{1}{25} = \frac{1 \times 32}{25 \times 32} = \frac{32}{800}, \frac{1}{32} = \frac{1 \times 25}{32 \times 25} = \frac{25}{800}; \frac{1}{40} = \frac{1 \times 20}{40 \times 20} = \frac{20}{800}$

and $\frac{1}{20} = \frac{1 \times 40}{20 \times 40} = \frac{40}{800}$

(a) Soni hop more than Nancy $= \frac{40}{800} - \frac{25}{800} = \frac{40-25}{800} = \frac{15}{800} = \frac{3}{160}$ km

(b) Total distance covered by Seema and Megha

$= \frac{32}{800} + \frac{20}{800} = \frac{32+20}{800} = \frac{52}{800} = \frac{13}{200}$ km

(c) Clearly, Nancy walked farther than Megha.

Question. 145 The table given below shows the distances, in kilo metres, between four villages of a state. To find the distance between two villages, locate the square, where the row for one village and the column for the other village intersect.

	Sonapur	Ramgarh	Himgaon	Rawalpur
Sonapur	╳	$40\frac{2}{3}$	$100\frac{5}{6}$	$16\frac{1}{2}$
Ramgarh	$40\frac{2}{3}$	╳	$210\frac{3}{8}$	$16\frac{2}{3}$
Himgaon	$100\frac{5}{6}$	$210\frac{3}{8}$	╳	$98\frac{3}{4}$
Rawalpur	$16\frac{1}{2}$	$30\frac{2}{3}$	$98\frac{3}{4}$	╳

(a) Compare the distance between Himgaon and Rawalpur to Sonapur and Ramgarh?
(b) If you drove from Himgaon to Sonapur and then from Sonapur to Rawalpur, how far would you drive?
Solution .

(a) The distance between Himgaon and Rawalpur = $98\frac{3}{4}$ km

and the distance between Sonapur and Ramgarh = $40\frac{2}{3}$ km

Difference of the distance between Himgaon and Rawalpur to Sonapur and Ramgarh

$$= \left(98\frac{3}{4} - 40\frac{2}{3}\right) = \left(\frac{395}{4} - \frac{122}{3}\right)$$

$$= \left(\frac{1185 - 488}{12}\right) = \frac{697}{12} = 58\frac{1}{12} \text{ km}$$

(b) Distance between Himgaon and Sonapur = $100\frac{5}{6}$ km

and distance between Sonapur and Rawalpur = $16\frac{1}{2}$ km

Total distance that he would drive

$$= 100\frac{5}{6} + 16\frac{1}{2} = \frac{605}{6} + \frac{33}{2}$$

$$= \frac{605 + 99}{6} = \frac{704}{6}$$

$$= \frac{352}{3} = 117\frac{1}{3} \text{ km}$$

Question. 146 The table shows the portion of some common materials that are recycled.

Material	Recycled
Paper	$\frac{5}{11}$
Aluminium cans	$\frac{5}{8}$
Glass	$\frac{2}{5}$
Scrap	$\frac{3}{4}$

(a) Is the rational number expressing the amount of paper recycled more than $-\frac{1}{2}$ or less than $-\frac{1}{2}$?

(b) Which items have a Recycled amount less than $-\frac{1}{2}$?

(c) Is the quantity of aluminium fans recycled more (or less) than half of the quantity of aluminium cans?

(d) Arrange the rate of recycling the materials from the greatest to the smallest.

Solution .

(a) Here, $\frac{1}{2} = \frac{1}{2} \times \frac{11}{11} = \frac{11}{22}$

and $\frac{5}{11} = \frac{5}{11} \times \frac{2}{2} = \frac{10}{22}$

So, paper recycled is less than $\frac{1}{2}$.

(b) Similarly, $\frac{5}{8}$ is greater than $\frac{1}{2}\left(=\frac{4}{8}\right)$.

Also, $\frac{2}{5} = \frac{2 \times 2}{5 \times 2} = \frac{4}{10} < \frac{1}{2}\left(=\frac{5}{10}\right)$

and $\frac{3}{4} > \frac{1}{2}\left(=\frac{2}{4}\right)$

So, the quantity of paper and glass recycled is less than $\frac{1}{2}$.

(c) Quantity of aluminium cans $= \frac{5}{8}\left(=\frac{10}{16}\right)$ is more than $\frac{1}{2}$ of the quantity of aluminium cans

$$= \frac{5}{8} \times \frac{1}{2} = \frac{5}{16}$$

(d) Taking LCM of 11, 8, 5, 4 = 440

Now, $\frac{5}{11} = \frac{5}{11} \times \frac{40}{40} = \frac{200}{440}$

$$\frac{5}{8} = \frac{5}{8} \times \frac{55}{55} = \frac{275}{440}$$

$$\frac{2}{5} = \frac{2}{5} \times \frac{88}{88} = \frac{176}{440}$$

$$\frac{3}{4} = \frac{3}{4} \times \frac{110}{110} = \frac{330}{440}$$

As, $\frac{330}{440} > \frac{275}{440} > \frac{200}{440} > \frac{176}{440}$

i.e. $\frac{3}{4} > \frac{5}{8} > \frac{5}{11} > \frac{2}{5}$

That means, Scrap > Aluminium cans> Paper > Glass

Question. 147 The overall width in cm of several wide-screen televisions are 97.28 cm,$98^{-\frac{4}{9}}$ cm, $98^{-\frac{1}{25}}$ cm and 97.94 cm. Express these numbers as rational numbers in the form $^{-\frac{p}{q}}$ and arrange the widths in ascending order.

Solution .

We have,width of televisions screen are 97.28 cm, $98\frac{4}{9}$ cm, $98\frac{1}{25}$ cm and 97.94 cm.

Then, firstly, we convert all widths in the rational numbers.

(i) $97.28\,\text{cm} = \frac{9728}{100}$ [remove decimal]

$\therefore \quad \frac{p}{q} = \frac{2432}{25}$ cm [numerator and denominator both dividing by 4]

(ii) $98\frac{4}{9}\,\text{cm} = \frac{886}{9}$ cm [convert mixed fraction into simple fraction]

$\therefore \quad \frac{p}{q} = \frac{886}{9}$ cm

(iii) $98\frac{1}{25}\,\text{cm} = \frac{2451}{25}$ cm [convert mixed fraction into simple fraction]

$\therefore \quad \frac{p}{q} = \frac{2451}{25}$ cm

(iv) $97.94\,\text{cm} = \frac{9794}{100}$ [remove decimal]

$\therefore \quad \frac{p}{q} = \frac{4897}{50}$ cm [numerator and denominator both dividing by 2]

To arrange in ascending order, firstly we convert all the denominators same, then we get

2	25,	9,	25,	50
25	25,	9,	25,	25
9	1,	9,	1,	1
	1,	1,	1,	1

$\therefore$ LCM of 25, 9, 25, 50 $= 2 \times 25 \times 9 = 450$

So, $\frac{2432}{25} = \frac{2432 \times 18}{25 \times 18} = \frac{43776}{450}; \frac{886}{9} = \frac{886 \times 50}{9 \times 50} = \frac{44300}{450}$

$\frac{2451}{25} = \frac{2451 \times 18}{25 \times 18} = \frac{44118}{450}; \frac{4897}{50} = \frac{4897 \times 9}{50 \times 9} = \frac{44073}{450}$

In ascending order, $\frac{43776}{450} > \frac{44073}{450} > \frac{44118}{450} > \frac{44300}{450}$

i.e. $97.28\,\text{cm} > 97.94\,\cancel{\text{cm}} < 98\frac{1}{25}\,\text{cm} < 98\frac{4}{9}\,\text{cm}$

Question. 148 Roller coaster at an amusement park is $-\frac{2}{3}$ m high. If a new roller coaster is built that is $-\frac{3}{5}$ times the height of the existing coaster, what will be the height of the new roller coaster?

Solution .

Given, height of the existing roller coaster = $\frac{2}{3}$ m

Height of new roller coaster = $\frac{3}{5}$ of height of the existing roller coaster

$$= \frac{3}{5} \times \frac{2}{3} = \frac{2}{5} \text{ m}$$

Question. 149 Here is a table which gives the information about the total rainfall for several months compared to the average monthly rains of a town. Write each decimal in the form of rational number $-\frac{p}{q}$.

Months	Above/Below normal (in cm)
May	2.6924
June	0.6096
July	– 6.0988
August	– 8.636

Solution .

(i) May = 2 .6924 = $\frac{26924}{10000}$ [remove decimal]

$\Rightarrow \frac{p}{q} = \frac{6731}{2500}$ cm [after dividing numerator and denominator by 4]

(ii) June = 0.6096 = $\frac{6096}{10000}$ [remove decimal]

$\Rightarrow \frac{p}{q} = \frac{381}{625}$ cm [after dividing numerator and denominator by 16]

(iii) July = – 6.9088

$= -\frac{69088}{10000}$ [remove decimal]

$\Rightarrow \frac{p}{q} = -\frac{4318}{625}$ cm [after dividing numerator and denomiator by 16]

(iv) August = – 8.636 = $-\frac{8636}{1000}$ [remove decimal]

$\Rightarrow \frac{p}{q} = -\frac{2159}{250}$ cm [after dividing numerator and denominator by 4]

Question. 150 The average life expectancies of males for several states are shown in the table. Express each decimal in the form $-\frac{p}{q}$ and arrange the states from the least to the greatest male life expectancy.

State-wise data are included below; more indicators can be found in the “FACTFILE” section on the homepage for each state.

State	Male	$\frac{p}{q}$ form	Lowest terms
Andhra Pradesh	61.6		
Assam	57.1		
Bihar	60.7		
Gujarat	61.9		
Haryana	64.1		
Himachal Pradesh	65.1		
Karnataka	62.4		
Kerala	70.6		
Madhya Pradesh	56.5		
Maharashtra	64.5		
Orissa	57.6		
Punjab	66.9		
Rajasthan	59.8		
Tamil Nadu	63.7		
Uttar Pradesh	58.9		
West Bengal	62.8		

Source Registrar General of India (2003) SRS Based Abridged Lefe Tables. SRS Analytical Studies, Report No. 3 of 2003, New Delhi: Registrar General of India.
The data are for the 1995-99 period; states subsequently divided are therefore included in their pre-partition states (Chhatisgarh in MP, Uttaranchal in UP and Jharkhand in Bihar)
Solution .

State	Male	$\frac{p}{q}$ form	Lowest term
Andhra Pradesh	61.6	$\frac{616}{10}$	$\frac{308}{5}$
Assam	57.1	$\frac{571}{10}$	$\frac{571}{10}$
Bihar	60.7	$\frac{607}{10}$	$\frac{607}{10}$
Gujarat	61.9	$\frac{619}{10}$	$\frac{619}{10}$
Haryana	64.1	$\frac{641}{10}$	$\frac{641}{10}$
Himachal Pradesh	65.1	$\frac{651}{10}$	$\frac{651}{10}$
Karnataka	62.4	$\frac{624}{10}$	$\frac{312}{5}$
Kerala	70.6	$\frac{706}{10}$	$\frac{353}{5}$
Madhya Pradesh	56.5	$\frac{565}{10}$	$\frac{113}{2}$
Maharashtra	64.5	$\frac{645}{10}$	$\frac{129}{2}$
Orissa	57.6	$\frac{576}{10}$	$\frac{288}{5}$
Punjab	66.9	$\frac{669}{10}$	$\frac{669}{10}$
Rajasthan	59.8	$\frac{598}{10}$	$\frac{299}{5}$
Tamil Nadu	63.7	$\frac{637}{10}$	$\frac{637}{10}$
Uttar Pradesh	58.9	$\frac{589}{10}$	$\frac{589}{10}$
West Bengal	62.8	$\frac{628}{10}$	$\frac{314}{5}$

Arrangement of the states from the least to the greatest male life expectancy, Haryana, Tamil Nadu, West Bengal, Karnataka, Gujarat, AndhraPradesh, Bihar, Rajasthan, Uttar Pradesh, Orissa, Assam, Madhya Pradesh.

Question. 151 A skirt that is 35 $\frac{7}{8}$ cm long has a hem of 3$\frac{1}{8}$ cm. How tong will the skirt . be if the hem is let down?

Solution .

Length of the skirt = $35\frac{7}{8}$ cm = $\frac{287}{8}$ cm

Dimension of hem = $3\frac{1}{8}$ cm = $\frac{25}{8}$ cm

Length of skirt, if hem is let down $=\left(\frac{287}{8}+\frac{25}{8}\right)$ cm $=\frac{312}{8}$ cm = 39 cm

Hence, the length of the skirt, if the hem is let down, is 39 cm.

Question. 152 Manavi and Kuber each receives an equal allowance. The table shows the fraction of their allowance each deposits into his/her saving account and the fraction each spends at the mall. If allowance of each is Rs 1260, find the amount left with each.

Where money goes	**Fraction of allowance**	
	Manavi	Kuber
Saving account	$\frac{1}{2}$	$\frac{1}{3}$
Spend at mall	$\frac{1}{4}$	$\frac{3}{5}$
Left over	?	?

Solution .

Let total cost be ₹1.

For Manavi,

Left over = Total cost – All spends $=1-\left(\frac{1}{2}+\frac{1}{4}\right)=1-\frac{3}{4}=\frac{1}{4}$

$\therefore$ Amount $=1260\times\frac{1}{4}=$ ₹ 315

For Kuber,

Left over = Total cost – All spends $=1-\left(\frac{1}{3}+\frac{3}{5}\right)=1-\frac{14}{15}=\frac{1}{15}$

$\therefore$ Amount $=1260\times\frac{1}{15}=$ ₹ 84

Alternate Method

Allowance given to Manavi = ₹ 1260

Left over amount of Manavi = Allowance – Saving – Spend at mall

$$=1260-\frac{1}{2}\times1260-\frac{1}{4}\times1260$$

$$=1260\left(1-\frac{1}{2}-\frac{1}{4}\right)=1260\times\left(\frac{4-2-1}{4}\right)$$

$$=1260\times\left(\frac{4-3}{4}\right)=1260\times\frac{1}{4}=₹\ 315$$

Hence, the amount left with Manavi is ₹ 315.

Allowance given to Kuber = ₹ 1260

Left over amount of Kuber = Allowance – Saving – Spend at mall

$$= 1260 - \frac{1}{3} \times 1260 - \frac{3}{5} \times 1260$$

$$= 1260\left(1 - \frac{1}{3} - \frac{3}{5}\right) = 1260\left(\frac{15-5-9}{15}\right)$$

$$= 1260\left(\frac{15-14}{15}\right)$$

$$= 1260 \times \frac{1}{15} = ₹\ 84$$

Hence, the amount left with Kuber is ₹ 84.