Rational Numbers Ex.A

RATIONAL NUMBERS

A rational number is a number that can be expressed as a fraction (ratio) in the form $^{a}/_{b}$, where a and b are integers and b is not zero.

Examples: ½, 8, $^{5}/_{3}$, $\sqrt{4}$, $7^{1}/_{9}$, -12, 6.25, $0.3\overline{11}$

When a rational number fraction is divided to form a decimal value, it becomes a terminating or repeating decimal.

$^{2}/_{5}$ can be represented as $2\overline{)5.0}$ (quotient 0.4) which is a terminating decimal.

$^{1}/_{3}$ can be represented as $1\overline{)3.0}$ (quotient $0.\overline{3}$) which is a repeating decimal.

A number of the form $\frac{p}{q}$, where 'p', 'q' are integers and $q \neq 0$.

Property	Operations on Rational Numbers			
Name	Addition	Subtraction	Multiplication	Division*
Closure	$a + b \in Q$	$a - b \in Q$	$a \times b \in Q$	$a \div b \in Q$
Commutative	$a + b = b + a$	$a - b \neq b - a$	$a \times b = b \times a$	$a \div b \neq b \div a$
Associative	$(a + b) + c = a + (b + c)$	$(a - b) - c \neq a - (b - c)$	$(a \times b) \times c = a \times (b \times c)$	$(a \div b) \div c \neq a \div (b \div c)$
Distributive	$a \times (b + c) = ab + ac$	$a \times (b - c) = ab - ac$	Not applicable	Not applicable
Where a, b, c ∈ Q (set of rational numbers), *b is a non-zero rational number				

Q1.

Answer :

If $\frac{a}{b}$ is a fraction and m is a non-zero integer, then $\frac{a}{b} = \frac{a \times m}{b \times m}$.

Now,

(i) $\frac{-3}{5} = \frac{-3 \times 4}{5 \times 4} = \frac{-12}{20}$

(ii) $\frac{-3}{5} = \frac{-3 \times -6}{5 \times -6} = \frac{18}{-30}$

(iii) $\frac{-3}{5} = \frac{-3 \times 7}{5 \times 7} = \frac{-21}{35}$

(iv) $\frac{-3}{5} = \frac{-3 \times -8}{5 \times -8} = \frac{24}{-40}$

Q2.

Answer :

If $\frac{a}{b}$ is a rational number and m is a common divisor of a and b, then $\frac{a}{b} = \frac{a \div m}{b \div m}$.

$\therefore \frac{-42}{98} = \frac{-42 \div 14}{98 \div 14} = \frac{-3}{7}$

Q3.

Answer :

If $\frac{a}{b}$ is a rational integer and m is a common divisor of a and b, then $\frac{a}{b} = \frac{a \div m}{b \div m}$.

$\therefore \frac{-48}{60} = \frac{-48 \div 12}{60 \div 12} = \frac{-4}{5}$

Q4.

Answer :

A rational number $\frac{a}{b}$ is said to be in the standard form if a and b have no common divisor other than unity and $b > 0$.
Thus,

(i) The greatest common divisor of 12 and 30 is 6.

$\therefore \frac{-12}{30} = \frac{-12 \div 6}{30 \div 6} = \frac{-2}{5}$ (In the standard form)

(ii)The greatest common divisor of 14 and 49 is 7.

$\therefore \frac{-14}{49} = \frac{-14 \div 7}{49 \div 7} = \frac{-2}{7}$ (In the standard form)

(iii) $\frac{24}{-64} = \frac{24 \times (-1)}{-64 \times -1} = \frac{-24}{64}$

The greatest common divisor of 24 and 64 is 8.

$\therefore \frac{-24}{64} = \frac{-24 \div 8}{64 \div 8} = \frac{-3}{8}$ (In the standard form)

(iv) $\frac{-36}{-63} = \frac{-36 \times (-1)}{-63 \times -1} = \frac{36}{63}$

The greatest common divisor of 36 and 63 is 9.

$\therefore \frac{36}{63} = \frac{36 \div 9}{63 \div 9} = \frac{4}{7}$ (In the standard form)

Q5.

Answer :

We know:
(i) Every positive rational number is greater than 0.
(ii) Every negative rational number is less than 0.

Thus, we have:

(i) $\frac{3}{8}$ is a positive rational number.
$\therefore \frac{3}{8} > 0$

(ii) $\frac{-2}{9}$ is a negative rational number.
$\therefore \frac{-2}{9} < 0$

(iii) $\frac{-3}{4}$ is a negative rational number.
$\therefore \frac{-3}{4} < 0$
Also,
$\frac{1}{4}$ is a positive rational number.
$\therefore \frac{1}{4} > 0$
Combining the two inequalities, we get:
$\frac{-3}{4} < \frac{1}{4}$

(iv)Both $\frac{-5}{7}$ and $\frac{-4}{7}$ have the same denominator, that is, 7.

So, we can directly compare the numerators.

$\therefore \frac{-5}{7} < \frac{-4}{7}$

(v)The two rational numbers are $\frac{2}{3}$ and $\frac{3}{4}$.

The LCM of the denominators 3 and 4 is 12.

Now,

$\frac{2}{3} = \frac{2\times4}{3\times4} = \frac{8}{12}$

Also,

$\frac{3}{4} = \frac{3\times3}{4\times3} = \frac{9}{12}$

Further

$\frac{8}{12} < \frac{9}{12}$

$\therefore \frac{2}{3} < \frac{3}{4}$

(vi)The two rational numbers are $\frac{-1}{2}$ and -1.

We can write $-1 = \frac{-1}{1}$.

The LCM of the denominators 2 and 1 is 2.

Now,

$\frac{-1}{2} = \frac{-1\times1}{2\times1} = \frac{-1}{2}$

Also,

$\frac{-1}{1} = \frac{-1\times2}{1\times2} = \frac{-2}{2}$

$\because \frac{-2}{1} < \frac{-1}{1}$

$\therefore -1 < \frac{-1}{2}$

Q6.

Answer :

1. The two rational numbers are $\frac{-4}{3}$ **and** $\frac{-8}{7}$.

The LCM of the denominators 3 and 7 is 21.

Now,

$\frac{-4}{3} = \frac{-4\times7}{3\times7} = \frac{-28}{21}$

Also,

$\frac{-8}{7} = \frac{-8\times3}{7\times3} = \frac{-24}{21}$

Further,

$\frac{-28}{21} < \frac{-24}{21}$

$\therefore \frac{-4}{3} < \frac{-8}{7}$

2. The two rational numbers are $\frac{7}{-9}$ and $\frac{-5}{8}$.

The first fraction can be expressed as $\frac{7}{-9} = \frac{7\times-1}{-9\times-1} = \frac{-7}{9}$.

The LCM of the denominators 9 and 8 is 72.

Now,

$\frac{-7}{9} = \frac{-7\times8}{9\times8} = \frac{-56}{72}$

Also,

$\frac{-5}{8} = \frac{-5\times9}{8\times9} = \frac{-45}{72}$

Further,

$\frac{-56}{72} < \frac{-45}{72}$

$\therefore \frac{7}{-9} < \frac{-5}{8}$

3. The two rational numbers are $\frac{-1}{3}$ and $\frac{4}{-5}$.

$\frac{4}{-5} = \frac{4\times-1}{-5\times-1} = \frac{-4}{5}$

The LCM of the denominators 3 and 5 is 15.

Now,

$\frac{-1}{3} = \frac{-1\times5}{3\times5} = \frac{-5}{15}$

Also,

$\frac{-4}{5} = \frac{-4\times3}{5\times3} = \frac{-12}{15}$

Further,

$\frac{-12}{15} < \frac{-5}{15}$

$\therefore \frac{4}{-5} < \frac{-1}{3}$

4. The two rational numbers are $\frac{9}{-13}$ and $\frac{7}{-12}$.

Now, $\frac{9}{-13} = \frac{9\times-1}{-13\times-1} = \frac{-9}{13}$ **and** $\frac{7}{-12} = \frac{7\times-1}{-12\times-1} = \frac{-7}{12}$

The LCM of the denominators 13 and 12 is 156.

Now,

$\frac{-9}{13} = \frac{-9\times12}{13\times12} = \frac{-108}{156}$

Also,

$\frac{-7}{12} = \frac{-7\times13}{12\times13} = \frac{-91}{156}$

Further,

$\frac{-108}{156} < \frac{-91}{156}$

$\therefore \frac{9}{-13} < \frac{7}{-12}$

5. The two rational numbers are $\frac{4}{-5}$ and $\frac{-7}{10}$.

$\therefore \frac{4}{-5} = \frac{4\times-1}{-5\times-1} = \frac{-4}{5}$

The LCM of the denominators 5 and 10 is 10.

Now,

$\frac{-4}{5} = \frac{-4\times2}{5\times2} = \frac{-8}{10}$

Also,

$\frac{-7}{10} = \frac{-7\times1}{10\times1} = \frac{-7}{10}$

Further,

$\frac{-8}{10} < \frac{-7}{10}$

$\therefore \frac{-4}{5} < \frac{-7}{10}$, *or*, $\frac{4}{-5} < \frac{-7}{10}$

6. The two rational numbers are $\frac{-12}{5}$ and -3.
-3 can be written as $\frac{-3}{1}$.

The LCM of the denominators is 5.

Now,

$\frac{-3}{1} = \frac{-3\times5}{1\times5} = \frac{-15}{5}$

Because $\frac{-15}{5} < \frac{-12}{5}$, we can conclude that $-3 < \frac{-12}{5}$.

Q7.

Thus,

$\frac{-3}{7} > \frac{6}{-13}$

(ii) We will write each of the given numbers with positive denominators.

One number = $\frac{5}{-13} = \frac{5\times(-1)}{-13\times(-1)} = \frac{-5}{13}$

Other number = $\frac{-35}{91}$

LCM of 13 and 91 = 91

$\therefore \frac{-5}{13} = \frac{-5\times7}{13\times7} = \frac{-35}{91}$ and $\frac{-35}{91}$

Clearly,

$-35 = -35$

$\therefore \frac{-35}{91} = \frac{-35}{91}$

Thus,

$\frac{-5}{13} = \frac{-35}{91}$

(iii) We will write each of the given numbers with positive denominators.

One number = -2

We can write -2 as $\frac{-2}{1}$.
Other number = $\frac{-13}{5}$

LCM of 1 and 5 = 5

$\therefore \frac{-2}{1} = \frac{-2\times5}{1\times5} = \frac{-10}{5}$ and $\frac{-13}{5} = \frac{-13\times1}{5\times1} = \frac{-13}{5}$

Clearly,

$-10 > -13$

$\therefore \frac{-10}{5} > \frac{-13}{5}$

Thus,

$\frac{-2}{1} > \frac{-13}{5}$

$-2 > \frac{-13}{5}$

(iv) We will write each of the given numbers with positive denominators.

One number = $\frac{-2}{3}$
Other number = $\frac{5}{-8} = \frac{5\times(-1)}{-8\times(-1)} = \frac{-5}{8}$

LCM of 3 and 8 = 24

$\therefore \frac{-2}{3} = \frac{-2\times8}{3\times8} = \frac{-16}{24}$ and $\frac{-5}{8} = \frac{-5\times3}{8\times3} = \frac{-15}{24}$

Clearly,

$-16 < -15$

$\therefore \frac{-16}{24} < \frac{-15}{24}$

Thus,

$\frac{-2}{3} < \frac{-5}{8}$
$\frac{-2}{3} < \frac{5}{-8}$

(v) $\frac{-3}{-5} = \frac{-3\times-1}{-5\times-1} = \frac{3}{5}$

$\frac{3}{5}$ is a positive number.

Because every positive rational number is greater than 0, $\frac{3}{5} > 0 \Rightarrow 0 < \frac{3}{5}$.

(vi) We will write each of the given numbers with positive denominators.

One number = $\frac{-8}{9}$

Other number = $\frac{-9}{10}$

LCM of 9 and 10 = 90

$\therefore \frac{-8}{9} = \frac{-8\times10}{9\times10} = \frac{-80}{90}$ and $\frac{-9}{10} = \frac{-9\times9}{10\times9} = \frac{-81}{90}$

Clearly,

$-81 < -80$

$\therefore \frac{-81}{90} < \frac{-80}{90}$

Thus,

$\frac{-9}{10} < \frac{-8}{9}$

Q8.

Answer :

(i) We will write each of the given numbers with positive denominators.

We have:

$\frac{4}{-9} = \frac{4\times(-1)}{-9\times(-1)} = \frac{-4}{9}$ and $\frac{7}{-18} = \frac{7\times(-1)}{-18\times(-1)} = \frac{-7}{18}$

Thus, the given numbers are $\frac{-4}{9}$, $\frac{-5}{12}$, $\frac{-7}{18}$ **and** $\frac{-2}{3}$.

LCM of 9, 12, 18 and 3 is 36.

Now,

$\frac{-4}{9} = \frac{-4\times4}{9\times4} = \frac{-16}{36}$

$\frac{-5}{12} = \frac{-5\times3}{12\times3} = \frac{-15}{36}$

$\frac{-7}{18} = \frac{-7\times2}{18\times2} = \frac{-14}{36}$

$\frac{-2}{3} = \frac{-2\times12}{3\times12} = \frac{-24}{36}$

Clearly,

$\frac{-24}{36} < \frac{-16}{36} < \frac{-15}{36} < \frac{-14}{36}$

$\therefore \frac{-2}{3} < \frac{-4}{9} < \frac{-5}{12} < \frac{-7}{18}$

That is

$\frac{-2}{3} < \frac{4}{-9} < \frac{-5}{12} < \frac{7}{-18}$

(ii) We will write each of the given numbers with positive denominators.

We have:

$\frac{5}{-12} = \frac{5\times(-1)}{-12\times(-1)} = \frac{-5}{12}$ and $\frac{9}{-24} = \frac{9\times(-1)}{-24\times(-1)} = \frac{-9}{24}$

Thus, the given numbers are $\frac{-3}{4}$, $\frac{-5}{12}$, $\frac{-7}{16}$ **and** $\frac{-9}{24}$.

LCM of 4, 12, 16 and 24 is 48.

Now,

$\frac{-3}{4} = \frac{-3\times12}{4\times12} = \frac{-36}{48}$

$\frac{-5}{12} = \frac{-5\times4}{12\times4} = \frac{-20}{48}$

$\frac{-7}{16} = \frac{-7\times3}{16\times3} = \frac{-21}{48}$

$\frac{-9}{24} = \frac{-9\times2}{24\times2} = \frac{-18}{48}$

Clearly,

$\frac{-36}{48} < \frac{-21}{48} < \frac{-20}{48} < \frac{-18}{48}$

$\therefore \frac{-3}{4} < \frac{-7}{16} < \frac{-5}{12} < \frac{-9}{24}$

That is

$\frac{-3}{4} < \frac{-7}{16} < \frac{5}{-12} < \frac{9}{-24}$

(iii) We will write each of the given numbers with positive denominators.

We have:

$\frac{3}{-5} = \frac{3\times(-1)}{-5\times(-1)} = \frac{-3}{5}$

Thus, the given numbers are $\frac{-3}{5}$, $\frac{-7}{10}$, $\frac{-11}{15}$ and $\frac{-13}{20}$.

LCM of 5, 10, 15 and 20 is 60.

Now,

$\frac{-3}{5} = \frac{-3\times12}{5\times12} = \frac{-36}{60}$

$\frac{-7}{10} = \frac{-7\times6}{10\times6} = \frac{-42}{60}$

$\frac{-11}{15} = \frac{-11\times4}{15\times4} = \frac{-44}{60}$

$\frac{-13}{20} = \frac{-13\times3}{20\times3} = \frac{-39}{60}$

Clearly,

$\frac{-44}{60} < \frac{-42}{60} < \frac{-39}{60} < \frac{-36}{60}$

$\therefore \frac{-11}{15} < \frac{-7}{10} < \frac{-13}{20} < \frac{-3}{5}$.

That is

$\frac{-11}{15} < \frac{-7}{10} < \frac{-13}{20} < \frac{3}{-5}$

(iv) We will write each of the given numbers with positive denominators.

We have:

$\frac{13}{-28} = \frac{13\times(-1)}{-28\times(-1)} = \frac{-13}{28}$

Thus, the given numbers are $\frac{-4}{7}$, $\frac{-9}{14}$, $\frac{-13}{28}$ and $\frac{-23}{42}$.

LCM of 7, 14, 28 and 42 is 84.

Now,

$\frac{-4}{7} = \frac{-4\times12}{7\times12} = \frac{-48}{84}$

$\frac{-9}{14} = \frac{-9\times6}{14\times6} = \frac{-54}{84}$

$\frac{-13}{28} = \frac{-13\times3}{28\times3} = \frac{-39}{84}$

$\frac{-23}{42} = \frac{-23\times2}{42\times2} = \frac{-46}{84}$

Clearly,

$\frac{-54}{84} < \frac{-48}{84} < \frac{-46}{84} < \frac{-39}{84}$

$\therefore \frac{-9}{14} < \frac{-4}{7} < \frac{-23}{42} < \frac{-13}{28}$.

That is

$\frac{-9}{14} < \frac{-4}{7} < \frac{-23}{42} < \frac{13}{-28}$

Q9.

Answer :

(i) We will first write each of the given numbers with positive denominators. We have:

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

Thus, the given numbers are $-2,\ \frac{-13}{6},\ \frac{-8}{3}$ and $\frac{1}{3}$

LCM of 1, 6, 3 and 3 is 6

Now,

$\frac{-2}{1} = \frac{-2\times6}{1\times6} = \frac{-12}{6}$

$\frac{-13}{6} = \frac{-13\times1}{6\times1} = \frac{-13}{6}$

$\frac{-8}{3} = \frac{-8\times2}{3\times2} = \frac{-16}{6}$

and

$\frac{1}{3} = \frac{1\times2}{3\times2} = \frac{2}{6}$

Clearly,Thus,

$\frac{2}{6} > \frac{-12}{6} > \frac{-13}{6} > \frac{-16}{6}$

$\therefore \frac{1}{3} > -2 > \frac{-13}{6} > \frac{-8}{3}$. i.e $\frac{1}{3} > -2 > \frac{-13}{6} > \frac{8}{-3}$

(ii) We will first write each of the given numbers with positive denominators. We have:

$\frac{7}{-15} = \frac{7\times(-1)}{-15\times(-1)} = \frac{-7}{15}$ and $\frac{17}{-30} = \frac{17\times(-1)}{-30\times(-1)} = \frac{-17}{30}$

Thus, the given numbers are $\frac{-3}{10}$, $\frac{-7}{15}$, $\frac{-11}{20}$ and $\frac{-17}{30}$

LCM of 10, 15, 20 and 30 is 60

Now,

$\frac{-3}{10} = \frac{-3\times6}{10\times6} = \frac{-18}{60}$

$\frac{-7}{15} = \frac{-7\times4}{15\times4} = \frac{-28}{60}$

$\frac{-11}{20} = \frac{-11\times3}{20\times3} = \frac{-33}{60}$

and

$\frac{-17}{30} = \frac{-17\times2}{30\times2} = \frac{-34}{60}$

Clearly,

$\frac{-18}{60} > \frac{-28}{60} > \frac{-33}{60} > \frac{-34}{60}$

$\therefore \frac{-3}{10} > \frac{-7}{15} > \frac{-11}{20} > \frac{-17}{30}$. i.e $\frac{-3}{10} > \frac{7}{-15} > \frac{-11}{20} > \frac{17}{-30}$

(iii) We will first write each of the given numbers with positive denominators. We have:

$\frac{23}{-24} = \frac{23\times(-1)}{-24\times(-1)} = \frac{-23}{24}$

Thus, the given numbers are $\frac{-5}{6}$, $\frac{-7}{12}$, $\frac{-13}{18}$ and $\frac{-23}{24}$

LCM of 6, 12, 18 and 24 is 72

Now,

Now,

$\frac{-5}{6} = \frac{-5\times12}{6\times12} = \frac{-60}{72}$

$\frac{-7}{12} = \frac{-7\times6}{12\times6} = \frac{-42}{72}$

$\frac{-13}{18} = \frac{-13\times4}{18\times4} = \frac{-52}{72}$

and

$\frac{-23}{24} = \frac{-23\times3}{24\times3} = \frac{-69}{72}$

Clearly,

$\frac{-42}{72} > \frac{-52}{72} > \frac{-60}{72} > \frac{-69}{72}$

$\therefore \frac{-7}{12} > \frac{-13}{18} > \frac{-5}{6} > \frac{-23}{24}$. i.e $\frac{-7}{12} > \frac{-13}{18} > \frac{-5}{6} > \frac{23}{-24}$

(iv) The given numbers are $\frac{-10}{11}$, $\frac{-19}{22}$, $\frac{-23}{33}$ and $\frac{-39}{44}$

LCM of 11, 22, 33 and 44 is 132

Now,

$\frac{-10}{11} = \frac{-10\times12}{11\times12} = \frac{-120}{132}$

$\frac{-19}{22} = \frac{-19\times6}{22\times6} = \frac{-114}{132}$

$\frac{-23}{33} = \frac{-23\times4}{33\times4} = \frac{-92}{132}$

and

$\frac{-39}{44} = \frac{-39\times3}{44\times3} = \frac{-117}{132}$

Clearly,

$\frac{-92}{132} > \frac{-114}{132} > \frac{-117}{132} > \frac{-120}{132}$

Q10.

Answer :

1. True
A whole number can be expressed as $\frac{a}{b}$, with $b = 1$ and $a \geq 0$. Thus, every whole number is rational.

2. True
Every integer is a rational number because any integer can be expressed as $\frac{a}{b}$, with $b = 1$ and $0 > a \geq 0$. Thus, every integer is a rational number.

3. False
$0 = \frac{a}{b}$, for $a = 0$ and $b \neq 0$. Thus, 0 is a rational and whole number.

Rational Numbers
Ex 1B

Q3.

Answer :

(i) True
A negative number always lies to the left of 0 on the number line.

(ii) False
A negative number always lies to the left of 0 on the number line.

(iii) True
Negative and positive numbers always lie on the opposite sides of 0 on the number line.

(iv) False
The negative sign cancels off and the number becomes $\frac{18}{13}$; it lies to the right of 0 on the number line.

Rational Numbers
Ex 1C

Q1.

Answer :

1. $\frac{-2}{5}+\frac{4}{5}=\frac{-2+4}{5}=\frac{2}{5}$

2. $\frac{-6}{11}+\frac{-4}{11}=\frac{-6+(-4)}{11}=\frac{-6-4}{11}=\frac{-10}{11}$

3. $\frac{-11}{8}+\frac{5}{8}=\frac{-11+5}{8}=\frac{-6}{8}=\frac{-3\times2}{4\times2}=\frac{-3}{4}$

4. $\frac{-7}{3}+\frac{1}{3}=\frac{-7+1}{3}=\frac{-6}{3}=\frac{-3\times2}{3}=-2$

5. $\frac{5}{6}+\frac{-1}{6}=\frac{5+(-1)}{6}=\frac{4}{6}=\frac{2\times2}{3\times2}=\frac{2}{3}$

6. $\frac{-17}{15}+\frac{-1}{15}=\frac{-17+(-1)}{15}=\frac{-17-1}{15}=\frac{-18}{15}=\frac{-6\times3}{5\times3}=\frac{-6}{5}$

Q2.

Answer :

1. The denominators of the given rational numbers are 4 and 5.

LCM of 4 and 5 is 20.

Now,

$\frac{3}{4}=\frac{3\times5}{4\times5}=\frac{15}{20}$ and $\frac{-3}{5}=\frac{-3\times4}{5\times4}=\frac{-12}{20}$

$\therefore \frac{3}{4}+\frac{-3}{5}=\frac{15}{20}+\frac{-12}{20}=\frac{15+(-12)}{20}=\frac{15-12}{20}=\frac{3}{20}$

2. The denominators of the given rational numbers are 8 and 12.

LCM of 8 and 12 is 24.

Now,

$\frac{5}{8}=\frac{5\times3}{8\times3}=\frac{15}{24}$ and $\frac{-7}{12}=\frac{-7\times2}{12\times2}=\frac{-14}{24}$

$\therefore \frac{5}{8}+\frac{-7}{12}=\frac{15}{24}+\frac{-14}{24}=\frac{15+(-14)}{24}=\frac{15-14}{24}=\frac{1}{24}$

3. The denominators of the given rational numbers are 9 and 6.

LCM of 9 and 6 is 18.

Now,

$\frac{-8}{9}=\frac{-8\times2}{9\times2}=\frac{-16}{18}$ and $\frac{11}{6}=\frac{11\times3}{6\times3}=\frac{33}{18}$

$\therefore \frac{-8}{9}+\frac{11}{6}=\frac{-16}{18}+\frac{33}{18}=\frac{-16+33}{18}=\frac{-16+33}{18}=\frac{17}{18}$

4. The denominators of the given rational numbers are 16 and 24.

LCM of 16 and 24 is 48.

Now,

$\frac{-5}{16}=\frac{-5\times3}{16\times3}=\frac{-15}{48}$ and $\frac{7}{24}=\frac{7\times2}{24\times2}=\frac{14}{48}$

$\therefore \frac{-5}{16}+\frac{7}{24}=\frac{-15}{48}+\frac{14}{48}=\frac{-15+14}{48}=\frac{-1}{48}$

5. We will first write each of the given numbers with positive denominators.

$\frac{7}{-18}=\frac{7\times(-1)}{-18\times(-1)}=\frac{-7}{18}$

The denominators of the given rational numbers are 18 and 27.

LCM of 18 and 27 is 54.

Now,

$\frac{-7}{18}=\frac{-7\times3}{18\times3}=\frac{-21}{54}$ and $\frac{8}{27}=\frac{8\times2}{27\times2}=\frac{16}{54}$

$\therefore \frac{7}{-18}+\frac{8}{27}=\frac{-21}{54}+\frac{16}{54}=\frac{-21+16}{54}=\frac{-5}{54}$

6. We will first write each of the given numbers with positive denominators.

$\frac{1}{-12}=\frac{1\times(-1)}{-12\times(-1)}=\frac{-1}{12}$ and $\frac{2}{-15}=\frac{2\times(-1)}{-15\times(-1)}=\frac{-2}{15}$

The denominators of the given rational numbers are 12 and 15.

LCM of 12 and 15 is 60.

Now,

$\frac{-1}{12} = \frac{-1\times5}{12\times5} = \frac{-5}{60}$ and $\frac{-2}{15} = \frac{-2\times4}{15\times4} = \frac{-8}{60}$

$\therefore \frac{1}{-12} + \frac{2}{-15} = \frac{-5}{60} + \frac{-8}{60} = \frac{-5+(-8)}{60} = \frac{-5-8}{60} = \frac{-13}{60}$

7. We can write -1 as $\frac{-1}{1}$.

The denominators of the given rational numbers are 1 and 4.

LCM of 1 and 4 is 4.

Now,

$\frac{-1}{1} = \frac{-1\times4}{1\times4} = \frac{-4}{4}$ and $\frac{3}{4} = \frac{3\times1}{4\times1} = \frac{3}{4}$

$\therefore -1 + \frac{3}{4} = \frac{-4}{4} + \frac{3}{4} = \frac{-4+3}{4} = \frac{-1}{4}$

8. We can write 2 as $\frac{2}{1}$.

The denominators of the given rational numbers are 1 and 4.

LCM of 1 and 4 is 4.

Now,

$\frac{2}{1} = \frac{2\times4}{1\times4} = \frac{8}{4}$ and $\frac{-5}{4} = \frac{-5\times1}{4\times1} = \frac{-5}{4}$

$\therefore 2 + \frac{(-5)}{4} = \frac{8}{4} + \frac{(-5)}{4} = \frac{8+(-5)}{4} = \frac{8-5}{4} = \frac{3}{4}$

9. We can write 0 as $\frac{0}{1}$.

The denominators of the given rational numbers are 1 and 5.

LCM of 1 and 5 is 5, that is, (1 × 5).

Now,

$\frac{0}{1} = \frac{0\times5}{1\times5} = \frac{0}{5} = 0$ and $\frac{-2}{5} = \frac{-2\times1}{5\times1} = \frac{-2}{5}$

$\therefore 0 + \frac{(-2)}{5} = \frac{0}{5} + \frac{(-2)}{5} = \frac{0+(-2)}{5} = \frac{0-2}{5} = \frac{-2}{5}$

Q3.

Answer :

1. LHS = $\frac{-12}{5} + \frac{2}{7}$

LCM of 5 and 7 is 35.

$\frac{-12\times7}{5\times7} + \frac{2\times5}{7\times5} = \frac{-84}{35} + \frac{10}{35} = \frac{-84+10}{35} = \frac{-74}{35}$

RHS = $\frac{2}{7} + \frac{-12}{5}$

LCM of 5 and 7 is 35.

$\frac{2\times5}{7\times5} + \frac{-12\times7}{5\times7} = \frac{10}{35} + \frac{-84}{35} = \frac{10-84}{35} = \frac{-74}{35}$

$\therefore \frac{-12}{5} + \frac{2}{7} = \frac{2}{7} + \frac{-12}{5}$

2. LHS = $\frac{-5}{8} + \frac{-9}{13}$

LCM of 8 and 13 is 104.

$\frac{-5\times13}{8\times13} + \frac{-9\times8}{13\times8} = \frac{-65}{104} + \frac{-72}{104} = \frac{-65+(-72)}{104} = \frac{-65-72}{104} = \frac{-137}{104}$

RHS = $\frac{-9}{13} + \frac{-5}{8}$

LCM of 13 and 8 is 104.

$\frac{-9\times8}{13\times8} + \frac{-5\times13}{8\times13} = \frac{-72}{104} + \frac{-65}{104} = \frac{-72-65}{104} = \frac{-137}{104}$

$\therefore \frac{-5}{8} + \frac{-9}{13} = \frac{-9}{13} + \frac{-5}{8}$

3. LHS = $\frac{3}{1} + \frac{-7}{12}$

LCM of 1 and 12 is 12.

$\frac{3\times12}{1\times12} + \frac{-7\times1}{12\times1} = \frac{36}{12} + \frac{-7}{12} = \frac{36+(-7)}{12} = \frac{36-7}{12} = \frac{29}{12}$

RHS = $\frac{-7}{12} + \frac{3}{1}$

LCM of 12 and 1 is 12.

$\frac{-7\times1}{12\times1} + \frac{3\times12}{1\times12} = \frac{-7}{12} + \frac{36}{12} = \frac{-7+36}{12} = \frac{29}{12}$

$\therefore 3 + \frac{-7}{12} = \frac{-7}{12} + 3$

4. LHS = $\frac{2}{-7}+\frac{12}{-35}$

We will write the given numbers with positive denominators.

$\frac{2}{-7}=\frac{2\times(-1)}{-7\times(-1)}=\frac{-2}{7}$ and $\frac{12}{-35}=\frac{12\times(-1)}{-35\times(-1)}=\frac{-12}{35}$

LCM of 7 and 35 is 35.

$\frac{-2\times5}{7\times5}+\frac{-12\times1}{35\times1}=\frac{-10}{35}+\frac{-12}{35}=\frac{-10+(-12)}{35}=\frac{-10-12}{35}=\frac{-22}{35}$

RHS = $\frac{12}{-35}+\frac{2}{-7}$

We will write the given numbers with positive denominators.

$\frac{12}{-35}=\frac{12\times(-1)}{-35\times(-1)}=\frac{-12}{35}$ and $\frac{2}{-7}=\frac{2\times(-1)}{-7\times(-1)}=\frac{-2}{7}$

LCM of 35 and 7 is 35.

$\frac{-2\times5}{7\times5}+\frac{-12\times1}{35\times1}=\frac{-10}{35}+\frac{-12}{35}=\frac{-10+(-12)}{35}=\frac{-10-12}{35}=\frac{-22}{35}$

$\therefore \frac{2}{-7}+\frac{12}{-35}=\frac{12}{-35}+\frac{2}{-7}$

Q4.

Answer :

1.

LHS = $\left\{\left(\frac{3}{4}+\frac{-2}{5}\right)+\frac{-7}{10}\right\}$

$\left\{\left(\frac{15-8}{20}\right)+\frac{-7}{10}\right\}=\left(\frac{7}{20}+\frac{-7}{10}\right)=\left(\frac{7}{20}+\frac{-14}{20}\right)=\left(\frac{7+(-14)}{20}\right)=\frac{-7}{20}$

RHS = $\left\{\frac{3}{4}+\left(\frac{-2}{5}+\frac{-7}{10}\right)\right\}$

$\left\{\frac{3}{4}+\left(\frac{-4}{10}+\frac{-7}{10}\right)\right\}=\left\{\frac{3}{4}+\left(\frac{-4-7}{10}\right)\right\}=\left\{\frac{3}{4}+\left(\frac{-11}{10}\right)\right\}=\left(\frac{3}{4}+\frac{-11}{10}\right)$
$=\left(\frac{15}{20}+\frac{-22}{20}\right)=\left(\frac{15-22}{20}\right)=\frac{-7}{20}$

$\therefore \left(\frac{3}{4}+\frac{-2}{5}\right)+\frac{-7}{10}=\frac{3}{4}+\left(\frac{-2}{5}+\frac{-7}{10}\right)$

2.

LHS = $\left\{\left(\frac{-7}{11}+\frac{2}{-5}\right)+\frac{-13}{22}\right\}$

We will first make the denominator positive.

$$\left\{\left(\frac{-7}{11}+\frac{2\times(-1)}{-5\times(-1)}\right)+\frac{-13}{22}\right\}=\left\{\left(\frac{-7}{11}+\frac{-2}{5}\right)+\frac{-13}{22}\right\}$$

$$\left\{\left(\frac{-7}{11}+\frac{-2}{5}\right)+\frac{-13}{22}\right\}=\left\{\left(\frac{-35}{55}+\frac{-22}{55}\right)+\frac{-13}{22}\right\}=\left\{\left(\frac{-35-22}{55}\right)+\frac{-13}{22}\right\}$$
$$=\left(\frac{-57}{55}+\frac{-13}{22}\right)=\frac{-114}{110}+\frac{-65}{110}=\frac{-114-65}{110}=\frac{-179}{110}$$

RHS = $\left\{\frac{-7}{11}+\left(\frac{2}{-5}+\frac{-13}{22}\right)\right\}$

We will first make the denominator positive.

$$\left\{\frac{-7}{11}+\left(\frac{2\times(-1)}{-5\times(-1)}+\frac{-13}{22}\right)\right\}=\left\{\frac{-7}{11}+\left(\frac{-2}{5}+\frac{-13}{22}\right)\right\}$$

$$\left\{\frac{-7}{11}+\left(\frac{-2}{5}+\frac{-13}{22}\right)\right\}=\left\{\frac{-7}{11}+\left(\frac{-44}{110}+\frac{-65}{110}\right)\right\}=\left\{\frac{-7}{11}+\left(\frac{-44+(-65)}{110}\right)\right\}$$
$$=\frac{-7}{11}+\frac{-109}{110}=\frac{-70}{110}+\frac{-109}{110}=\frac{-70-109}{110}=\frac{-179}{110}$$

$$\therefore\left(\frac{-7}{11}+\frac{2}{-5}\right)+\frac{-13}{22}=\frac{-7}{11}+\left(\frac{2}{-5}+\frac{-13}{22}\right)$$

3.

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

$$\left\{\frac{-1}{1}+\left(\frac{-2}{3}+\frac{-3}{4}\right)\right\}=\left\{\frac{-1}{1}+\left(\frac{-8}{12}+\frac{-9}{12}\right)\right\}=\left\{\frac{-1}{1}+\left(\frac{-8-9}{12}\right)\right\}$$
$$=\left\{\frac{-1}{1}+\left(\frac{-17}{12}\right)\right\}=\left(\frac{-1}{1}+\frac{-17}{12}\right)=\left(\frac{-1\times12}{1\times12}+\frac{-17\times1}{12\times1}\right)=\left(\frac{-12+(-17)}{12}\right)$$
$$=\left(\frac{-12-17}{12}\right)=\frac{-29}{12}$$

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

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

$$\left\{\left(\frac{-1}{1}+\frac{-2}{3}\right)+\frac{-3}{4}\right\}=\left\{\left(\frac{-3}{3}+\frac{-2}{3}\right)+\frac{-3}{4}\right\}=\left\{\left(\frac{-3-2}{3}\right)+\frac{-3}{4}\right\}$$
$$=\left\{\left(\frac{-5}{3}\right)+\frac{-3}{4}\right\}=\left(\frac{-5}{3}+\frac{-3}{4}\right)=\left(\frac{-20}{12}+\frac{-9}{12}\right)=\left(\frac{-20-9}{12}\right)=\frac{-29}{12}$$

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

Q5.

Answer :

(i) Addition is commutative, that is, $a+b=b+a$.

Hence, the required solution is $\left(\frac{-3}{17}\right)+\left(\frac{-12}{5}\right)=\left(\frac{-12}{5}\right)+\boxed{\left(\frac{-3}{7}\right)}$.

(ii) Addition is commutative, that is, $a+b=b+a$.

Hence, the required solution is $-9+\frac{-21}{8}=\frac{-21}{8}+\boxed{-9}$.

(iii) Addition is associative, that is, $(a+b)+c=a+(b+c)$.

Hence, the required solution is $\left(\frac{-8}{13}+\frac{3}{7}\right)+\left(\frac{-13}{4}\right)=\boxed{\left(\frac{-8}{13}\right)}+\left[\frac{3}{7}+\left(\frac{-13}{4}\right)\right]$.

(iv) Addition is associative, that is, $(a+b)+c=a+(b+c)$.

Hence, the required solution is $-12+\left(\frac{7}{12}+\frac{-9}{11}\right)=\left(-12+\frac{7}{12}\right)+\frac{-9}{11}$.

(iv) Addition is associative, that is, $(a+b)+c=a+(b+c)$.

Hence, the required solution is $-12+\left(\frac{7}{12}+\frac{-9}{11}\right)=\left(-12+\frac{7}{12}\right)+\frac{-9}{11}$.

(v) Addition is associative, that is, $(a+b)+c=a+(b+c)$.

Hence, the required solution is $\frac{19}{-5}+\left(\frac{-3}{11}+\frac{-7}{8}\right)=\left\{\frac{19}{-5}+\boxed{\left(\frac{-3}{11}\right)}\right\}+\frac{-7}{8}$.

(vi) 0 is the additive identity, that is, $0+a=a$.

Hence, the required solution is $\frac{-16}{7}+\boxed{0}=\boxed{0}+\frac{-16}{7}=\frac{-16}{7}$.

Q6.

Answer :

The additive inverse of $\frac{a}{b}$ is $\frac{-a}{b}$. Therefore, $\frac{a}{b}+\left(\frac{-a}{b}\right)=0$

(i) Additive inverse of $\frac{1}{3}$ is $\frac{-1}{3}$.

(ii) Additive inverse of $\frac{23}{9}$ is $\frac{-23}{9}$.

(iii) Additive inverse of -18 is 18.

(iv) Additive inverse of $\frac{-17}{8}$ is $\frac{17}{8}$.

(v) In the standard form, we write $\frac{15}{-4}$ as $\frac{-15}{4}$.

Hence, its additive inverse is $\frac{15}{4}$.

(vi) We can write:

$\frac{-16}{-5}=\frac{-16\times(-1)}{-5\times(-1)}=\frac{16}{5}$

Hence, its additive inverse is $\frac{-16}{5}$.

(vii) Additive inverse of $\frac{-3}{11}$ is $\frac{3}{11}$.

(viii) Additive inverse of 0 is 0.

(ix) In the standard form, we write $\frac{19}{-6}$ as $\frac{-19}{6}$.

Hence, its additive inverse is $\frac{19}{6}$.

(x) We can write:

$$\frac{-8}{-7}=\frac{-8\times(-1)}{-7\times(-1)}=\frac{8}{7}$$

Hence, its additive inverse is $\frac{-8}{7}$.

Q7.

Answer :

(i) $\left(\frac{1}{3}-\frac{3}{4}\right)=\frac{1}{3}+\left(\text{Additive inverse of}\ \frac{3}{4}\right)$

$$=\left(\frac{1}{3}+\frac{-3}{4}\right)=\left(\frac{4}{12}+\frac{-9}{12}\right)=\left(\frac{4-9}{12}\right)=\frac{-5}{12}$$

(ii) $\left(\frac{1}{3}-\frac{-5}{6}\right)=\frac{1}{3}+\left(\text{Additive inverse of}\ \frac{-5}{6}\right)$

$$=\left(\frac{1}{3}+\frac{5}{6}\right)\ \text{(Because the additive inverse of}\ \frac{-5}{6}\ \text{is}\ \frac{5}{6})$$

$$=\left(\frac{2}{6}+\frac{5}{6}\right)=\left(\frac{2+5}{6}\right)=\frac{7}{6}$$

(iii) $\left(\frac{-3}{5}-\frac{-8}{9}\right)=\frac{-3}{5}+\left(\text{Additive inverse of}\ \frac{-8}{9}\right)$

$$=\left(\frac{-3}{5}+\frac{8}{9}\right)\ \text{(Because the additive inverse of}\ \frac{-8}{9}\ \text{is}\ \frac{8}{9})$$

$$=\left(\frac{-27}{45}+\frac{40}{45}\right)=\left(\frac{-27+40}{45}\right)=\frac{13}{45}$$

(iv) $\left(-1-\frac{-9}{7}\right)=-1+\left(\text{Additive inverse of}\ \frac{-9}{7}\right)$

$$=\left(\frac{-1}{1}+\frac{9}{7}\right)\ \text{(Because the additive inverse of}\ \frac{-9}{7}\ \text{is}\ \frac{9}{7})$$

$$=\left(\frac{-7}{7}+\frac{9}{7}\right)=\left(\frac{-7+9}{7}\right)=\frac{2}{7}$$

(v) $\left(1-\frac{-18}{11}\right)=1+\left(\text{Additive inverse of}\ \frac{-18}{11}\right)$

$$=\left(\frac{1}{1}+\frac{18}{11}\right)\ \text{(Because the additive inverse of}\ \frac{-18}{11}\ \text{is}\ \frac{18}{11})$$

$$=\left(\frac{11}{11}+\frac{18}{11}\right)=\left(\frac{11+18}{11}\right)=\frac{29}{11}$$

(vi) $\left(0-\frac{-13}{9}\right)=0+\left(\text{Additive inverse of}\frac{-13}{9}\right)$

$=\left(0+\frac{13}{9}\right)$ (Because the additive inverse of $\frac{-13}{9}$ is $\frac{13}{9}$)

$=\frac{13}{9}$

(vii) $\left(\frac{-6}{5}-\frac{-32}{13}\right)=\frac{-6}{5}+\left(\text{Additive inverse of}\frac{-32}{13}\right)$

$=\left(\frac{-6}{5}+\frac{32}{13}\right)$ (Because the additive inverse of $\frac{-32}{13}$ is $\frac{32}{13}$)

$=\left(\frac{-78}{65}+\frac{160}{65}\right)=\left(\frac{-78+160}{65}\right)=\frac{82}{65}$

(vi) $\left(0-\frac{-13}{9}\right)=0+\left(\text{Additive inverse of}\frac{-13}{9}\right)$

$=\left(0+\frac{13}{9}\right)$ (Because the additive inverse of $\frac{-13}{9}$ is $\frac{13}{9}$)

$=\frac{13}{9}$

(vii) $\left(\frac{-6}{5}-\frac{-32}{13}\right)=\frac{-6}{5}+\left(\text{Additive inverse of}\frac{-32}{13}\right)$

$=\left(\frac{-6}{5}+\frac{32}{13}\right)$ (Because the additive inverse of $\frac{-32}{13}$ is $\frac{32}{13}$)

$=\left(\frac{-78}{65}+\frac{160}{65}\right)=\left(\frac{-78+160}{65}\right)=\frac{82}{65}$

Q8.

Answer :

(i)

$\left(\frac{4}{3}+\frac{-2}{3}\right)+\left(\frac{3}{5}+\frac{-11}{5}\right)$

$=\left(\frac{4-2}{3}\right)+\left(\frac{3-11}{5}\right)$

$=\left(\frac{2}{3}+\frac{-8}{5}\right)$

$=\left(\frac{10}{15}+\frac{-24}{15}\right)$

$=\left(\frac{10-24}{15}\right)$

$=\frac{-14}{15}$

(ii)

$\left(\frac{-8}{3}+\frac{-11}{6}\right)+\left(\frac{-1}{4}+\frac{3}{8}\right)$

$=\left(\frac{-16}{6}+\frac{-11}{6}\right)+\left(\frac{-2}{8}+\frac{3}{8}\right)$

$=\left(\frac{-16-11}{6}\right)+\left(\frac{-2+3}{8}\right)$

$=\left(\frac{-27}{6}+\frac{1}{8}\right)$

$=\left(\frac{-108}{24}+\frac{3}{24}\right)$

$=\frac{-105}{24}$

$=\frac{35}{8}$

(iii)

$\left(\frac{-13}{20}+\frac{7}{10}\right)+\left(\frac{11}{14}+\frac{-5}{7}\right)$

$=\left(\frac{-13}{20}+\frac{14}{20}\right)+\left(\frac{11}{14}+\frac{-10}{14}\right)$

$=\left(\frac{-13+14}{20}\right)+\left(\frac{11-10}{14}\right)$

$=\left(\frac{1}{20}+\frac{1}{14}\right)$

$=\left(\frac{7}{140}+\frac{10}{140}\right)$

$=\left(\frac{7+10}{140}\right)$

$=\left(\frac{17}{140}\right)$

$=\frac{17}{140}$

(iv)

$\left(\frac{-6}{7}+\frac{-15}{7}\right)+\left(\frac{-5}{6}+\frac{-4}{9}\right)$

$=\left(\frac{-6}{7}+\frac{-15}{7}\right)+\left(\frac{-15}{18}+\frac{-8}{18}\right)$

$=\left(\frac{-6-15}{7}\right)+\left(\frac{-15-8}{18}\right)$

$=\left(\frac{-21}{7}+\frac{-23}{18}\right)$

$=\left(\frac{-3}{1}+\frac{-23}{18}\right)$

$=\left(\frac{-54}{18}+\frac{-23}{18}\right)$

$=\left(\frac{-54-23}{18}\right)$

Q9.

Answer :

Let the other number be x.
Now,

$\Rightarrow x+\frac{-14}{5}=-2$

$\Rightarrow x-\frac{14}{5}=-2$

$\Rightarrow x=-2+\frac{14}{5}$

$\Rightarrow x=\frac{(-2)\times 5+14}{5}$

$\Rightarrow x=\frac{-10+14}{5}$

$\Rightarrow x=\frac{4}{5}$

Q10.

Answer :

Let the other number be x.
Now,

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

$\Rightarrow x = -\frac{1}{2} - \frac{5}{6}$

$\Rightarrow x = \frac{-3-5}{6}$

$\Rightarrow x = \frac{-8}{6}$

$\Rightarrow x = \frac{-4}{3}$

Q11.

Answer :

Let the required number be *x*.

Now,

$\frac{-5}{8} + x = \frac{-3}{2}$

$\Rightarrow \frac{-5}{8} + x + \frac{5}{8} = \frac{-3}{2} + \frac{5}{8}$ (Adding $\frac{5}{8}$ to both the sides)

$\Rightarrow x = \left(\frac{-3}{2} + \frac{5}{8}\right)$

$\Rightarrow x = \left(\frac{-12}{8} + \frac{5}{8}\right)$

$\Rightarrow x = \left(\frac{-12+5}{8}\right)$

$\Rightarrow x = \frac{-7}{8}$

Hence, the required number is $\frac{-7}{8}$.

Q12.

Answer :

Let the required number be *x*.

Now,

$-1 + x = \frac{5}{7}$

$\Rightarrow -1 + x + 1 = \frac{5}{7} + 1$ (Adding 1 to both the sides)

$\Rightarrow x = \left(\frac{5+7}{7}\right)$

$\Rightarrow x = \frac{12}{7}$

Hence, the required number is $\frac{12}{7}$.

Q13.

Answer :

Let the required number be *x*.

Now,

$\frac{-2}{3} - x = \frac{-1}{6}$
$\Rightarrow \frac{-2}{3} - x + x = \frac{-1}{6} + x$ (Adding x to both the sides)
$\Rightarrow \frac{-2}{3} = \frac{-1}{6} + x$
$\Rightarrow \frac{-2}{3} + \frac{1}{6} = \frac{-1}{6} + x + \frac{1}{6}$ (Adding $\frac{1}{6}$ to both the sides)
$\Rightarrow \left(\frac{-4}{6} + \frac{1}{6}\right) = x$
$\Rightarrow \left(\frac{-4+1}{6}\right) = x$
$\Rightarrow \frac{-3}{6} = x$
$\Rightarrow \frac{-1\times3}{2\times3} = x$
$\Rightarrow \frac{-1}{2} = x$

Hence, the required number is $\frac{-1}{2}$.

Q14.

Answer :

1. Zero is a rational number that is its own additive inverse.

2. Yes
Consider ab-cd (with a, b, c and d as integers), where b and d are not equal to 0.

ab-cd implies adbd-bcbd implies ad-bcbd
Since ad, bc and bd are integers since integers are closed under the operation of multiplication and ad-bc is an integer since integers are closed under the operation of subtraction, then ad-bcbd
since it is in the form of one integer divided by another and the denominator is not equal to 0
Since, *b* and *d* were not equal to 0

Thus, ab-cd is a rational number.

3. Yes, rational numbers are commutative under addition. If *a* and *b* are rational numbers, then the commutative law under addition is a+b=b+a.

4. Yes, rational numbers are associative under addition. If *a, b* and *c* are rational numbers, then the associative law under addition is a+(b+c)=(a+b)+c.

5. No, subtraction is not commutative on rational numbers. In general, for any two rational numbers, $(a-b) \neq (b-a)$.

6. Rational numbers are not associative under subtraction. Therefore,
$a-(b-c) \neq (a-b)-c$.

7. Negative of a negative rational number is a positive rational number.

Rational Numbers
Ex 1D

Q1.

Answer :

(i)

$$\frac{3}{5} \times \frac{-7}{8}$$
$$= \frac{3 \times (-7)}{5 \times 8}$$
$$= -\frac{21}{40}$$

(ii)

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

(iii)

$$\frac{-6}{11} \times \frac{-5}{3}$$
$$= \frac{(-6) \times (-5)}{11 \times 3}$$
$$= \frac{30}{33}$$

Simplifying the above rational number, we get:

$\frac{30}{33} = \frac{30 \div 3}{33 \div 3} = \frac{10}{11}$

(iv)

$\frac{-2}{3} \times \frac{6}{7}$
$= \frac{(-2) \times 6}{3 \times 7}$
$= \frac{-12}{21}$

Simplifying the above rational number, we get:

$\frac{-12}{21} = \frac{-12 \div 3}{21 \div 3} = \frac{-4}{7}$

(v)

$\frac{-12}{5} \times \frac{10}{-3}$
$= \frac{(-12) \times 10}{5 \times (-3)}$
$= \frac{-120}{-15}$
$= \frac{120}{15}$

Simplifying the above rational number, we get:

$\frac{120}{15} = \frac{120 \div 3}{15 \div 3} = \frac{40}{5} = 8$

(vi)

$\frac{25}{-9} \times \frac{3}{-10}$
$= \frac{25 \times 3}{(-9) \times (-10)}$
$= \frac{75}{90}$

Simplifying the above rational number, we get:

$\frac{75}{90} = \frac{75 \div 15}{90 \div 15} = \frac{5}{6}$

(vii)

$\frac{5}{-18} \times \frac{-9}{20}$
$= \frac{5 \times (-9)}{-18 \times 20}$
$= \frac{-45}{-360}$
$= \frac{45}{360}$

Simplifying the above rational number, we get:

$\frac{45}{360} = \frac{45 \div 45}{360 \div 45} = \frac{1}{8}$

(viii)

$\frac{-13}{15} \times \frac{-25}{26}$
$= \frac{(-13) \times (-25)}{15 \times 26}$
$= \frac{325}{390}$

Simplifying the above rational number, we get:

$\frac{325}{390} = \frac{325 \div 5}{390 \div 5} = \frac{65}{78} = \frac{65 \div 13}{78 \div 13} = \frac{5}{6}$

(ix)

$\frac{16}{-21} \times \frac{14}{5}$
$= \frac{16 \times 14}{(-21) \times 5}$
$= \frac{224}{-105}$

Simplifying the above rational number, we get:

$\frac{224}{-105} = \frac{224 \div 7}{(-105) \div 7} = \frac{32}{-15} = \frac{32 \times -1}{-15 \times -1} = \frac{-32}{15}$

(x)

$\frac{-7}{6} \times 24$
$= \frac{(-7) \times 24}{6}$
$= \frac{-168}{6}$

Simplifying the above rational number, we get:

$\frac{-168}{6} = \frac{(-168) \div 2}{6 \div 2} = \frac{84}{3} = \frac{-84 \div 3}{3 \div 3} = -28$

(xi)

$\frac{7}{24} \times \left(-48\right)$
$= \frac{7 \times (-48)}{24} = -\frac{336}{24}$

Simplifying the above rational number, we get:

$\frac{-336}{24} = \frac{-336 \div 24}{24 \div 24} = -14$

(xii)

$\frac{-13}{5} \times \left(-10\right)$
$= \frac{(-13) \times (-10)}{5}$
$= \frac{130}{5}$

Simplifying the above rational number, we get:

$\frac{130}{5} = \frac{130 \div 5}{5 \div 5} = 26$

Q2.

Answer :

(i)

$\frac{3}{7} \times \frac{-5}{9} = \frac{-5}{9} \times \frac{3}{7}$

$\text{LHS} = \frac{3 \times (-5)}{7 \times 9}$

$= -\frac{15}{63}$

Simplifying, we get:

$-\frac{15}{63} = -\frac{15 \div 3}{63 \div 3}$

$= -\frac{5}{21}$

$\text{RHS} = \frac{-5}{9} \times \frac{3}{7}$

$= \frac{(-5) \times 3}{9 \times 7}$

$= \frac{-15}{63}$

Simplifying, we get:

$= \frac{-15 \div 3}{63 \div 3}$

$= -\frac{5}{21}$

LHS = RHS

(ii)

$\frac{-8}{7} \times \frac{13}{9} = \frac{13}{9} \times \frac{-8}{7}$

$\text{LHS} = \frac{-8}{7} \times \frac{13}{9} = \frac{(-8) \times 13}{7 \times 9} = -\frac{104}{63}$ $\text{RHS} = \frac{13}{9} \times \frac{-8}{7} = \frac{13 \times (-8)}{9 \times 7} = -\frac{104}{63}$ $\text{LHS} = \text{RHS}$

(iii)

$\frac{-12}{5} \times \frac{7}{-36} = \frac{7}{-36} \times \frac{-12}{5}$

$\text{LHS} = \frac{-12}{5} \times \frac{7}{-36}$

$= \frac{(-12) \times 7}{5 \times (-36)}$

$= \frac{84}{180}$

Simplifying, we get:

$= \frac{84 \div 12}{180 \div 12}$

$= \frac{7}{15}$

$\text{RHS} = \frac{7}{-36} \times \frac{-12}{5}$

$= \frac{7 \times (-12)}{(-36) \times 5}$

$= \frac{84}{180}$

Simplifying, we get:

$= \frac{84 \div 12}{180 \div 12}$

$= \frac{7}{15}$

LHS = RHS

(iv)

$-8 \times \frac{-13}{12} = \frac{-13}{12} \times \left(-8\right)$

$\text{LHS} = -8 \times \frac{-13}{12}$

$= \frac{(-8) \times (-13)}{12}$

$= \frac{104}{12}$

Simplifying, we get:

$= \frac{104 \div 4}{12 \div 4}$

$= \frac{26}{3}$

$\text{RHS} = \frac{-13}{12} \times \left(-8\right)$

$= \frac{(-13) \times (-8)}{12}$

$= \frac{104}{12}$

Simplifying, we get:

$= \frac{104 \div 4}{12 \div 4}$

$= \frac{26}{3}$

LHS = RHS

Q3.

Answer :

(i)

$\left(\frac{5}{7} \times \frac{12}{13}\right) \times \frac{7}{18} = \frac{5}{7} \times \left(\frac{12}{13} \times \frac{7}{18}\right)$

$\text{LHS} = \left(\frac{5}{7} \times \frac{12}{13}\right) \times \frac{7}{18}$

$= \frac{5 \times 12}{7 \times 13} \times \frac{7}{18}$

$= \frac{60}{91} \times \frac{7}{18}$

$= \frac{420}{1638}$

$= \frac{10}{39}$

$\text{RHS} = \frac{5}{7} \times \left(\frac{12}{13} \times \frac{7}{18}\right)$

$= \frac{5}{7} \times \frac{12 \times 7}{13 \times 18}$

$= \frac{5}{7} \times \frac{84}{234}$

$= \frac{420}{1638}$

$= \frac{10}{39}$

$\therefore \left(\frac{5}{7} \times \frac{12}{13}\right) \times \frac{7}{18} = \frac{5}{7} \times \left(\frac{12}{13} \times \frac{7}{18}\right)$

(ii)

$\frac{-13}{24} \times \left(\frac{-12}{5} \times \frac{35}{36}\right) = \left(\frac{-13}{24} \times \frac{-12}{5}\right) \times \frac{35}{36}$

$\text{LHS} = \frac{-13}{24} \times \left(\frac{-12}{5} \times \frac{35}{36}\right)$

$= \frac{-13}{24} \times \frac{(-12)\times 35}{5\times 36}$

$= \frac{-13}{24} \times \frac{-420}{180}$

$= \frac{5460}{4320}$

$= \frac{91}{72}$

$\text{RHS} = \left(\frac{-13}{24} \times \frac{-12}{5}\right) \times \frac{35}{36}$

$= \frac{(-13)\times(-12)}{24\times 5} \times \frac{35}{36}$

$= \frac{156}{120} \times \frac{35}{36}$

$= \frac{156\times 35}{120\times 36}$

$= \frac{5460}{4320}$

$= \frac{91}{72}$

$\therefore \frac{-13}{24} \times \left(\frac{-12}{5} \times \frac{35}{36}\right) = \left(\frac{-13}{24} \times \frac{-12}{5}\right) \times \frac{35}{36}$

(iii)

$\left(\frac{-9}{5} \times \frac{-10}{3}\right) \times \frac{21}{-4} = \frac{-9}{5} \times \left(\frac{-10}{3} \times \frac{21}{-4}\right)$

$\text{LHS} = \left(\frac{-9}{5} \times \frac{-10}{3}\right) \times \frac{21}{-4}$

$= \frac{(-9)\times(-10)}{5\times 3} \times \frac{21}{-4}$

$= \frac{90}{15} \times \frac{21}{-4}$

$= \frac{90\times 21}{15\times(-4)}$

$= -\frac{1890}{60}$

$= -\frac{63}{2}$

$\text{RHS} = \frac{-9}{5} \times \left(\frac{-10}{3} \times \frac{21}{-4}\right)$

$= \frac{-9}{5} \times \frac{(-10)\times 21}{3\times(-4)}$

$= \frac{-9}{5} \times \frac{210}{12}$

$= \frac{(-9)\times 210}{5\times 12}$

$= -\frac{1890}{60}$

$= \frac{-63}{2}$

$\therefore \left(\frac{-9}{5} \times \frac{-10}{3}\right) \times \frac{21}{-4} = \frac{-9}{5} \times \left(\frac{-10}{3} \times \frac{21}{-4}\right)$

Q4.

Answer :

(i)

$\frac{-23}{17} \times \frac{18}{35} = \frac{18}{35} \times \boxed{\frac{-23}{17}} \qquad \left(\because a \times b = b \times a\right)$

(ii)

$-38 \times \frac{-7}{9} = \frac{-7}{9} \times \boxed{-38} \qquad \left(\because a \times b = b \times a\right)$

(iii)

$\left(\frac{15}{7} \times \frac{-21}{10}\right) \times \frac{-5}{6} = \boxed{\frac{15}{7}} \times \left(\frac{-21}{10} \times \frac{-5}{6}\right) \quad \left[\because a \times \left(b \times c\right) = \left(a \times b\right) \times c\right]$

(iv)

$\frac{-12}{5} \times \left(\frac{4}{15} \times \frac{25}{-16}\right) = \left(\frac{-12}{5} \times \frac{4}{15}\right) \times \boxed{\frac{25}{-16}} \quad \left[\because a \times \left(b \times c\right) = \left(a \times b\right) \times c\right]$

Q5.

Answer :

(i)

Reciprocal of $\frac{13}{25}$ is $\frac{25}{13}$.

(ii)

Reciprocal of $\frac{-17}{12}$ is $\frac{12}{-17}$, that is, $\frac{-12}{17}$.

(iii)

Reciprocal of $\frac{-7}{24}$ is $\frac{24}{-7}$, that is, $\frac{-24}{7}$.

(iv)

Reciprocal of 18 is $\frac{1}{18}$.

(v)

Reciprocal of -16 is $\frac{1}{-16}$, that is, $\frac{-1}{16}$.

(vi)

Reciprocal of $\frac{-3}{-5}$ is $\frac{-5}{-3}$, that is, $\frac{5}{3}$.

(vii)

Reciprocal of -1 is -1.

(viii)

Reciprocal of $\frac{0}{2}$ does not exist as $\frac{2}{0} = \infty$.

(ix)

Reciprocal of $\frac{2}{-5}$ is $\frac{-5}{2}$.

(x)

Reciprocal of $\frac{-1}{8}$ is -8.

Q6.

Answer :

We know that $a^{-1} = \frac{1}{a}$ or $a^{-1} \times a = 1$

(i)

$\left(\frac{5}{8}\right)^{-1} = \frac{8}{5}$

$\because \frac{5}{8} \times \left(\frac{5}{8}\right)^{-1} = 1$

(ii)

$\left(\frac{-4}{9}\right)^{-1} = \frac{9}{-4} = \frac{-9}{4}$

$\because \frac{-4}{9} \times \left(\frac{-4}{9}\right)^{-1} = 1$

(iii)

$\left(-7\right)^{-1} = \frac{1}{-7} = \frac{-1}{7}$

$\because -7 \times \left(-7\right)^{-1} = 1$

(iv) $\left(-3\right)^{-1}$

$\left(-3\right)^{-1} = \frac{1}{-3} = \frac{-1}{3}$

$\because \left(-3\right)^{-1} \times (-3) = 1$

Q7.

Answer :

(i)

$\text{LHS} = \frac{3}{7} \times \left(\frac{5}{6} + \frac{12}{13}\right)$

$= \frac{3}{7} \times \left(\frac{65+72}{78}\right)$

$= \frac{3}{7} \times \frac{137}{78}$

$= \frac{137}{182}$

$\text{RHS} = \left(\frac{3}{7} \times \frac{5}{6}\right) + \left(\frac{12}{13} \times \frac{3}{7}\right)$

$= \frac{3\times5}{7\times6} + \frac{12\times3}{13\times7}$

$= \frac{15}{42} + \frac{36}{91}$

$= \frac{195+216}{546}$

$= \frac{411}{546}$

$= \frac{137}{182}$

$\therefore \frac{3}{7} \times \left(\frac{5}{6} + \frac{12}{13}\right) = \left(\frac{3}{7} \times \frac{5}{6}\right) + \left(\frac{3}{7} \times \frac{12}{13}\right)$

(ii)

$$\text{LHS} = \frac{-15}{4} \times \left(\frac{3}{7} + \frac{-12}{5}\right)$$
$$= \frac{-15}{4} \times \left(\frac{15-84}{35}\right)$$
$$= \frac{-15}{4} \times \frac{-69}{35}$$
$$= \frac{(-15)\times(-69)}{140}$$
$$= \frac{1035}{140}$$
$$= \frac{207}{28}$$
$$\text{RHS} = \left(\frac{-15}{4} \times \frac{3}{7}\right) + \left(\frac{-15}{4} \times \frac{-12}{5}\right)$$
$$= \frac{(-15)\times 3}{4\times 7} + \frac{(-15)\times(-12)}{4\times 5}$$
$$= \frac{-45}{28} + \frac{180}{20}$$
$$= \frac{-225+1260}{140}$$
$$= \frac{1035}{140}$$
$$= \frac{207}{28}$$

$$\therefore \frac{-15}{4} \times \left(\frac{3}{7} + \frac{-12}{5}\right) = \left(\frac{-15}{4} \times \frac{3}{7}\right) + \left(\frac{-15}{4} \times \frac{-12}{5}\right)$$

(iii)

$$\left(\frac{-8}{3} + \frac{-13}{12}\right) \times \frac{5}{6} = \left(\frac{-8}{3} \times \frac{5}{6}\right) + \left(\frac{-13}{12} \times \frac{5}{6}\right)$$
$$\text{LHS} = \left(\frac{-8}{3} + \frac{-13}{12}\right) \times \frac{5}{6}$$
$$= \frac{-32-13}{12} \times \frac{5}{6}$$
$$= \frac{-45}{12} \times \frac{5}{6}$$
$$= \frac{-45\times 5}{12\times 6}$$
$$= \frac{-225}{72}$$
$$= \frac{-225\div 9}{72\div 9}$$
$$= -\frac{25}{8}$$
$$\text{RHS} = \left(\frac{-8}{3} \times \frac{5}{6}\right) + \left(\frac{-13}{12} \times \frac{5}{6}\right)$$
$$= \frac{-8\times 5}{3\times 6} + \frac{(-13)\times 5}{12\times 6}$$
$$= \frac{-40}{18} + \frac{-65}{72}$$
$$= \frac{-160-65}{72}$$
$$= \frac{-225}{72}$$
$$= \frac{-225\div 9}{72\div 9}$$
$$= \frac{-25}{8}$$
$$\therefore \left(\frac{-8}{3} + \frac{-13}{12}\right) \times \frac{5}{6} = \left(\frac{-8}{3} \times \frac{5}{6}\right) + \left(\frac{-13}{12} \times \frac{5}{6}\right)$$

(iv)

$$\frac{-16}{7} \times \left(\frac{-8}{9} + \frac{-7}{6}\right) = \left(\frac{-16}{7} \times \frac{-8}{9}\right) + \left(\frac{-16}{7} \times \frac{-7}{6}\right)$$
$$\text{LHS} = \frac{-16}{7} \times \left(\frac{-8}{9} + \frac{-7}{6}\right)$$
$$= \frac{-16}{7} \times \left(\frac{-16-21}{18}\right)$$
$$= \frac{-16}{7} \times \frac{-37}{18}$$
$$= \frac{592}{126}$$
$$= \frac{296}{63}$$
$$\text{RHS} = \left(\frac{-16}{7} \times \frac{-8}{9}\right) + \left(\frac{-16}{7} \times \frac{-7}{6}\right)$$
$$= \frac{128}{63} + \frac{112}{42}$$
$$= \frac{256+336}{126}$$

$= \frac{592}{126}$

$= \frac{296}{63}$

$\therefore \ \frac{-16}{7} \times \left(\frac{-8}{9} + \frac{-7}{6}\right) = \left(\frac{-16}{7} \times \frac{-8}{9}\right) + \left(\frac{-16}{7} \times \frac{-7}{6}\right)$

Q8.

Answer :

Commutative property
Associative property
Distributive property
Property of multiplicative identity
Property of multiplicative inverse
Multiplicative property of 0

Q9.

Answer :

(i) 1
(ii) no
(iii) 1; -1
(iv) not
(v) 1a
(vi) a
(vii) positive
(viii) negative

Rational Numbers
Ex 1E

Q1.

Answer :

(i)

$\frac{4}{9} \div \frac{-5}{12}$

$= \frac{4}{9} \times \frac{12}{-5}$

$= \frac{4 \times 12}{9 \times -5}$

$= \frac{48}{-45}$

$= \frac{-48}{45}$

$= \frac{-16}{15}$

(ii)

$-8 \div \frac{-7}{16}$

$= -8 \times \frac{16}{-7}$

$= \frac{8 \times 16}{7}$

$= \frac{128}{7}$

(iii)

$\frac{-12}{7} \div (-18)$

$= \frac{-12}{7} \times \frac{1}{-18}$

$= \frac{12}{126}$

$= \frac{12 \div 3}{126 \div 3}$

$= \frac{4}{42}$

$= \frac{4 \div 2}{42 \div 2}$

$= \frac{2}{21}$

$\left(\text{iv}\right)$

$\frac{-1}{10} \div \frac{-8}{5}$

$= \frac{-1}{10} \times \frac{5}{-8}$

$= \frac{5}{80}$

$= \frac{5 \div 5}{80 \div 5}$

$= \frac{1}{16}$

$\left(\text{v}\right)$

$\frac{-16}{35} \div \frac{-15}{14}$

$= \frac{-16}{35} \times \frac{14}{-15}$

$= \frac{224}{525}$

$\left(\text{vi}\right)$

$\frac{-65}{14} \div \frac{13}{7}$

$= \frac{-65}{14} \times \frac{7}{13}$

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

Q2.

Answer :

$\left(\text{i}\right)$

$\frac{13}{5} \div \frac{26}{10} = \frac{26}{10} \div \frac{13}{5}$

LHS

$\frac{13}{5} \div \frac{26}{10}$

$= \frac{13}{5} \times \frac{10}{26}$

$= \frac{130}{130}$

$= 1$

RHS

$\frac{26}{10} \div \frac{13}{5}$

$= \frac{26}{10} \times \frac{5}{13}$

$= \frac{130}{130}$

$= 1$

TRUE

$\left(\text{ii}\right) -9 \div \frac{3}{4} = \frac{3}{4} \div \left(-9\right) \text{LHS} -9 \div \frac{3}{4} = -9 \times \frac{4}{3} = \frac{-36}{3} = -12 \text{RHS} \frac{3}{4} \div (-9) = \frac{3}{4} \times \frac{1}{-9}$

$= \frac{3}{-36} = \frac{-1}{12}$ FALSE iii) $\frac{-8}{9} \div \frac{-4}{3} = \frac{-4}{3} \div \frac{-8}{9}$ LHS $\frac{-8}{9} \div \frac{-4}{3}$

$= \frac{-8}{9} \times \frac{3}{-4} = \frac{24}{36} = \frac{2}{3}$ RHS $\frac{-4}{3} \div \frac{-8}{9} = \frac{-4}{3} \times \frac{9}{-8} = \frac{36}{24}$

$= \frac{3}{2}$ FALSE $\left(\text{iv}\right) \frac{-7}{24} \div \frac{3}{-16} = \frac{3}{-16} \div \frac{-7}{24}$ LHS $\frac{-7}{24} \times \frac{-16}{3}$

$= \frac{112}{72}$ RHS $\frac{3}{-16} \div \frac{-7}{24} = \frac{3}{-16} \times \frac{24}{-7} = \frac{72}{112}$ FALSE

Q3.

Answer :

(i)

$\left(\frac{5}{9} \div \frac{1}{3}\right) \div \frac{5}{2} = \frac{5}{9} \div \left(\frac{1}{3} \div \frac{5}{2}\right)$

LHS

$\left(\frac{5}{9} \div \frac{1}{3}\right) \div \frac{5}{2}$

$= \left(\frac{5}{9} \times \frac{3}{1}\right) \times \frac{2}{5}$

$= \frac{5 \times 3 \times 2}{9 \times 1 \times 5}$

$= \frac{30}{45}$

$= \frac{2}{3}$

RHS

$\frac{5}{9} \div \left(\frac{1}{3} \div \frac{5}{2}\right)$

$= \frac{5}{9} \div \left(\frac{1}{3} \times \frac{2}{5}\right)$

$= \frac{5}{9} \div \left(\frac{2}{15}\right)$

$= \frac{5}{9} \times \left(\frac{15}{2}\right) = \frac{75}{18}$

$= \frac{25}{6}$

LHS $\neq$ RHS

FALSE

(ii)

$\left[\left(-16\right) \div \frac{6}{5}\right] \div \frac{-9}{10} = \left(-16\right) \div \left[\frac{6}{5} \div \frac{-9}{10}\right]$

LHS

$= \left[\left(-16\right) \div \frac{6}{5}\right] \div \frac{-9}{10}$

$= \left[\left(-16\right) \times \frac{5}{6}\right] \times \frac{10}{-9}$

$= \frac{(-16) \times 5 \times 10}{6 \times (-9)}$

$= \frac{800}{54}$

$= \frac{400}{27}$

RHS

$\left(-16\right) \div \left(\frac{6}{5} \div \frac{-9}{10}\right)$

$= \left(-16\right) \div \left(\frac{6}{5} \times \frac{10}{-9}\right)$

$= -16 \div \left\{\frac{-60}{45}\right\}$

$= -16 \times \left(\frac{-45}{60}\right)$

$= \frac{48}{4}$

$= 12$

LHS $\neq$ RHS

FALSE

(iii)

$\left(\frac{-3}{5} \div \frac{-12}{35}\right) \div \frac{1}{14} = \frac{-3}{5} \div \left(\frac{-12}{35} \div \frac{1}{4}\right)$

LHS

$= \left(\frac{-3}{5} \times \frac{35}{-12}\right) \times 14$

$= \frac{(-3)\times 35 \times 14}{5\times(-12)}$

$= \frac{1470}{60}$

$= \frac{49}{2}$

RHS

$= \frac{-3}{5} \div \left(\frac{-12}{35} \div \frac{1}{4}\right)$

$= \frac{-3}{5} \div \left(\frac{-12}{35} \times \frac{4}{1}\right)$

$= \frac{-3}{5} \div \left(\frac{-12\times 4}{35}\right)$

$= \frac{-3}{5} \div \left(\frac{-12\times 4}{35}\right)$

$= \frac{-3}{5} \div \left(\frac{-48}{35}\right)$

$= \frac{-3}{5} \times \frac{35}{-48}$

$= \frac{3\times 35}{5\times 48}$

$= \frac{105}{240}$

$= \frac{7}{16}$

LHS $\neq$ RHS

FALSE

Q4.

Answer :

Let the number be x.

Now,

$x \times \left(-12\right) = -9$

$\Rightarrow x = -9 \div \left(-12\right)$

$\Rightarrow x = \left(-9\right) \times \frac{1}{-12}$

$\Rightarrow x = \frac{-9}{-12}$

$\Rightarrow x = \frac{3}{4}$

Q5.

Answer :

Let the number be x. .

Now,

$x \times \frac{-4}{3} = \frac{-16}{9}$

$\Rightarrow x = \frac{-16}{9} \div \frac{-4}{3}$

$\Rightarrow x = \frac{-16}{9} \times \frac{3}{-4}$

$\Rightarrow x = \frac{-16\times 3}{9\times(-4)}$

$\Rightarrow x = \frac{48}{36}$

$\Rightarrow x = \frac{4}{3}$

Q6.

Answer :

Let the number be x.
Now,

$x \times \frac{-15}{56} = \frac{-5}{7}$

$\Rightarrow x = \frac{-5}{7} \div \frac{-15}{56}$

$\Rightarrow x = \frac{-5}{7} \times \frac{56}{-15}$

$\Rightarrow x = \frac{280}{105}$

$\Rightarrow x = \frac{280 \div 5}{105 \div 5}$

$\Rightarrow x = \frac{56}{21}$

$\Rightarrow x = \frac{56 \div 7}{21 \div 7}$

$\Rightarrow x = \frac{8}{3}$

Q7.

Answer :

Let the number be x.
Now,

$x \times \frac{-8}{39} = \frac{1}{26}$

$\Rightarrow x = \frac{1}{26} \div \frac{-8}{39}$

$\Rightarrow x = \frac{1}{26} \times \frac{39}{-8}$

$\Rightarrow x = \frac{39}{-208}$

$\Rightarrow x = \frac{39 \times -1}{-208 \times -1}$

$\Rightarrow x = \frac{-39}{208}$

$\Rightarrow x = \frac{-39 \div 13}{208 \div 13}$

$\Rightarrow x = \frac{-3}{16}$

Q8.

Answer :

Let the number be x.
Now,

$\frac{-33}{8} \div x = \frac{-11}{2}$

$\Rightarrow \frac{-33}{8} \times \frac{1}{x} = \frac{-11}{2}$

$\Rightarrow \frac{1}{x} = \frac{-11}{2} \div \frac{-33}{8}$

$\Rightarrow \frac{1}{x} = \frac{-11}{2} \times \frac{8}{-33}$

$\Rightarrow \frac{1}{x} = \frac{88}{66}$

$\Rightarrow \frac{1}{x} = \frac{4}{3}$

$\Rightarrow x = \frac{3}{4}$ $\left(\text{Reciprocal of } \frac{4}{3}\right)$

Q9.

Answer :

$\left(\frac{13}{5} + \frac{-12}{7}\right) \div \left(\frac{-31}{7} \times \frac{1}{-2}\right)$

$= \left(\frac{91-60}{35}\right) \div \left(\frac{-31}{-14}\right)$

$= \left(\frac{31}{35}\right) \div \left(\frac{31}{14}\right)$

$= \left(\frac{31}{35}\right) \times \left(\frac{14}{31}\right)$

$= \frac{14}{35}$

$= \frac{14 \div 7}{35 \div 7}$

$= \frac{2}{5}$

Q10.

Answer :

$$\left(\frac{65}{12}+\frac{8}{3}\right)\div\left(\frac{65}{12}-\frac{8}{3}\right)$$
$$=\left(\frac{65}{12}+\frac{32}{12}\right)\div\left(\frac{65}{12}-\frac{32}{12}\right)$$
$$=\left(\frac{97}{12}\right)\div\left(\frac{33}{12}\right)$$
$$=\frac{97}{12}\times\frac{12}{33}$$
$$=\frac{97}{33}$$

Q11.

Answer :

(i)

Let $\frac{9}{8}\div x=\frac{-3}{2}$
$\Rightarrow\frac{9}{8}\times\frac{1}{x}=\frac{-3}{2}$
$\Rightarrow\frac{1}{x}=\frac{-3}{2}\div\frac{9}{8}$
$\Rightarrow\frac{1}{x}=\frac{-3}{2}\times\frac{8}{9}$
$\Rightarrow\frac{1}{x}=\frac{-24}{18}$
$\Rightarrow\frac{1}{x}=\frac{-4}{3}$
$\Rightarrow x=\frac{-3}{4}$ $\left[\text{Reciprocal of } \frac{-4}{3}\right]$

(ii)

Let $x\div\left(\frac{-7}{5}\right)=\frac{10}{19}$
$\Rightarrow x\times\left(\frac{5}{-7}\right)=\frac{10}{19}$
$\Rightarrow x=\left(\frac{10}{19}\right)\div\left(\frac{5}{-7}\right)$
$\Rightarrow x=\frac{10}{19}\times\frac{-7}{5}$
$\Rightarrow x=\frac{-14}{19}$

(iii)

Let $x\div\left(-3\right)=\frac{-4}{15}$
$\Rightarrow x\times\left(\frac{1}{-3}\right)=\frac{-4}{15}$
$\Rightarrow x=\frac{-4}{15}\times\left(-3\right)$
$\Rightarrow x=\frac{12}{15}$
$\Rightarrow x=\frac{4}{5}$

(iv)

Let $\left(-12\right)\div x=\frac{-6}{5}$
$\Rightarrow\left(-12\right)\times\frac{1}{x}=\frac{-6}{5}$
$\Rightarrow\frac{1}{x}=\frac{-6}{5}\div\left(-12\right)$
$\Rightarrow\frac{1}{x}=\frac{-6}{5}\times\frac{1}{-12}$
$\Rightarrow\frac{1}{x}=\frac{1}{10}$
$\Rightarrow x=10$

Q12.

Answer :

(i) No, rational numbers are not closed under division in general.

$\frac{a}{0} = \infty$; it is not a rational number.

(ii) No

$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c} = \frac{ad}{bc}$

Also,

$\frac{c}{d} \div \frac{a}{b} = \frac{c}{d} \times \frac{b}{a} = \frac{cb}{da}$ Thus, $\frac{a}{b} \div \frac{c}{d} \neq \frac{c}{d} \div \frac{a}{b}$

Therefore, division is not commutative.

(iii) No, rational numbers are not associative under division.

$\frac{a}{b} \div \left(\frac{c}{d} \div \frac{e}{f}\right) \neq \left(\frac{a}{b} \div \frac{c}{d}\right) \div \frac{e}{f}$

(iv) No, we cannot divide 1 by 0. The answer will be∞, which is not defined.

Rational Numbers
Ex 1F

Q1.

Answer :

$\text{Required number} = \frac{1}{2}\left(\frac{1}{4}+\frac{1}{3}\right)$

$= \frac{1}{2}\left(\frac{3+4}{12}\right)$

$= \left(\frac{1}{2}\times\frac{7}{12}\right)$

$= \frac{7}{24}$

Q2.

Answer :

$\text{Required Number} = \frac{1}{2}\times\left(2+3\right)$

$= \frac{5}{2}$

Q3.

Answer :

$\text{Required number} = \frac{1}{2}\times\left(\frac{-1}{3}+\frac{1}{2}\right)$

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

$= \frac{1}{2}\times\frac{1}{6}$

$= \frac{1}{12}$

Q4.

Answer :

Required number $= \frac{1}{2} \times (-3-2)$

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

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

We know :

$-3 < \frac{-5}{2} < -2$

Rational number between -3 and $\frac{-5}{2} = \frac{1}{2} \times \left(-3-\frac{5}{2}\right)$

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

$= \frac{1}{2} \times \frac{-11}{2}$

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

Thus, the required numbers are $\frac{-5}{2}$ and $\frac{-11}{4}$.

Q5.

Answer :

Rational number between 4 and 5 :

$\frac{1}{2}\left(4+5\right)$

$= \frac{9}{2}$

Rational number between 4 and $\frac{9}{2}$:

$\frac{1}{2}\left(4+\frac{9}{2}\right)$

$= \frac{1}{2}\left(\frac{8+9}{2}\right)$

$= \frac{1}{2}\left(\frac{17}{2}\right)$

$= \frac{17}{4}$

Rational number between $\frac{9}{2}$ and 5 :

$\frac{1}{2}\left(\frac{9}{2}+5\right)$

$= \frac{1}{2}\left(\frac{9+10}{2}\right)$

$= \frac{19}{4}$

We know :

$4 < \frac{17}{4} < \frac{9}{2} < \frac{19}{4} < 5$

Q6.

Answer :

Rational number between $\frac{2}{3}$ and $\frac{3}{4}$:

$\frac{1}{2}\left(\frac{2}{3}+\frac{3}{4}\right)$

$= \frac{1}{2}\left(\frac{8+9}{12}\right)$

$= \frac{17}{24}$

We know :

$\frac{2}{3} < \frac{17}{24} < \frac{3}{4}$

Rational number between $\frac{2}{3}$ and $\frac{17}{24}$:

$\frac{1}{2}\left(\frac{2}{3}+\frac{17}{24}\right)$

$= \frac{1}{2}\left(\frac{16+17}{24}\right)$

$= \frac{1}{2}\left(\frac{33}{24}\right)$

$= \frac{33}{48} = \frac{33 \div 3}{48 \div 3} = \frac{11}{16}$

Rational number between $\frac{17}{24}$ and $\frac{3}{4}$:

$\frac{1}{2}\left(\frac{17}{24}+\frac{3}{4}\right)$

$= \frac{1}{2}\left(\frac{17+18}{24}\right)$

$= \frac{1}{2}\left(\frac{35}{24}\right)$

$= \frac{35}{48}$

We know :

$\frac{2}{3} < \frac{11}{16} < \frac{17}{24} < \frac{35}{48} < \frac{3}{4}$

Thus, the three rational numbers are $\frac{11}{16}$, $\frac{17}{24}$ and $\frac{35}{48}$.

Q8.

Answer :

We may write :

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

and

$2 = \frac{20}{10}$

Rational numbers between -1 and 2 :

$\frac{-9}{10}, \frac{-8}{10}, \frac{-7}{10}, \frac{-6}{10}, \frac{-5}{10}, \frac{-4}{10}, \ldots, \frac{14}{10}, \frac{15}{10}, \frac{16}{10}, \frac{17}{10}, \frac{18}{10}$ and $\frac{19}{10}$

We can take any 12 numbers out of these.

Rational Numbers
Ex 1G

Q1.

Answer :

Length of the rope when two pieces of lengths $2\frac{3}{5}\ \mathbf{m}$ and $3\frac{3}{10}\ \mathbf{m}$ are cut off = Total length of the rope - Length of the two cut off pieces

$\therefore 11-\left(2\frac{3}{5}+3\frac{3}{10}\right)$

Now,

$2\frac{3}{5}+3\frac{3}{10} \Rightarrow \left(2+\frac{3}{5}\right)+\left(3+\frac{3}{10}\right)$

$=\frac{13}{5}+\frac{33}{10}$

LCM of 5 and 10 is 10, i.e., $(5\times 1\times 2)$.

We have :

$\frac{(13\times 2)+(33\times 1)}{10}$

$=\frac{26+33}{10}$

$=\frac{59}{10}$

$\therefore 2\frac{3}{5}+3\frac{3}{10}=\frac{59}{10}$

Length of the remaining rope $=11-\frac{59}{10}$

$=\frac{110-59}{10}$

$=\frac{51}{10}$

$=5\frac{1}{10}\ \mathbf{m}$

Therefore, the length of the remaining rope is $5\frac{1}{10}\ \mathbf{m}$.

Q2.

Answer :

Weight of rice in the drum = Weight of the drum full of rice - Weight of the empty drum

$$\begin{aligned}&= 40\frac{1}{6} - 13\frac{3}{4}\\&= \left(40 + \frac{1}{6}\right) - \left(13 + \frac{3}{4}\right)\\&= \frac{241}{6} - \frac{55}{4}\\&= \frac{241}{6} + \left(\text{Additive inverse of } \frac{55}{4}\right)\\&= \frac{482-165}{12}\\&= \frac{317}{12}\\&= 26\frac{5}{12}\ \text{kg}\end{aligned}$$

Therefore, the weight of rice in the drum is $26\frac{5}{12}$ kg.

Q3.

Answer :

Weight of pears in the basket = Weight of the basket containing three types of fruits - (Weight of apples + Weight of oranges)

$=19\frac{1}{3} - \left(8\frac{1}{9} + 3\frac{1}{6}\right)$

Now,

$$\begin{aligned}\left(8\frac{1}{9} + 3\frac{1}{6}\right) &\Rightarrow \left(8 + \frac{1}{9}\right) + \left(3 + \frac{1}{6}\right)\\&= \frac{73}{9} + \frac{19}{6}\end{aligned}$$

LCM of 9 and 6 is 18, that is, $(3 \times 3 \times 2)$.

We have :

$\frac{(73\times2)+(19\times3)}{18}$

$= \frac{146+57}{18}$

$= \frac{203}{18}$

$\therefore 8\frac{1}{9} + 3\frac{1}{6} = \frac{203}{18}$

Weight of pears in the basket = $19\frac{1}{3} - \frac{203}{18}$

$$\begin{aligned}&= \left(19 + \frac{1}{3}\right) - \frac{203}{18}\\&= \frac{58}{3} - \frac{203}{18}\\&= \frac{58}{3} + \left(\text{Additive inverse of } \frac{203}{18}\right)\\&= \frac{348-203}{18}\\&= \frac{145}{18}\\&= 8\frac{1}{18}\ \text{kg}\end{aligned}$$

Therefore, the weight of the pears in the basket is $8\frac{1}{18}$ kg.

Q4.

Answer :

Money saved by the rickshaw puller = Total money earned - (Earnings spent on tea and snacks + Earnings spent on food + Earnings spent on repairs)

$$\begin{aligned}&= 80 - \left(13\frac{3}{5} + 25\frac{1}{2} + 4\frac{2}{5}\right)\\&= 80 - \left(\left(13 + \frac{3}{5}\right) + \left(25 + \frac{1}{2}\right) + \left(4 + \frac{2}{5}\right)\right)\\&= 80 - \left(\frac{68}{5} + \frac{51}{2} + \frac{22}{5}\right)\end{aligned}$$

Now,

$\frac{68}{5} + \frac{51}{2} + \frac{22}{5} = \frac{(68\times2)+(51\times5)+(22\times2)}{10}$

$= \frac{136+255+44}{10}$

$= \frac{435}{10}$

$= \frac{87}{2}$

$\therefore \frac{68}{5} + \frac{51}{2} + \frac{22}{5} = \frac{87}{2}$

Money saved by the rickshaw puller $= 80 - \frac{87}{2}$

$= 80 + \left(\text{Additive inverse of } \frac{87}{2}\right)$

$= \frac{160-87}{2}$

$= \frac{73}{2}$

$= \text{Rs } 36\frac{1}{2}$

Therefore, the amount of money saved by the rickshaw puller is Rs $36\frac{1}{2}$.

Q5.

Answer :

Cost of $3\frac{2}{5}$ m cloth = $3\frac{2}{5} \times 36\frac{3}{4}$

$= \left(3 + \frac{2}{5}\right) \times \left(36 + \frac{3}{4}\right)$

$= \frac{17}{5} \times \frac{147}{4}$

$= \frac{17 \times 147}{5 \times 4}$

$= \frac{2499}{20}$

$= \text{Rs } 124\frac{19}{20}$

Therefore, the cost of $3\frac{2}{5}$ m cloth is Rs $124\frac{19}{20}$.

Q6.

Answer :

Distance covered by the car in $7\frac{1}{2}$ hours = $7\frac{1}{2} \times 40\frac{2}{5}$ [Distance = Speed × Time]

$= \left(7 + \frac{1}{2}\right) \times \left(40 + \frac{2}{5}\right)$

$= \frac{15}{2} \times \frac{202}{5}$

$= \frac{15 \times 202}{10}$

$= \frac{3030}{10}$

$= 303 \text{ km}$

Therefore, distance covered by the car is 303 km.

Q7.

Answer :

Area of the rectangular park = Length of the park × Breadth of the park (∵ Area of rectangle = Length × Breadth)

$= 36\frac{3}{5} \times 16\frac{2}{3}$

$= \left(36 + \frac{3}{5}\right) \times \left(16 + \frac{2}{3}\right)$

$= \frac{183}{5} \times \frac{50}{3}$

$= \frac{183 \times 50}{5 \times 3}$

$= \frac{9150}{15}$

$= 610 \text{ m}^2$

Therefore, the area of the rectangular park is 610 m^2.

Q8.

Answer :

Area of the square plot = Side × Side = $(\text{Side})^2$ = a^2 (Because the area of the square is a^2, where a is the side of the square)

$$
\begin{aligned}
&= 8\tfrac{1}{2} \times 8\tfrac{1}{2} \\
&= \left(8+\tfrac{1}{2}\right) \times \left(8+\tfrac{1}{2}\right) \\
&= \tfrac{17}{2} \times \tfrac{17}{2} \\
&= \tfrac{17\times17}{2\times2} \\
&= \tfrac{289}{4} \\
&= 72\tfrac{1}{4}\ \text{m}^2
\end{aligned}
$$

Therefore, the area of the square plot is $72\frac{1}{4}\ \text{m}^2$.

Q10.

Answer :

Distance covered by the aeroplane in $4\frac{1}{6}$ hours = $4\frac{1}{6} \times 1020$

$$
\begin{aligned}
&= \left(4+\tfrac{1}{6}\right) \times 1020 \\
&= \tfrac{25}{6} \times 1020 \\
&= \tfrac{25}{6} \times \tfrac{1020}{1} \\
&= \tfrac{25\times1020}{6\times1} \\
&= \tfrac{25500}{6} \\
&= 4250\ \text{km}
\end{aligned}
$$

Therefore, the distance covered by the aeroplane is $4250\ \text{km}$.

Q11.

Answer :

Cost of one metre of cloth = $57\frac{3}{4} \div 3\frac{1}{2}$

$$
\begin{aligned}
&= \left(57+\tfrac{3}{4}\right) \div \left(3+\tfrac{1}{2}\right) \\
&= \tfrac{231}{4} \div \tfrac{7}{2} \\
&= \tfrac{231}{4} \times \tfrac{2}{7} \\
&= \tfrac{231\times2}{4\times7} \\
&= \tfrac{462}{28} \\
&= 16\tfrac{14}{28} \\
&= \text{Rs}\ 16\tfrac{1}{2}
\end{aligned}
$$

Therefore, the cost of one metre of cloth is Rs $16\frac{1}{2}$.

Q12.

Answer :

Length of each piece of the cord = $71\frac{1}{2} \div 26$

$$
\begin{aligned}
&= \left(71+\tfrac{1}{2}\right) \div 26 \\
&= \tfrac{143}{2} \div 26 \\
&= \tfrac{143}{2} \div \tfrac{26}{1} \\
&= \tfrac{143}{2} \times \tfrac{1}{26} \\
&= \tfrac{143\times1}{2\times26} \\
&= \tfrac{143}{52} \\
&= \tfrac{9}{4} \\
&= 2\tfrac{3}{4}\ \text{m}
\end{aligned}
$$

Hence, the length of each piece of the cord is $2\frac{3}{4}$ metres.

Q13.

Answer :

Area of a room = Length × Breadth

Thus, we have:

$$65\frac{1}{4} = \text{Length} \times 5\frac{7}{16}$$

$$\text{Length} = 65\frac{1}{4} \div 5\frac{7}{16}$$

$$= \left(65 + \frac{1}{4}\right) \div \left(5 + \frac{7}{16}\right)$$

$$= \frac{261}{4} \div \frac{87}{16}$$

$$= \frac{261}{4} \times \frac{16}{87}$$

$$= \frac{261 \times 16}{4 \times 87}$$

$$= \frac{4176}{348}$$

$$= 12 \text{ m}$$

Hence, the length of the room is 12 metres.

Q14.

Answer :

Let the other fraction be *x*.

Now, we have:

$$9\frac{3}{7} \times x = 9\frac{3}{5}$$

$$\Rightarrow x = 9\frac{3}{5} \div 9\frac{3}{7}$$

$$= \left(9 + \frac{3}{5}\right) \div \left(9 + \frac{3}{7}\right)$$

$$= \frac{48}{5} \div \frac{66}{7}$$

$$= \frac{48}{5} \times \frac{7}{66}$$

$$= \frac{48 \times 7}{5 \times 66}$$

$$= \frac{336}{330}$$

$$= \frac{56}{55}$$

$$= 1\frac{1}{55}$$

Hence, the other fraction is $1\frac{1}{55}$.

Q15.

Answer :

If $\frac{5}{8}$of the students are boys, then the ratio of girls is $1 - \frac{5}{8}$, that is, $\frac{3}{8}$.

Now, let *x* be the total number of students.

Thus, we have:

$$\frac{3}{8}x = 240$$

$$\Rightarrow x = 240 \div \frac{3}{8}$$

$$= 240 \times \frac{8}{3}$$

$$= \frac{240}{1} \times \frac{8}{3}$$

$$= \frac{240 \times 8}{1 \times 3}$$

$$= \frac{1920}{3}$$

$$= 640$$

Hence, the total number of students is 640.

Now,

Number of boys = Total number of students - Number of girls

$$= 640 - 240$$

$$= 400$$

Q16.

Answer :

Ratio of the read book = $\frac{7}{9}$

Ratio of the unread book = $1 - \frac{7}{9}$

$= \frac{2}{9}$

Let *x* be the total number of pages in the book.

Thus, we have:

$\frac{2}{9} \times x = 40$

$\Rightarrow x = 40 \div \frac{2}{9}$

$= 40 \times \frac{9}{2}$

$= \frac{40}{1} \times \frac{9}{2}$

$= \frac{40 \times 9}{1 \times 2}$

$= \frac{360}{2}$

$= 180$

Hence, the total number of pages in the book is 180.

Q17.

Answer :

Amount of money spent on notebooks = $300 \times \frac{1}{3}$

$= \frac{300}{1} \times \frac{1}{3}$

$= \frac{300}{3}$

$= 100$

∴ Money left after spending on notebooks = $300 - 100$

$= 200$

Amount of money spent on stationery items from the remainder = $200 \times \frac{1}{4}$

$= \frac{200}{1} \times \frac{1}{4}$

$= \frac{200}{4}$

$= 50$

∴ Amount of money left with Rita = $200 - 50$

$= \mathbf{Rs}\ 150$

Q18.

Answer :

Total amount of money Amit earns = Rs 16000

Amount of money spent on food $= 16000 \times \frac{1}{4}$

$= \frac{16000}{1} \times \frac{1}{4}$

$= \frac{16000}{4}$

$= \mathbf{Rs}\ 4000$

∴ Amount of money left after spending on food $= 16000 - 4000$

$= \mathbf{Rs}\ 12000$

Amount of money spent on house rent from the remainder $= 12000 \times \frac{3}{10}$

$= \frac{12000}{1} \times \frac{3}{10}$

$= \frac{12000 \times 3}{1 \times 10}$

$= \frac{36000}{10}$

$= \mathbf{Rs}\ 3600$

∴ Amount of money left after spending on food and house rent $= 12000 - 3600$

$= \mathbf{Rs}\ 8400$

Amount of money spent on children's education from the remainder $= 8400 \times \frac{5}{21}$

$= \frac{8400}{1} \times \frac{5}{21}$

$= \frac{42000}{21}$

$= \text{Rs } 2000$

∴ Amount of money left$= 8400 - 2000$

$= \text{Rs } 6400$

Hence, the amount of money left with Amit is Rs 6400.

Q19.

Answer :

Let *x* be the required number.

We know that $\frac{3}{5}$ of the number exceeds its $\frac{2}{7}$ by 44.

That is,

$$\frac{3}{5} \times x = \frac{2}{7} \times x + 44$$

$$\frac{3}{5} \times x - \frac{2}{7} \times x = 44$$

$$\left(\frac{3}{5} - \frac{2}{7}\right) \times x = 44$$

$$\left(\frac{3}{5} + \text{Additive inverse of } \frac{2}{7}\right) \times x = 44$$

$$\left(\frac{21-10}{35}\right) \times x = 44$$

$$\frac{11}{35} \times x = 44$$

$$x = 44 \div \frac{11}{35}$$

$$= 44 \times \frac{35}{11}$$

$$= \frac{44}{1} \times \frac{35}{11}$$

$$= \frac{44 \times 35}{1 \times 11}$$

$$= \frac{1540}{11}$$

$$= 140$$

Q20.

Answer :

Ratio of spectators in the open $= 1 - \frac{2}{7}$

$= \frac{5}{7}$

Total number of spectators in the open = *x*

Then, $\frac{5}{7} \times x = 15000$

$$\Rightarrow x = 15000 \div \frac{5}{7}$$

$$= 15000 \times \frac{7}{5}$$

$$= \frac{15000}{1} \times \frac{7}{5}$$

$$= \frac{15000 \times 7}{1 \times 5}$$

$$= \frac{10500}{5}$$

$$= 21000$$

Hence, the total number of spectators is 21,000

Rational Numbers
Ex 1H

Q2.

Answer :

(b) $\frac{-28}{15}$

$\frac{8}{-15} = \frac{-8}{15}$ and $\frac{4}{-3} = \frac{-4}{3}$

Now, we have:

$$\left(\frac{8}{-15} + \frac{4}{-3}\right) = \left(\frac{-8}{15} + \frac{-4}{3}\right)$$

LCM of 15 and 3 is $(3 \times 5 \times 1)$, that is, 15

$$\begin{aligned}\frac{-8}{15} + \frac{-4}{3} &= \frac{1\times(-8)+5\times(-4)}{15} \\ &= \frac{(-8)+(-20)}{15} \\ &= \frac{-28}{15}\end{aligned}$$

Q3.

Answer :

$\frac{7}{-26} = \frac{-7}{26}$

Now, we have:

$$\left(\frac{7}{-26} + \frac{16}{39}\right) = \left(\frac{-7}{26} + \frac{16}{39}\right)$$

LCM of 26 and 39 is 1014, that is, $(29 \times 1 \times 36)$.

(a) $\frac{11}{78}$

$$\begin{aligned}\left(\frac{-7}{26} + \frac{16}{39}\right) &= \frac{39\times(-7)+26\times16}{1014} \\ &= \frac{(-273)+416}{1014} \\ &= \frac{143}{1014} \\ &= \frac{11}{78}\end{aligned}$$

Q4.

Answer :

(b) $\frac{16}{7}$

$3 = \frac{3}{1}$ and $\frac{5}{-7} = \frac{-5}{7}$

Now, we have:

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

LCM of 1 and 7 is 7

$$\left(\frac{3}{1} + \frac{-5}{7}\right) = \frac{7\times3+1\times(-5)}{7}$$
$$= \frac{21+(-5)}{7}$$
$$= \frac{16}{7}$$

Q5.

Answer :

(d) $\frac{-67}{8}$

$\frac{31}{-4} = \frac{-31}{4}$

We have:

$\left(\frac{31}{-4} + \frac{-5}{8}\right) = \left(\frac{-31}{4} + \frac{-5}{8}\right)$

LCM of 4 and 8 is 8, that is, $(4 \times 1 \times 2)$.

$$\left(\frac{-31}{4} + \frac{-5}{8}\right) = \frac{2\times(-31)+1\times(-5)}{8}$$
$$= \frac{(-62)+(-5)}{8}$$
$$= \frac{-67}{8}$$

Q6.

Answer :

(b) $\frac{-17}{20}$

Let the required number be *x*.

Now,

$\frac{7}{12} + x = \frac{-4}{15}$

$\Rightarrow x = \left(\frac{-4}{15} + \frac{-7}{12}\right)$

$= \frac{4\times(-4)+5\times(-7)}{60}$

$= \frac{(-16)+(-35)}{60}$

$= \frac{-51}{60}$

$= \frac{-17}{20}$

Q7.

Answer :

(c) $\frac{-13}{60}$

Using the commutative and associative laws, we can arrange the terms in any suitable manner. Using this rearrangement property, we have:

$$\frac{2}{3}+\frac{-4}{5}+\frac{7}{15}+\frac{-11}{20}=\left(\frac{2}{3}+\frac{7}{15}\right)+\left(\frac{-4}{5}+\frac{-11}{20}\right)$$

$$=\frac{(10+7)}{15}+\frac{[(-16)+(-11)]}{20}$$
$$=\left(\frac{17}{15}+\frac{-27}{20}\right)$$
$$=\frac{[68+(-81)]}{60}$$
$$=\frac{-13}{60}$$

Q8.

Answer :

(b) $\frac{11}{3}$

Let the other number be *x*.

Now,

$$x+(-5)=\frac{-4}{3}$$
$$\Rightarrow x=\frac{-4}{3}+(\text{Additive inverse of } -5)$$
$$\Rightarrow x=\frac{-4}{3}+5$$

$$=\frac{-4}{3}+\frac{5}{1}$$
$$=\frac{(-4)+15}{3}$$
$$=\frac{11}{3}$$

Q9.

Answer :

(c) $\frac{1}{21}$

Let the required number be *x*.

Now,

$$\frac{-5}{7}+x=\frac{-2}{3}$$
$$\Rightarrow x=\frac{-2}{3}+\left(\text{Additive inverse of } \frac{-5}{7}\right)$$
$$\Rightarrow x=\left(\frac{-2}{3}+\frac{5}{7}\right)$$
$$=\frac{(-14)+15}{21}$$
$$=\frac{1}{21}$$

Q10.

Answer :

(d) $\frac{-5}{2}$

Let the required number be *x*.

Now,

$$\frac{-5}{3}-x=\frac{5}{6}$$
$$\Rightarrow x=\left(\frac{-5}{3}-\frac{5}{6}\right)$$

$$=\frac{-10-5}{6}$$
$$=\frac{-15}{6}$$
$$=\frac{-5}{2}$$

Thus, the required number is $\frac{-5}{2}$

Q11.

Answer :

(b) $\frac{-7}{3}$

$\left(-\frac{3}{7}\right)^{-1} \Rightarrow \text{Reciprocal of} \frac{-3}{7}$

The reciprocal of $\frac{-3}{7}$ is $\frac{7}{-3}$, i.e., $\frac{-7}{3}$

Q12.

Answer :

(a) $\frac{-2}{3}$

Let the other number be *x*.

Now,

$x \times \frac{14}{27} = \frac{-28}{81}$

$\Rightarrow x = \frac{-28}{81} \div \frac{14}{27}$

$= \frac{-28}{81} \times \frac{27}{14}$

$= \frac{(-28) \times 27}{81 \times 14}$

$= \frac{-(28 \times 27)}{81 \times 14}$

$= \frac{-(2 \times 3)}{9 \times 1}$

$= \frac{-6}{9}$

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

Thus, the other number is $\frac{-2}{3}$

Q13.

Answer :

(c) $\frac{32}{75}$

Let the other number be *x*.

Now,

$x \times \frac{-15}{4} = \frac{-16}{35}$

$\Rightarrow x = \frac{-16}{35} \div \frac{-15}{14}$

$= \frac{-16}{35} \times \frac{14}{-15}$

$= \frac{-(16 \times 14)}{-(35 \times 15)}$

$= \frac{16 \times 14}{35 \times 15} = \frac{224}{525} = \frac{32}{75}$

Thus, the other number is $\frac{32}{75}$

Q14.

Answer :

(d) $\frac{7}{5}$

Let the required number be *x*.

Now,

$-\frac{3}{5} - x = -2$

$\Rightarrow -\frac{3}{5} = -2 + x$

$\Rightarrow x = \left(-\frac{3}{5} + 2\right)$

$\Rightarrow x = \frac{(-3+10)}{5}$

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

Thus, the required number is $\frac{7}{5}$

Q15.

Answer :

(c) $\frac{1}{3}$

Let the other number be *x*.

Now,

$$x + \left(-\frac{10}{3}\right) = -3$$

$$\Rightarrow x = -3 + \left(\text{Additive inverse of } -\frac{10}{3}\right)$$

$$\Rightarrow x = \left(-3 + \frac{10}{3}\right)$$

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

$$= \frac{(-9+10)}{3}$$

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

Thus, the other number is $\frac{1}{3}$

Q16.

Answer :

(b) $\frac{-49}{71}$ and (c) $\frac{-9}{16}$

The numbers $\frac{-49}{71}$ and $\frac{-9}{16}$ are in the standard form because they have no common divisor other than 1 and their denominators are positive.

Q17.

Answer :

(a) $\frac{-3}{10}$

$$\left(\frac{-9}{16} \times \frac{8}{15}\right) = \frac{-9\times 8}{16\times 15}$$

$$= \frac{-72}{240}$$

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

Q18.

Answer :

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

$$\frac{-5}{9} \div \frac{2}{3} = \frac{-5}{9} \times \frac{3}{2}$$

$$= \frac{-5\times 3}{9\times 2}$$

$$= \frac{-15}{18}$$

$$= \frac{-5}{6}$$

Q19.

Answer :

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

Let $\frac{4}{9} \div \frac{a}{b} = \frac{-8}{15}$

Now,

$\frac{4}{9} \times \frac{b}{a} = \frac{-8}{15}$

$\Rightarrow \frac{b}{a} = \frac{-8}{15} \times \frac{9}{4}$

$= \frac{-6}{5}$

$\Rightarrow \frac{a}{b} = \frac{5}{-6}$

$= \frac{-5}{6}$

Hence, the missing number is $\frac{-5}{6}$.

Q20.

Answer :

(c) $\frac{5}{9}$

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

Q21.

Answer :

(c) $\frac{-4}{3}$

Reciprocal of $\frac{-3}{4}$ is $\frac{4}{-3}$, $\mathbf{i.e.,}$ $\frac{-4}{3}$.

Q22.

Answer :

(d) $\frac{-5}{24}$

Rational number between $\frac{-2}{3}$ and $\frac{1}{4} = \frac{1}{2}\left(\frac{-2}{3} + \frac{1}{4}\right)$

$= \frac{1}{2}\left(\frac{-8+3}{12}\right)$

$= \frac{1}{2} \times \frac{-5}{12}$

$= \frac{-5}{24}$

Q23.

Answer :

(b) is a negative rational number

The reciprocal of a negative rational number is a negative rational number.