Rational Numbers Question Answers Test-1

Subjective Test

Question 1 (1.0 marks)
Are rational numbers closed under division? Give reasons in support of your answer.

Solution:
No, rational numbers are not closed under division.

This is because if we consider a rational number a ($a \neq 0$)and the rational number 0, then

$a \div 0$ is not a rational number (since it is not defined).

Question 2 (1.0 marks)
Fill in the blanks:

(a) The reciprocal of the rational number $\frac{a}{b}, (a, b \neq 0)$ is _____. ($\frac{1}{2}$ mark)

(b) The rational number _____ has no multiplicative inverse. ($\frac{1}{2}$ mark)

Solution:
(a) The reciprocal of the rational number $\frac{a}{b}, (a, b \neq 0)$ is $\frac{b}{a}$.

(b) The rational number 0 has no multiplicative inverse.

Question 3 (1.0 marks)

Is $-1\frac{29}{71}$ the multiplicative inverse of 0.71? Give reason in support of your answer.

Solution:

$$-1\frac{29}{71} = -\frac{100}{71}$$

$$0.71 = \frac{71}{100}$$

Consider

$$-\frac{100}{71} \times \frac{71}{100} = -1 \neq 1$$

Thus, $-1\frac{29}{71}$ is not the multiplicative inverse of 0.71.

Question 4 (1.0 marks)
Name the property under multiplication used in the expression $\left(-\frac{3}{4} \times \frac{6}{7}\right) \times \frac{2}{9} = -\frac{3}{4} \times \left(\frac{6}{7} \times \frac{2}{9}\right)$

Solution:
Under associative property of multiplication of rational numbers,

$(a \times b) \times c = a \times (b \times c)$, where a, b, and c are any three rational numbers

Thus, in the expression $\left(-\frac{3}{4} \times \frac{6}{7}\right) \times \frac{2}{9} = -\frac{3}{4} \times \left(\frac{6}{7} \times \frac{2}{9}\right)$, the associative property under multiplication has been used.

Question 5 (1.0 marks)
Using property of multiplication, find the value of the expression $\frac{3}{5}\times\frac{3}{14}\times\frac{15}{2}\times-\frac{7}{9}$

Solution:
Using commutative property of multiplication, the given expression can be simplified as:

$$\frac{3}{5}\times\frac{3}{14}\times\frac{15}{2}\times\left(-\frac{7}{9}\right)$$
$$=\left(\frac{3}{5}\times\frac{15}{2}\right)\times\left(\frac{3}{14}\times\left(-\frac{7}{9}\right)\right)$$
$$=\frac{3\times15}{5\times2}\times\left(\frac{3\times(-7)}{14\times9}\right)$$
$$=\frac{9}{2}\times\left(-\frac{1}{6}\right)$$
$$=\frac{-9}{2\times6}$$
$$=-\frac{3}{4}$$

Question 6 (2.0 marks)
(a) Define a rational number. (1 mark)

(b) Are rational numbers closed under subtraction? Give reasons. (1 mark)

Solution:
(a) A rational number is a number which can be written in the form $\frac{p}{q}$, where p and q are integers, $q \neq 0$.
Example, $-\frac{3}{2},\frac{5}{2},6$

(b) Yes, rational numbers are closed under subtraction because when we subtract any rational number from a rational number, the result is again a rational number.

Consider two distinct rational numbers $\frac{p}{q}$ and $\frac{r}{s}$.

$\frac{p}{q}-\frac{r}{s}=\frac{ps-rq}{qs}$, which is also a rational number

Question 7 (2.0 marks)
Find the additive inverse of the multiplicative inverse of the expression $\left(-\frac{3}{5}\right)\times(-10)$

Solution:
The expression $\left(-\frac{3}{5}\right)\times(-10)$ can be simplified as:

$$\left(-\frac{3}{5}\right)\times(-10)=\frac{(-3)\times(-10)}{5}=\frac{30}{5}=6$$

Multiplicative inverse of $6=\frac{1}{6}\left[\text{Since } 6\times\frac{1}{6}=1\right]$

$$\frac{1}{6}=-\frac{1}{6}\left[\text{Since } \frac{1}{6}+\left(-\frac{1}{6}\right)=0\right]$$

Additive inverse of

Thus, the required number is $-\frac{1}{6}$

Question 8 (3.0 marks)
Find seven rational numbers between −1 and 1 and represent them on the number line.

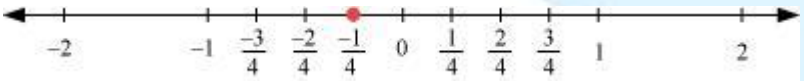
Solution:

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

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

Rational numbers between −1 and 1 are $-\frac{3}{4},-\frac{2}{4},-\frac{1}{4},0,\frac{1}{4},\frac{2}{4},\frac{3}{4}$

These numbers can now be represented on number line as:



Question 9 (3.0 marks)
(a) State distributive property of multiplication over addition and subtraction for rational numbers. (1 mark)

(b) Using the property under multiplication, simplify the expression $\frac{5}{9}\times\frac{5}{2}-\frac{3}{2}\times\frac{5}{9}+\frac{5}{18}$. (2 marks)

Solution:
(a) Distributive property of multiplication over addition and subtraction states that for all rational numbers *a*, *b*, and *c*,

$$a(b+c)=ab+ac$$

$$a(b-c)=ab-ac$$

(b) $\frac{5}{9}\times\frac{5}{2}-\frac{3}{2}\times\frac{5}{9}+\frac{5}{18}$

$=\frac{5}{9}\times\frac{5}{2}-\frac{5}{9}\times\frac{3}{2}+\frac{5}{18}$ [Commutative property of multiplication]

$=\frac{5}{9}\left(\frac{5}{2}-\frac{3}{2}\right)+\frac{5}{18}$ [Distributivity of multiplication under subtraction]

$$= \frac{5}{9} \times 1 + \frac{5}{18}$$
$$= \frac{5}{9} + \frac{5}{18}$$
$$= \frac{10+5}{18}$$
$$= \frac{15}{18}$$
$$= \frac{5}{6}$$

Question 10 (6.0 marks)

(a) Find eight rational numbers between $-\frac{7}{5}$ and $\frac{3}{4}$. (2 marks)

(b) Find four rational numbers between $\frac{1}{9}$ and $\frac{1}{3}$. (2 marks)

(c) How many rational numbers are there between 3 and 4? Write any two of them. (2 marks)

Solution:

$$-\frac{7}{5} = \frac{-7 \times 4}{5 \times 4} = -\frac{28}{20}$$
$$\frac{3}{4} = \frac{3 \times 5}{4 \times 5} = \frac{15}{20}$$

$\therefore$ Eight rational numbers lying between $-\frac{7}{5}$ and $\frac{3}{4}$ are $-\frac{27}{20}, -\frac{26}{20}, -\frac{25}{20}, -\frac{24}{20}, -\frac{23}{20}$, $0, \frac{1}{20}, \frac{2}{20}$.

(b) Mean of $\frac{1}{9}$ and $\frac{1}{3} = \left(\frac{1}{9} + \frac{1}{3}\right) \div 2 = \frac{2}{9}$

$$\therefore \frac{1}{9} < \frac{2}{9} < \frac{1}{3}$$

Mean of $\frac{1}{9}$ and $\frac{2}{9} = \left(\frac{1}{9} + \frac{2}{9}\right) \div 2$

$$= \frac{3}{9 \times 2} = \frac{1}{6}$$

$$\therefore \frac{1}{9} < \frac{1}{6} < \frac{2}{9} \qquad \ldots(1)$$

Mean of $\frac{2}{9}$ and $\frac{1}{3} = \left(\frac{2}{9} + \frac{1}{3}\right) \div 2$

$$= \left(\frac{2+3}{9}\right) \div 2$$
$$= \frac{5}{9 \times 2} = \frac{5}{18}$$
$$\therefore \frac{2}{9} < \frac{5}{18} < \frac{1}{3} \qquad \ldots(2)$$

From (1), (2), (3), we obtain

$$\frac{1}{9} < \frac{1}{6} < \frac{2}{9} < \frac{5}{18} < \frac{1}{3} \qquad \ldots(4)$$

Mean of $\frac{2}{9}$ and $\frac{5}{18} = \left(\frac{2}{9} + \frac{5}{18}\right) \div 2$

$= \left(\frac{4+5}{18}\right) \div 2$

$= \frac{9}{18} \div 2$

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

$\therefore \frac{2}{9} < \frac{1}{4} < \frac{5}{18}$ ...(5)

Thus, $\frac{1}{9} < \frac{1}{6} < \frac{2}{9} < \frac{1}{4} < \frac{5}{18} < \frac{1}{3}$ [Using (4) and (5)]

Hence, four rational numbers between $\frac{1}{9}$ and $\frac{1}{3}$ are $\frac{1}{6}, \frac{2}{9}, \frac{1}{4}, \frac{5}{18}$.

(c) We know that there are infinite numbers of rational numbers between any two rational numbers.

Hence, there are infinite number of rational numbers between 3 and 4.

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

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

Thus, any two rational numbers between 3 and 4 are $\frac{10}{3}$ and $\frac{11}{3}$.