

NOTES

CLASS 7

MATHS

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RATIONAL NUMBERS

Important Facts and Concepts:

A number that can be expressed in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$, is **called a rational number**.

All integers and fractions are **rational numbers**.

If the numerator and denominator of a rational number are multiplied or divided by a non-zero integer, we get a rational number which is said to be **equivalent to the given rational number**.

Rational numbers are classified as positive, zero or negative rational numbers. When the numerator and denominator both are positive integers or both are negative integers, it is a positive rational number. When either the numerator or the denominator is a negative integer, it is a negative rational number.

The number **0** is **neither a positive nor a negative** rational number.

There are **unlimited number of rational numbers** between two rational numbers.

A rational number is said to be in the standard form, if its denominator is a positive integer and the numerator and denominator have no common factor other than 1.

Two rational numbers with the same denominator can be added by adding their numerators, keeping with the same denominator.

Two rational numbers with different denominators are added by first taking the LCM of the two denominators and then converting both the rational numbers to their equivalent forms having the LCM as the denominator and adding them as above.

While subtracting two rational numbers, we add the additive inverse of the rational number to be subtracted to the other rational number.

• **Product of rational numbers** $= \frac{\text{Product of numerators}}{\text{Product of denominators}}$

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

• To divide one rational number by the other non-zero rational number, we multiply the first rational number by the reciprocal of the other.

EXAMPLE 1 Reduce $\frac{-45}{30}$ to the standard form.

Solution: $\frac{-45}{30} = -\frac{3 \times 3 \times 5}{2 \times 3 \times 3} = -\frac{5}{2}$

EXAMPLE 3: Do $\frac{4}{-9}$ and $-\frac{16}{36}$ represent the same rational number?

Solution: Yes, because $\frac{4}{-9} \times \frac{4}{4} = \frac{-16}{36}$, $\frac{-16}{36} \div \frac{4}{4} = -\frac{4}{9}$

EXAMPLE 3 List three rational numbers between -2 and -1 .

Solution: $-2 \times \frac{10}{10} = -\frac{20}{10}$, $-1 \times \frac{10}{10} = -\frac{10}{10}$, Any three numbers are, $-\frac{19}{10}$, $-\frac{18}{10}$, $-\frac{17}{10}$

SHORT ANSWER QUESTIONS:

Q1. Reduce $\frac{55}{66}$ into the standard form.

Solution: $\frac{55}{66} \div \frac{11}{11} = \frac{5}{6}$

Q2. Express $\frac{3}{4}$ as a rational number with denominator as -80

Solution: $-80 \div 4 = -20$



$$\text{So, } \frac{3}{4} \times \frac{-20}{-20} = \frac{-60}{-80}$$

Q3. Find the product of $\frac{15}{22} \times \frac{11}{5}$

$$\text{Solution: } \frac{15}{22} \times \frac{11}{5} = \frac{3 \times 5}{2 \times 11} \times \frac{11}{5} = \frac{3}{2}$$

Q4. Simplify: $\frac{2}{5} - \frac{1}{2}$

Solution: LCM of 2 and 5 is 10

$$\frac{2}{5} \times \frac{2}{2} = \frac{4}{10}$$

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

$$\text{So, } \frac{4}{10} - \frac{5}{10} = \frac{4-5}{10} = -\frac{1}{10}$$

LONG ANSWER QUESTIONS:

Q1. List five rational numbers between -4 and -3 .

$$\text{Solution: } -4 \times \frac{6}{6} = -\frac{24}{6}$$

$$-3 \times \frac{6}{6} = -\frac{18}{6}$$

five rational numbers between -4 and -3 are,

$$-\frac{19}{6}, -\frac{20}{6}, -\frac{21}{6}, -\frac{22}{6}, -\frac{23}{6}$$

Q2. Solve: $\frac{29}{4} - \frac{30}{7}$

Solution: LCM of 4 and 7 is 28.

$$\frac{29}{4} \times \frac{7}{7} = \frac{203}{28}$$

$$\frac{30}{7} \times \frac{4}{4} = \frac{120}{28}$$

So,

$$\frac{203}{28} - \frac{120}{28} = \frac{203 - 120}{28} = \frac{83}{28} = \frac{2 \times 3 \times 7}{2 \times 2 \times 7} = \frac{3}{2}$$

PRACTICE QUESTIONS:

MCQ:

Q1. In the standard form of a rational number, the common factor of numerator and denominator is always:

- (a) 0 (b) 1 (c) -2 (d) 2

Q2: Which of the following rational numbers is equal to its reciprocal?

- (a) 1 (b) 2 (c) $\frac{1}{2}$ (d) 0

Q3. How many rational numbers are there between two rational numbers?

- (a) 1 (b) 0 (c) unlimited (d) 100

Q4. In the standard form of a rational number, the denominator is always a

- (a) 0 (b) negative integer (c) positive integer (d) 1



Q5. To reduce a rational number to its standard form, we divide its numerator and denominator by their

- (a) LCM (b) HCF (c) product (d) multiple

Q6. Which is greater number in the following?

- (a) $-\frac{1}{2}$ (b) 0 (c) $\frac{1}{2}$ (d) -2

Q7. Which of the following rational numbers is negative?

- (a) $-\left(\frac{-3}{7}\right)$ (b) $\frac{-5}{-8}$ (c) $\frac{9}{8}$ (d) $-\frac{3}{7}$

Q8. A rational number is defined as a number that can be expressed in the form $\frac{p}{q}$, where p and q are integers and

- (a) $q = 0$ (b) $q = 1$ (c) $q \neq 1$ (d) $q \neq 0$

Q9. Find the odd one out of the following and give reason.

- (a) $\frac{4}{3} \times \frac{3}{4}$ (b) $\frac{-3}{2} \times \frac{-2}{3}$ (c) $2 \times \frac{1}{2}$ (d) $-\frac{1}{3} \times \frac{3}{1}$

Q10. The value of $-\frac{4}{3} - \left(\frac{-1}{3}\right)$ is

- (a) -2 (b) -3 (c) 2 (d) -1

SHORT ANSWER QUESTIONS:

Q1. Reduce the following rational number in its lowest form: $-\frac{60}{72}$.

Q2. Are the rational numbers $-\frac{8}{28}$, and $\frac{32}{-112}$ equivalent? Give reason.

Q3. Arrange the rational numbers $-\frac{7}{10}$, $\frac{5}{-8}$, $\frac{2}{-3}$, $-\frac{1}{4}$, $-\frac{3}{5}$ in ascending order.

Q4. If $-\frac{5}{7} = \frac{x}{28}$, find the value of x ?

Q5. Give two rational numbers equivalent to: $\frac{7}{8}$

Q6. What should be added to $-\frac{1}{2}$ to obtain the nearest natural number?

Q7. What's the Error? Chhaya simplified a rational number in this manner $\frac{-25}{-30} = \frac{-5}{6}$, what error did the student make?

LONG ANSWER QUESTIONS:

Q1. Find the reciprocal of the following: $\frac{1}{2} \times \frac{1}{4} + \frac{1}{2} \times 6$

Q2. Write each of the following numbers in the form $\frac{p}{q}$, where p and q are integers:

- (a) six-eighths (b) three and half (c) opposite of 1 (d) one-fourth

Q3. From a rope 68 m long, pieces of equal size are cut. If length of one piece is $4\frac{1}{4}$ m, find the number of such pieces.

Q4. 150 students are studying English, Maths or both. 62 per cent of the students are studying English and 68 per cent are studying Maths. How many students are studying both?

Q5. A body floats $\frac{2}{9}$ of its volume above the surface. What is the ratio of the body submerged volume to its exposed volume? Re-write it as a rational number.

Q6. If $x = \frac{1}{10}$ and $y = -\frac{3}{8}$, then evaluate $x + y$, $x - y$, $x \times y$ and $x \div y$.



ANSWERS:**MCQ:**

- Q1 (b) 1 Q2 (a) 1 Q3 (c) unlimited Q4 (c) positive integer
 Q5 (b) HCF Q6 (c) $\frac{1}{2}$ Q7 (d) $-\frac{3}{7}$ Q8 (d) $q \neq 0$
 Q9 (d) $-\frac{1}{3} \times \frac{3}{1}$ Q10 (d) -1

SHORT ANSWER QUESTIONS:

- Q1. $-\frac{5}{6}$ Q2. Yes, as both are equivalent rational numbers.
 Q3. $-\frac{7}{10}, \frac{2}{-3}, \frac{5}{-8}, -\frac{3}{5}, -\frac{1}{4}$ Q4. $x = -20$
 Q5. There are many possibilities. Some of them are: $\frac{14}{16}, \frac{21}{24}$
 Q6. $\frac{3}{2}$ Q7. Error is of negative sign.

LONG ANSWER QUESTIONS:

- Q1. $\frac{8}{25}$ Q2. (a) $\frac{3}{4}$ (b) $\frac{7}{2}$ (c) $-\frac{1}{1}$ (d) $\frac{1}{4}$ Q3. 16 Pieces Q4. 45
 Q5. 7:2 and $\frac{7}{2}$ Q6. $-\frac{11}{40}, \frac{19}{40}, -\frac{3}{80}, -\frac{4}{15}$

TEST-1 (20 Marks)

- Q1. Fill in the blanks to make the statements true: There are _____ number of rational numbers between two rational numbers. (1)
 Q2. Write equivalent rational numbers for $\frac{2}{3}$? (2)
 Q3. Represent the following rational numbers on a number line: $\frac{3}{8}, \frac{-7}{3}$ (2)
 Q4. List two rational numbers between $\frac{5}{7}$ and $\frac{7}{8}$. (2)
 Q5. Find the sum of $\frac{7}{3} + \frac{-4}{3}$. (2)
 Q6. Which is greater in the following? $\frac{3}{4}$ and $\frac{7}{8}$ (2)
 Q7. Find the product of: $\frac{-4}{5}$ and $\frac{-5}{12}$. (2)
 Q8. Find a rational number exactly halfway between: $\frac{1}{6}$ and $\frac{1}{9}$. (2)
 Q9. Solve : $\frac{29}{4} - \frac{30}{7}$.
 Q10. Simplify: $\frac{13}{11} \times \frac{-14}{5} + \frac{13}{11} \times \frac{-7}{5} + \frac{-13}{11} \times \frac{34}{5}$ (3)



TEST-2 (30 Marks)

Q1. Fill in the blanks to make the statements true. The rational number _____ is neither positive nor negative. (1)

Q2. Write equivalent rational number for $\frac{12}{17}$ (2)

Q3. Write four more rational numbers to complete the pattern: $-\frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \dots, \dots, \dots, \dots$ (4)

Q4. Find the sum of $-4\frac{5}{6}$ and $-7\frac{3}{4}$ (3)

Q5. Find the product of $-2\frac{3}{4}$ and $5\frac{6}{7}$ (3)

Q6. If 12 *shirts* of equal size can be prepared from 27m *cloth*, what is length of cloth required for each shirt? (3)

Q7. Insert 3 equivalent rational numbers between $-\frac{1}{2}$ and $\frac{1}{5}$ (3)

Q8. Represent the following rational numbers on a number line: $-\frac{2}{5}, \frac{5}{-6}, \frac{7}{-3}$ (3)

Q9. Simplify: $\frac{6}{5} \times \frac{3}{5} - \frac{1}{5} \times \frac{3}{7}$ (3)

Q10. Match column I to column II in the following: (5)

	COLUMN-I	COLUMN-II
i.	$\frac{3}{4} \div \frac{3}{4}$	(a) -1
ii.	$\frac{1}{2} \div \frac{4}{3}$	(b) $-\frac{2}{3}$
iii.	$\frac{2}{3} \div (-1)$	(c) $\frac{3}{2}$
iv.	$\frac{3}{4} \div \frac{1}{2}$	(d) $\frac{3}{8}$
v.	$\frac{5}{7} \div \left(-\frac{5}{7}\right)$	(e) 1





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