MATHEMATICS

Chapter 9: Rational Numbers

Important Questions

Multiple Choice Questions :

Question 1. The numerator of the rational number $\frac{1}{100}$ is

(a) 100

(b) 1

(c) 10

(d) 99

Question 2. The denominator of the rational number $\frac{4}{7}$ is

(a) 7

(b) 4

(c) 3

(d) 11

Question 3. The denominator of the rational number $\frac{7}{13}$ is

(a) 13

(b) 7

(c) 6

(d) 91

Question 4. The numerator of the rational number $-\frac{3}{4}$ is

(a) -3

(b) 3

(c) 4

(d) -4

Question 5. The numerator of the rational number $-\frac{2}{9}$ is

(a) -2

(b) 2

(c) -9

(d) 9

Question 6. The denominator of the rational number $\frac{5}{-3}$ is

(a) 5

(b) -3

(c) 3

(d) 8

Question 7. The denominator of the rational number $\frac{3}{-7}$ is

(a) 7

(b) -7

(c) 3

(d) -3

Question 8. The numerator of the rational number $\frac{-2}{-5}$ is

(a) 2

(b) -2

(c) 5

(d) -5

Question 9. the numerator of the rational number $\frac{-5}{-3}$ is

(a) -5

(b) 5

(c) -3

(d) 3

Question 10. The denominator of the rational number $\frac{-2}{-9}$ is

(a) -2

(b) 2

(c) 9

(d) -9

Question 11. The denominator of the rational number $\frac{-6}{-5}$ is

(a) 6

(b) -6

(c) 5

(d) -5

Question 12. The denominator of the rational number $\frac{-13}{-11}$ is

(a) -13

(b) 13

(c) 11

(d) -11

Question 13. The numerator of the rational number 0 is

(a) 0

(b) 1

(c) 2

(d) 3

Question 14. The denominator of the rational number 0 is

(a) 0

(b) 1

(c) -1

(d) any non-zero integer

Question 15. The numerator of a rational number 8 is

(a) 2

(b) 4

(c) 6

(d) 8

Very Short Questions :

1. Find three rational numbers equivalent to each of the following rational numbers.

   (i) $\frac{-2}{5}$

   (ii) $\frac{3}{7}$

2. Reduce the following rational numbers in standard form.

   (i) $\frac{35}{-15}$

   (ii) $\frac{-36}{-21}$

3. Represent $\frac{3}{2}$ and $\frac{-3}{4}$ on number lines.

4. Which of the following rational numbers is greater?

   (i) $\frac{3}{4}, \frac{1}{2}$

   (ii) $-\frac{3}{2}, \frac{-3}{4}$

5. Find the sum of

(i) $-4\frac{3}{4}+2\frac{7}{12}$ (ii) $\frac{9}{-12}+\frac{5}{8}$

6. Subtract:

(i) $\frac{-5}{6}$ from $\frac{-7}{8}$ (ii) $2\frac{1}{5}$ from $-3\frac{1}{6}$

Short Questions :

1. Find the product:

(i) $6\frac{2}{3}\times\left(-5\frac{1}{16}\right)$ (ii) $\left(-3\frac{1}{4}\right)\times\left(-2\frac{3}{4}\right)$

2. If the product of two rational numbers is $\frac{-9}{16}$ and one of them is $\frac{-4}{15}$, find the other number.

3. Arrange the following rational numbers in ascending order.

(i) $-\frac{1}{3},\frac{-4}{3},\frac{-2}{9}$ (ii) $-\frac{2}{3},\frac{4}{5},\frac{6}{7},-\frac{1}{6}$

4. Insert five rational numbers between:

(i) $\frac{-2}{3}$ and -1 (ii) $-\frac{1}{2}$ and $\frac{-3}{2}$

5. Evaluate the following:

$$\frac{-12}{-5}+\frac{7}{-3}+\frac{-5}{14}+\frac{22}{7}$$

6. Subtract the sum of $\frac{-5}{6}$ and $-1\frac{3}{5}$ from the sum $2\frac{2}{3}$ and $-6\frac{2}{5}$.

Long Questions :

1.

Simplify: $\left(\frac{3}{7}\times\frac{-5}{8}\right)\div\left(\frac{1}{3}\times\frac{5}{6}\right)+\left|\frac{-1}{2}-\frac{1}{5}\right|$

2. Divide the sum of $-2\frac{15}{17}$ and $3\frac{5}{34}$ by their difference.

3. During a festival sale, the cost of an object is ₹ 870 on which 20% is off. The same object is available at other shops for ₹ 975 with a discount of $6\frac{2}{3}$%. Which is a better deal and by how much?

4. Simplify:

$$21.5\ \div\ 5-\frac{1}{5}\text{of}\ (20.5-5.5)+\ 0.5\ \times\ 8.5$$

5. Simplify:

$$2.3 - [1.89 - \{3.6 - (2.7 - \overline{0.8 - 0.03})\}]$$

6.

$$\text{If } x = \frac{-4}{9}, y = \frac{5}{12} \text{ and } z = \frac{7}{18}, \text{ find the value of}$$
$$x \div y - \left[\frac{1}{xy} - y\left(\frac{2x}{y} \div \frac{x}{2y}\right) - xyz\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right)\right].$$

ANSWER KEY -

Multiple Choice questions :

1. (b) 1
2. (a) 7
3. (a) 13
4. (a) -3
5. (a) -2
6. (b) -3
7. (b) -7
8. (b) -2
9. (a) -5
10. (d) -9
11. (d) -5
12. (d) -11
13. (a) 0
14. (d) -1
15. (d) 8

Very Short Answer :

1.

$$(i)\ \frac{-2}{5} = \frac{-2 \times 2}{5 \times 2} = \frac{-4}{10}$$
$$\frac{-2}{5} = \frac{-2 \times 3}{5 \times 3} = \frac{-6}{15}$$
$$\frac{-2}{5} = \frac{-2 \times 4}{5 \times 4} = \frac{-8}{20}$$

Hence, the required rational numbers are

$\frac{-4}{10}, \frac{-6}{15}$ and $\frac{-8}{20}$.

(ii) $\frac{3}{7} = \frac{3 \times 2}{7 \times 2} = \frac{6}{14}$

$\frac{3}{7} = \frac{3 \times 3}{7 \times 3} = \frac{9}{21}$

$\frac{3}{7} = \frac{3 \times 4}{7 \times 4} = \frac{12}{28}$

Hence, the required rational numbers are

$\frac{6}{14}, \frac{9}{21}$ and $\frac{12}{28}$.

2.

(i) $\frac{35}{-15} = \frac{-35}{15} = \frac{-35 \div 5}{15 \div 5} = \frac{-7}{3}$

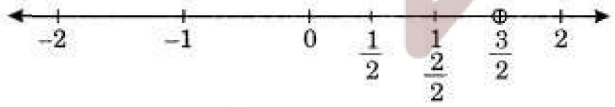
[$\because$ HCF of 35 and 15 = 5]

(ii) $\frac{-36}{-216} = \frac{36}{216} = \frac{36 \div 36}{216 \div 36} = \frac{1}{6}$

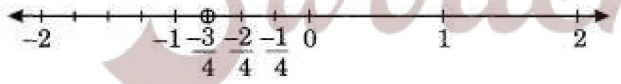
[$\because$ HCF of 36 and 216 = 36]

3.

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



(ii) $-\frac{3}{4}$



4.

(*i*) We have $\frac{3}{4}, \frac{1}{2}$

LCM of 4 and 2 = 4

$\therefore \quad \frac{3}{4} = \frac{3 \times 1}{4 \times 1} = \frac{3}{4}$

$\frac{1}{2} = \frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$

Since $\frac{3}{4} > \frac{2}{4}$

$\therefore \quad \frac{3}{4} > \frac{1}{2}$

(*ii*) We have $\frac{-3}{2}, \frac{-3}{4}$

LCM of 2 and 4 = 4

$\therefore \quad \frac{-3}{2} = \frac{-3 \times 2}{2 \times 2} = \frac{-6}{4}$

$\frac{-3}{4} = \frac{-3 \times 1}{4 \times 1} = \frac{-3}{4}$

Since $\frac{-3}{4} > \frac{-6}{4}$

$\therefore \quad \frac{-3}{4} > \frac{-3}{2}$

5. Find the sum of

(*i*) $-4\frac{3}{4} + 2\frac{7}{12}$ (*ii*) $\frac{9}{-12} + \frac{5}{8}$

6.

$= \frac{-7}{8} - \left(-\frac{5}{6}\right) = \frac{-7}{8} + \frac{5}{6}$

$= \frac{-7 \times 3}{8 \times 3} + \frac{5 \times 4}{6 \times 4}$ [LCM of 8 and 6 = 24]

$= \frac{-21}{24} + \frac{20}{24} = \frac{-21 + 20}{24} = \frac{-1}{24}$

(*ii*) $2\frac{1}{5}$ from $-3\frac{1}{6} = -3\frac{1}{6} - 2\frac{1}{5} = \frac{-19}{6} - \frac{11}{5}$

$= \frac{-19 \times 5}{6 \times 5} - \frac{11 \times 6}{5 \times 6}$ [LCM of 6 and 5 = 30]

$= \frac{-95}{30} - \frac{66}{30} = \frac{-95 - 66}{30}$

$= \frac{-161}{30} = -5\frac{11}{30}$

Short Answer :

1.

$$(i)\ 6\frac{2}{3}\times\left(-5\frac{1}{16}\right)=\frac{20}{3}\times\left(-\frac{81}{16}\right)$$

$$\Rightarrow\ \frac{5}{1}\times\left(-\frac{27}{4}\right)$$

$$\left[\frac{20}{16}=\frac{20\div4}{16\div4}=\frac{5}{4},\ \frac{-81}{3}=\frac{-81\div3}{3\div3}=\frac{-27}{1}\right]$$

$$=\frac{-5\times27}{1\times4}=\frac{-135}{4}=-33\frac{3}{4}$$

$$(ii)\left(-3\frac{1}{4}\right)\times\left(-2\frac{3}{4}\right)=\left(-\frac{13}{4}\right)\times\left(-\frac{11}{4}\right)$$

$$=(-)\times(-)\times\left(\frac{13}{4}\times\frac{11}{4}\right)=\frac{13\times11}{4\times4}$$

$$=\frac{143}{16}=8\frac{15}{16}\qquad[\because(-)\times(-)=(+)]$$

2. Let the required rational number be x.

$$\therefore\ x\times\left(\frac{-4}{15}\right)=-\frac{9}{16}$$

$$\Rightarrow\qquad x=-\frac{9}{16}\div\left(-\frac{4}{15}\right)=-\frac{9}{16}\times\frac{15}{-4}$$

$$\left[\text{Reciprocal of }-\frac{4}{15}=\frac{15}{-4}\right]$$

$$=\frac{-9\times15}{-16\times4}=\frac{135}{64}=2\frac{7}{64}$$

Hence, the required rational number $=2\frac{7}{64}$.

3.

(*i*) We have $-\frac{1}{3}, \frac{-4}{3}, \frac{-2}{9}$

LCM of 3, 3 and 9 = 9

$\therefore \frac{-1\times 3}{3\times 3}, \frac{-4\times 3}{3\times 3}, \frac{-2\times 1}{9\times 1}$

[Converting denominators as same number]

$\Rightarrow \quad \frac{-3}{9}, \frac{-12}{9}, \frac{-2}{9}$

Since $\frac{-12}{9} < \frac{-3}{9} < \frac{-2}{9}$

$\therefore \quad -\frac{4}{3} < -\frac{1}{3} < \frac{-2}{9}$

(*ii*) We have $-\frac{2}{3}, \frac{4}{5}, \frac{6}{7}, -\frac{1}{6}$

LCM of 3, 5, 6 and 7 = 210

$\therefore \frac{-2\times 70}{3\times 70}, \frac{4\times 42}{5\times 42}, \frac{6\times 30}{7\times 30}, \frac{-1\times 35}{6\times 35}$

[Converting the denominators as same numbers]

$\Rightarrow \quad -\frac{140}{210}, \frac{168}{210}, \frac{180}{210}, \frac{-35}{210}$

Since $\frac{-140}{210} < \frac{-35}{210} < \frac{168}{210} < \frac{180}{210}$

$\therefore \quad \frac{-2}{3} < \frac{-1}{6} < \frac{4}{5} < \frac{6}{7}$

4.

(*i*) $\frac{-2}{3}$ and $-1 \Rightarrow \frac{-2}{3}$ and $\frac{-1}{1}$

LCM of 3 and 1 = 3

$\therefore \frac{-2\times1}{3\times1} = \frac{-2}{3}$ and $\frac{-1\times3}{1\times3} = \frac{-3}{3}$

We know that there is no integer between –2 and –3.

$\therefore$ Multiplying and dividing by 5 + 1 = 6 to each of the rational numbers, we have

$\frac{-2\times6}{3\times6} = \frac{-12}{18}$ and $\frac{-3\times6}{3\times6} = \frac{-18}{18}$

Here, integers between –12 and –18 are –13, –14, –15, –16 and –17.

$\therefore$ The required rational numbers are

$\frac{-13}{18}, \frac{-14}{18}, \frac{-15}{18}, \frac{-16}{18}$ and $\frac{-17}{18}$

i.e., $\frac{-13}{18}, \frac{-7}{9}, \frac{-5}{6}, \frac{-8}{9}, \frac{-17}{18}$

(*ii*) $-\frac{1}{2}$ and $\frac{-3}{2}$

Since, the denominator are same and there is only one integer between –1 and –3.

$\therefore$ Multiplying and dividing by 5 + 1 = 6 to each of the rational numbers, we have

$\frac{-1\times6}{2\times6} = \frac{-6}{12}$ and $\frac{-3\times6}{2\times6} = \frac{-18}{12}$

Here, the integers between –6 and –18 are –7, –8, –9, –10, –11

$\therefore$ The required rational numbers are

$\frac{-7}{12}, \frac{-8}{12}, \frac{-9}{12}, \frac{-10}{12}, \frac{-11}{12}$

i.e., $\frac{-7}{12}, \frac{-2}{3}, \frac{-3}{4}, \frac{-5}{6}, \frac{-11}{12}$

5.

$$\frac{-12}{-5} + \frac{7}{-3} + \frac{-5}{14} + \frac{22}{7}$$

$$= \frac{12}{5} - \frac{7}{3} - \frac{5}{14} + \frac{22}{7}$$

[LCM of 5, 3, 14, 7 = 210]

$\therefore \quad \frac{12}{5} = \frac{12\times42}{5\times42} = \frac{504}{210}$

$$\frac{-7}{3} = \frac{-7 \times 70}{3 \times 70} = \frac{-490}{210}$$

$$\frac{-5}{14} = \frac{-5 \times 15}{14 \times 15} = \frac{-75}{210}$$

$$\frac{22}{7} = \frac{22 \times 30}{7 \times 30} = \frac{660}{210}$$

So, $\frac{12}{5} - \frac{7}{3} + \frac{-5}{14} + \frac{22}{7}$

$$= \frac{504}{210} - \frac{490}{210} - \frac{75}{210} + \frac{660}{210}$$

$$= \frac{504 - 490 - 75 + 660}{210}$$

$$= \frac{1164 - 565}{210}$$

$$= \frac{599}{210} = 2\frac{179}{210}$$

6.

Sum of $\frac{-5}{6}$ and $-1\frac{3}{5}$

$\Rightarrow \quad \frac{-5}{6}+\left(-1\frac{3}{5}\right)=\frac{-5}{6}-\frac{8}{5}$

$=\frac{-5\times5}{6\times5}-\frac{8\times6}{5\times6}$

[LCM of 6 and 5 = 30]

$=\frac{-25}{30}-\frac{48}{30}$

$=\frac{-25-48}{30}=\frac{-73}{30}$

Sum of $2\frac{2}{3}$ and $-6\frac{2}{5}$

$\Rightarrow \quad 2\frac{2}{3}+\left(-6\frac{2}{5}\right)=\frac{8}{3}-\frac{32}{5}$

$=\frac{8\times5}{3\times5}-\frac{32\times3}{5\times3}$ [LCM of 3 and 5 = 15]

$=\frac{40}{15}-\frac{96}{15}=\frac{40-96}{15}=\frac{-56}{15}$

$\therefore$ Required difference is $\left(\frac{-56}{15}\right)-\left(\frac{-73}{30}\right)$

$\frac{-56}{15}+\frac{73}{30}=\frac{73}{30}-\frac{56}{15}=\frac{73\times1}{30\times1}-\frac{56\times2}{15\times2}$

$=\frac{73}{30}-\frac{112}{30}=\frac{73-112}{30}=\frac{-39^{13}}{\cancel{30}_{10}}=\frac{-13}{10}$

Long Answer :

1. We have

$$\left(\frac{3}{7}\times\frac{-5}{8}\right)\div\left(\frac{1}{3}\times\frac{5}{6}\right)+\left|\frac{-1}{2}-\frac{1}{5}\right|$$

$$=\left(\frac{-3\times5}{7\times8}\right)\div\left(\frac{1\times5}{3\times6}\right)+\left|\frac{-5-2}{10}\right|$$

$$=\frac{-15}{56}\div\frac{5}{18}+\left|\frac{-7}{10}\right|$$

$$=\frac{\cancel{-15}^{3}}{\cancel{56}_{28}}\times\frac{\cancel{18}^{9}}{\cancel{5}}+\frac{7}{10}$$

[$\because$ absolute value of $-a=a$]

$$=\frac{-27}{28}+\frac{7}{10}=\frac{-27\times5+7\times14}{140}$$

[LCM of 28 and 10 = 140]

$$=\frac{-135+98}{140}=\frac{-37}{140}$$

2.

Given rational numbers are $-2\frac{15}{17}$ and $3\frac{5}{34}$

Sum of the given numbers

$$=-2\frac{15}{17}+3\frac{5}{34}=\frac{-49}{17}+\frac{107}{34}$$

$$=\frac{-49\times2}{17\times2}+\frac{107\times1}{34\times1}$$ [LCM of 17 and 34 = 34]

$$=\frac{-98}{34}+\frac{107}{34}=\frac{-98+107}{34}=\frac{9}{34}$$

Difference of the given numbers $=3\frac{5}{34}-\left(-2\frac{15}{17}\right)$

$$=\frac{107}{34}+\frac{49}{17}=\frac{107\times1}{34\times1}+\frac{49\times2}{17\times2}=\frac{107}{34}+\frac{98}{34}$$

$$=\frac{107+98}{34}=\frac{205}{34}$$

As per the question, we have

Sum of the numbers ÷ Difference of the numbers

$$\frac{9}{34}\div\frac{205}{34}=\frac{9}{\cancel{34}}\times\frac{\cancel{34}}{205}=\frac{9}{205}$$

Hence, the required division $=\frac{9}{205}$.

3. The cost of the object = ₹ 870

Discount = 20% of ₹ 870 $=\frac{20}{100}\times 870 = ₹\,174$

Selling price = ₹ 870 – ₹ 174 = ₹ 696

The same object is available at other shop = ₹ 975

$$\text{Discount} = 6\frac{2}{3}\% \text{ of } ₹\ 975$$

$$= \frac{\cancel{20}}{\cancel{3}} \times \frac{1}{\cancel{100}_{\cancel{5}}} \times \cancel{975}^{\cancel{195}^{65}} = ₹\ 65$$

Selling price = ₹ 975 – ₹ 65 = ₹ 910

Since ₹ 910 > ₹ 696

Hence, deal at first shop is better and by ₹ 910 – ₹ 696 = ₹ 214

4. Using BODMAS rule, we have

$21.5 \div 5 - \frac{1}{5}$ of $(20.5 - 5.5) + 0.5 \times 8.5$

$= 21.5 \div 5 - \frac{1}{5}$ of $15 + 0.5 \times 8.5$

$= 21.5 \times \frac{1}{5} - \frac{1}{5} \times 15 + 0.5 \times 8.5$

$= 4.3 - 3 + 4.25$

$= 4.3 + 4.25 - 3$

$= 8.55 - 3$

$= 5.55$

5. Using BODMAS rule, we have

$2.3 - [1.89 - \{3.6 - (2.7 - 0.77)\}]$

$= 2.3 - [1.89 - \{3.6 - 1.93\}]$

$= 2.3 - [1.89 - 1.67]$

$= 2.3 - 0.22$

$= 2.08$

6. Using BODMAS rule, we have

$$x \div y - \left[\frac{1}{xy} - y\left(\frac{2x}{y} \times \frac{2y}{x}\right) - \cancel{xyz}\left(\frac{yz + zx + xy}{\cancel{xyz}}\right)\right]$$

$$= x \div y - \left[\frac{1}{xy} - y(4) - (yz + zx + xy)\right]$$

$$= x \div y - \left[\frac{1}{xy} - 4y - yz - zx - xy\right]$$

$$= x \div y - \frac{1}{xy} + 4y + yz + zx + xy$$

$$= \frac{x}{y} - \frac{1}{xy} + 4y + yz + zx + xy$$

Putting $x = \frac{-4}{9}$, $y = \frac{5}{12}$ and $z = \frac{7}{18}$, we get

$$= \frac{\frac{-4}{9}}{\frac{5}{12}} - \frac{1}{\left(\frac{-4}{9}\right)\left(\frac{5}{12}\right)} + 4\left(\frac{5}{12}\right) + \left(\frac{5}{12}\right)\left(\frac{7}{18}\right) + \left(\frac{7}{18}\right)\left(\frac{-4}{9}\right) + \left(\frac{-4}{9}\right)\left(\frac{5}{12}\right)$$

$$= \frac{-4}{9} \times \frac{12}{5} - \frac{1}{\left(\frac{-5}{27}\right)} + \frac{5}{3} + \frac{35}{216} - \frac{14}{81} - \frac{5}{27}$$