Grade VII

Lesson : 9

Objective Type Questions

I. Multiple choice questions

RATIONAL NUMBERS

1. Additive inverse of $\frac{3}{4}$ is :

a) $\frac{4}{3}$ b) $-\frac{3}{4}$ c) $\frac{1}{4}$ d) 0

2. Which is greater number in the following :

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

3. Which of the following rational number is equivalent to $\frac{7}{-4}$

a) $\frac{14}{-8}$ b) $\frac{22}{-11}$ c) $\frac{7}{-8}$ d) $\frac{1}{2}$

4. The reciprocal of $\frac{-2}{5}$ is

a) $-\frac{5}{2}$ b) $\frac{5}{2}$ c) $\frac{2}{5}$ d) None of these

5) The sum of $\frac{5}{4} + \left(-\frac{25}{4}\right)$ is :

a) -5 b) 5 c) 4 d) -4

6) Which of the following is the standard form of $\frac{36}{-24}$?

a) $\frac{-3}{2}$ b) $\frac{3}{2}$ c) $\frac{2}{3}$ d) $\frac{2}{-3}$

7. What is the value of $\left(\frac{-7}{5}\right) + \left(\frac{-2}{3}\right)$ is :

a) $\frac{-31}{15}$ b) $\frac{31}{15}$ c) $\frac{15}{31}$ d) $\frac{15}{-31}$

8. Which of the following is the additive inverse of $\left(\frac{-4}{7}\right)$?

a) $\frac{-4}{7}$ b) $\frac{4}{7}$ c) Zero d) $\frac{7}{4}$

9.Which of the following is the multiplicative inverse of $\frac{-4}{5}$?

a) $\frac{4}{5}$ b) $\frac{-5}{4}$ c) Zero d) $\frac{5}{4}$

10. What is the value of $\left(\frac{-7}{5}\right) \times \left(\frac{-15}{4}\right)$?

a) $\frac{-3}{2}$ b) $\frac{3}{2}$ c) $\frac{2}{3}$ d) $\frac{2}{3}$

11. How many rational numbers are there between 2 and 4?

a) Zero b)One c) Two d) Uncountable

12. What is the value of $\left(\frac{-7}{15}\right) \div \left(\frac{-14}{15}\right)$?

a) $\frac{-1}{2}$ b) $\frac{1}{2}$ c) $\frac{98}{225}$ d) -2

13. Which of the following rational numbers is equivalent to $\frac{2}{3}$?

a) $\frac{3}{2}$ b) $\frac{4}{9}$ c) $\frac{4}{6}$ d) $\frac{9}{4}$

14) Which of the following numbers is in standard form?

a) $\frac{20}{30}$ b) $\frac{10}{4}$ c) $\frac{1}{2}$ d) $\frac{1}{-3}$

15.The sum of $\frac{-3}{2}$ and $\frac{1}{2}$ is:

a) -1 b)-2 c) 4 d) 3

16.The value of - $\frac{-4}{3}$ - $\frac{-1}{3}$ is :

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

17. 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) $q \neq 0$

18. Which of the following rational is positive?

a) $\frac{-8}{7}$ b) $\frac{19}{-13}$ c) $\frac{-3}{-4}$ d) $\frac{-21}{13}$

19.Which of the following rational numbers is negative?

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

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

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

21.Which of the following rational numbers is equal to its reciprocal?

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

22. The reciprocal of $\frac{1}{2}$:

a) 3 b) 2 c) -1 d) 0

23.The standard form of $\frac{-48}{60}$ is :

a) $\frac{48}{60}$ b) $\frac{-60}{48}$ c) $\frac{-4}{5}$ d) $\frac{-4}{-5}$

24. Which of the following is equivalent to $\frac{4}{5}$ is :

a) $\frac{5}{4}$ b) $\frac{16}{25}$ c) $\frac{16}{20}$ d) $\frac{15}{25}$

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

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

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

a) 0 b) negative integer

c) Positive integer d) 1

27. To reduce a rational number to the standard form we divide its numerator and denominator by their :

a) LCM B) HCF C) product d) multiple

1) b	2) c	3) a	4) a	5) a	6) a	7) a	8) b	9) b	10) b
11) d	12) b	13) c	14) c	15) a	16) d	17) d	18)c	19) d	20) b
21) a	22) b	23)c	24) c	25) c	26) c	27) b			

II. Multiple choice questions

1. Which of the following rational numbers is positive?

a. $\frac{-8}{7}$ b. $\frac{19}{-13}$ c. $\frac{-3}{-4}$ d. $\frac{-21}{13}$

2. Which of the following rational numbers is negative?

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

3. In the standard form of a rational numbers, the common factor of numerator and denominator is always

a. 0 b. 1 c.-2 d. 2

4. The standard form of $-\frac{32}{40}$ is

a. $\frac{-32}{40}$ b. $\frac{-4}{5}$ c. $\frac{4}{-5}$ d. $\frac{32}{-40}$

5. Which pair shows equivalent rational number?

a. $\frac{3}{4}, \frac{6}{8}$ b. $\frac{5}{6}, \frac{5}{12}$ c. $\frac{3}{2}, \frac{3}{4}$ d. None of these

6. -3 can be written in the form of $\frac{p}{q}$ as?

a. $\frac{-3}{-1}$ b. $\frac{-3}{0}$ c. $\frac{0}{-3}$ d. $\frac{-3}{1}$

7. Which of the following is equivalent to $\frac{4}{5}$?

a. $\frac{5}{4}$ b. $\frac{16}{25}$ c. $\frac{16}{20}$ d. $\frac{15}{25}$

8. The sum $4\frac{1}{2}$ and $5\frac{3}{5}$ is?

a. $\frac{93}{10}$ b. $\frac{97}{10}$ c. $\frac{99}{10}$ d. $\frac{101}{10}$

9. The product $6\frac{4}{5}$ and $\frac{50}{5}$ is

a. $3\frac{1}{5}$ b. $2\frac{1}{5}$ c. $\frac{31}{95}$ d. $\frac{39}{95}$

10. The product $2\frac{6}{8}$ and $4\frac{1}{4}$ is

a. $11\frac{11}{16}$ b. $\frac{29}{31}$ c. $\frac{34}{57}$ d. $\frac{86}{97}$

11. The simplified value of $2\frac{1}{4} \times 2\frac{1}{4} \div 4\frac{1}{2}$ is

a. $1\frac{1}{7}$ b. $1\frac{1}{8}$ c. $\frac{9}{11}$ d. $\frac{13}{15}$

1. c	2. d	3. b	4. b	5. a	6. d	7. c	8. d	9. a	14. a	15. b

Hints / Solutions

I. Fill in the Blanks

In question 1 to 29 fill in the blanks to make the statements true.

1. $-\frac{3}{8}$ is a _____ rational numbers
2. 1 is a _____ rational numbers
3. The standard form of $\frac{-8}{-36}$ is _____
4. The standard form of $\frac{18}{-24}$ is _____
5. On a number line, $\frac{-1}{2}$ is to the _____ of zero (0)
6. On a number line , $\frac{4}{3}$ is to the _____ of zero (0)
7. $-\frac{1}{2}$ is _____ than $\frac{1}{5}$
8. $-\frac{3}{5}$ is the _____ than 0
9. $\frac{-16}{24}$ and $\frac{20}{-16}$ represent _____ rational numbers
10. $\frac{-27}{45}$ and $\frac{-3}{5}$ represent _____ rational number
11. Additive inverse of $\frac{2}{3}$ _____

12. $\frac{-3}{5} + \frac{2}{5}$ = _____

13. $\frac{-5}{6} + \frac{-1}{6}$ = _____

14. $-\frac{3}{4} \times \frac{-2}{3}$ = _____

15. $\frac{-5}{3} \times \frac{-3}{5}$ = _____

16. $\frac{-6}{7} = \frac{?}{42}$

17. $\frac{1}{2} = \frac{6}{?}$

18. $\frac{-2}{9} - \frac{7}{9}$ = _____

19. The reciprocal of _____ does not exist

20. The reciprocal of 1 is _____

21. $\frac{-3}{7} - \frac{7}{3}$ = _____

22. $0 \div \frac{-5}{6}$ = _____

23. $0 \times \frac{5}{6}$ = _____

24. _____ $\times \frac{2}{5} = 1$

25. The standard form of rational number -1 is _____

26. If m is a common divisor of a and b then $\frac{a}{b} = \frac{a}{b}$ m

27. If p and q are positive integers, then $\frac{p}{-q}$ is a _____

rational numbers and $\frac{p}{-q}$ is a .....

28. Two rational numbers are said to be equivalent of equal. If they have the same _____ form.

29. If $\frac{p}{q}$ is a rational numbers, then q cannot be _____

1) Negative	2) Positive	3)219	4)$\frac{-3}{4}$	5) left	6) right	7) Less
8) Less	9) Different	10) Same	11)$\frac{-2}{3}$	12)$\frac{-1}{5}$	13) -1	14) ½
15) 1	16) -36	17) 12	18) -1	19)0 Zero	20) 1	21) $\frac{9}{49}$
22) 0	23) 0	24) $\frac{5}{2}$	25) $\frac{-1}{1}$	26) b÷ m	27) Positive, negative	28) Simplest
30) Zero						

Fill in the boxes with the correct symbol >, < or =

1. $\frac{7}{-8}$ ☐ $\frac{8}{9}$
2. $\frac{3}{7}$ ☐ $\frac{-5}{6}$
3. $\frac{5}{6}$ ☐ $\frac{8}{4}$
4. $\frac{-9}{7}$ ☐ $\frac{4}{-7}$
5. $\frac{8}{8}$ ☐ $\frac{2}{3}$

1. <	2. >	3. <	4. <	5. =

I. True or False

In questions 1 to 19 state ,whether the statements are True or False.

1. Every natural number is a rational numbers but every rational number need not be a natural number.
2. Zero is a rational numbers
3. Every integer is a rational number but every rational number need not be an integer .
4. Every negative integer is not a negative rational number
5. If $\frac{p}{q}$ is a rational number and m is a non-zero integer then,
6. If $\frac{p}{q}$ is a rational number and m is a non-zero common divisor of p and q then $\frac{p}{q} = \frac{p \div m}{q \div m}$
7. In a rational number denominator always has to be a non – zero integers.
8. If $\frac{p}{q}$ is a rational number and m is a non-zero integer then $\frac{p \times m}{q \times m}$ is a rational number not equivalent to $\frac{p}{q}$.
9. Sum of two rational numbers is always a rational number.
10. All decimal numbers are also rational numbers.
11. The quotient of two rational is always a rational number.
12. Every fraction is a rational number.
13. Two rational with different numbers can never be equal
14. 8 can be written as a rational number with any integer as denominator.
15. $\frac{4}{6}$ is equivalent of $\frac{2}{3}$.
16. The rational number $\frac{-3}{4}$ lies to the right of zero on the number line.

17. The rational numbers $\frac{-12}{-5}$ and $\frac{-7}{17}$ are on the opposite sides of zero on the number line.

18. Reciprocal of -1 is -1

19. Product of $\frac{3}{7}$ x $\left(\frac{-7}{4}\right)$ is $\frac{3}{4}$.

1) True	2) True	3) True	4) False	5) True	6) True	7) True	8) False	9) True
10) True	11) False	12) True	13) False	14) False	15) True	16) False	17) True	18) True
19) False								

II. True or False

1. $\frac{24}{64} \div \frac{6}{16} = \frac{4}{7}$.

2. $9\frac{3}{4} \div \frac{4}{8}$ x $\frac{1}{2} = \frac{6}{5}$.

3. If $\frac{-6}{7} = \frac{X}{28}$, then the value of x is $\frac{-3}{2}$.

4. If $\frac{p}{q}$ is rational number and m is a non-zero common divisor of p and q, then $\frac{p}{q} = \frac{p \div m}{q \div m}$.

1. c	2. c	3. b	4. b

I. Match the columns

Column A		Column B	
a)	$\frac{a}{b} \div \frac{a}{b}$	i)	$\frac{-a}{b}$
b)	$\frac{a}{b} \div \frac{c}{d}$	ii	-1
c)	$\frac{a}{b} \div (-1)$	iii	1
d)	$\frac{a}{b} \div \frac{-a}{b}$	iv	$\frac{bc}{ad}$
e)	$\frac{a}{b} \div \left(\frac{d}{c}\right)$	v	$\frac{ad}{bc}$

Column A		Column B	
a)	$\frac{2}{6}+\frac{4}{6}$	i)	$\frac{37}{81}$
b)	$\frac{2}{8}-\frac{1}{4}$	ii	$\frac{9}{32}$
c)	$4\frac{1}{9}X\frac{1}{9}$	iii	1
d)	$\frac{7}{21}\div\frac{8}{3}\div\frac{4}{9}$	iv	0

I. Very Short Answer Questions

1. Find x, such that $\frac{-5}{8}=\frac{x}{-32}$

$\frac{-5}{8}=\frac{x}{32}$

$= (-5)(-32)=8x$

$= x=\frac{5x32}{8}=20.$

2. Divide $\frac{12}{5}$ by $\frac{21}{25}$

$=\frac{12}{5}\times\frac{25}{21}$

$=\frac{12\times5}{21}$

$=\frac{4\times5}{7}=\frac{20}{7}.$

3. If product of two rational numbers is $\frac{-8}{9}$ and one of the number is $\frac{-10}{3}$, find the other. Let other number be x.

$x=\left(\frac{-10}{3}\right)=\frac{-8}{9}$

$x=\frac{8x3}{10x9}$

$=\frac{4x1}{5x3}=\frac{4}{5}$

4. Find x if sum of $\frac{-1}{2}$ and x is 0.

$x-\frac{1}{2}=0$

$x=\frac{1}{2}.$

5. What should be added to $\frac{-3}{4}$ to get 0?

$=\frac{3}{4}.$

II. Very Short Answer Questions

1. Reduce $\frac{-6}{-18}$ to standard from.

Since, HCF of 6 and 18 is 6.

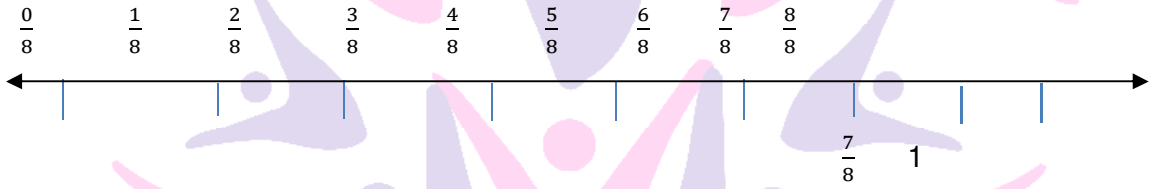
∴ We have $\frac{-6}{-18} = \frac{-6 \div 6}{-18 \div 6} = \frac{1}{3}$

2. Is the number $\frac{2}{-3}$ rational? Think about it.

Yes, $\frac{2}{-3}$ is a rational number

∵ 2 and -3 are integers and -3 ≠0.

3. Draw a number line and represent the rational number 7/8 on it.



4. Do $\frac{-7}{21}$ and $\frac{3}{9}$ represent same rational number?

$\frac{-7}{21}$ is a negative natural number and $\frac{3}{9}$ is a positive rational number.

∴ $\frac{-7}{21} \neq \frac{3}{9}$.

5. Write $\frac{-44}{72}$ in the simplest form.

HCF o 44 and 72 is 4

∴ $\frac{-11}{18} = \frac{-44}{72} = \frac{(-44) \div 4}{72 \div 4} = \frac{-11}{18}$

Thus, simplest form of $\frac{-44}{72}$ is $\frac{-11}{18}$.

6. Write it in an ascending order.

$\frac{-3}{5}, \frac{-2}{5}, \frac{-1}{5}$

Since, (-3) < (-2)<(-1)

∴ $\frac{-3}{5} < \frac{-2}{5} < \frac{-1}{5}$ is ascending order.

7. Fill in the box with the correct symbol out of >, < and =.

i) $-\frac{4}{5} \square -\frac{5}{7}$ ii) $-\frac{7}{8} \square -\frac{14}{16}$

i) $-\frac{4}{5} \square -\frac{5}{7}$

LCM of 5 and7 is 35

$\frac{-4}{5} = \frac{(-4)X\,7}{5\,X\,7} = \frac{-28}{35}$

and $\frac{-5}{7} = \frac{(-5)X\,5}{7\,X\,5} = \frac{-25}{35}$

$\frac{-28}{35} < \frac{-25}{35}$

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

ii) $-\frac{7}{8}$ $-\frac{14}{16}$

LCM of 8 and 16 is 16.

$\therefore \frac{-7}{8} = \frac{(-7)X\,2}{8\,X\,2} = \frac{-14}{16}$

and $\frac{14}{-16} = \frac{(-14)X-1}{-16\,X\,(-1)} = \frac{14}{-16}$

$\frac{14}{-16} = \frac{14}{-16}$

$\therefore \frac{-7}{8}$ $\boxed{=}$ $\frac{14}{-16}$

8. Fill in the blanks :

$\frac{3}{4}$ x $\left(\frac{-2}{3}\right)$ = _____

$\frac{3}{4}$ x $\left(\frac{-2}{3}\right) = \frac{3\text{ x }(-2)}{4\text{ x }3} = \frac{-6}{12} = \frac{-1}{2}$.

9. $\frac{-5}{6}$ **+** $\left(\frac{-1}{6}\right)$ **=** _____

We have 6 as LCM

$= \frac{-5+(-1)}{6} = \frac{-5-1}{6} = \frac{-6}{6} = -1.$

I. Short Answer Questions

1. What will be the product of the following:

a) $\frac{6}{7}$ x $\left(-\frac{3}{5}\right)$ b) $\left(-\frac{11}{4}\right)$ x $\left(\frac{5}{7}\right)$

a) $\frac{6}{7}$ x $\left(-\frac{3}{5}\right) = \frac{6\text{ x }(-3)}{7\text{ x }5}$

$= -\frac{18}{35}$

b) $\left(-\frac{11}{4}\right)$ x $\frac{5}{7} = \frac{(-11)X\,5}{4\,X\,7}$

$= -\frac{55}{28}$.

2. Subtract :

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

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

$= \frac{5\ X\ 3}{7\ X\ 3} + \frac{7\ X\ 7}{3\ X\ 7}$

$= \frac{15}{21} + \frac{49}{21}$

$= \frac{15+49}{21}$

$= \frac{64}{21}$.

b) $\frac{3}{8}$ from $\frac{5}{8}$

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

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

$= \frac{2}{8} = \frac{1}{4}$.

3. Divide:

a) $\frac{5}{11} \div \frac{-3}{8}$ b) $\frac{7}{5} \div \frac{-2}{3}$

a) $\frac{5}{11} \div \frac{-3}{8} = \frac{5}{11} \div \left(\frac{8}{-3}\right)$

$= \frac{5\ X\ 8}{11\ X\ (-3)}$

$= \frac{40}{-33}$

$= \frac{-\ 40}{33}$

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

$= \frac{7\ X\ 3}{3\ X\ (-2)}$

$= -\ \frac{21}{10}$.

4. 'a' and 'b' are two different numbers taken from the numbers 1 – 50 . What is the largest value that $\frac{a-b}{a+b}$ can have? What is the largest value that $\frac{a+b}{a-b}$ can have?

Since, a and be are two different numbers.

Let a = 15 and b = 10

$\therefore \frac{a-b}{a+b} = \frac{15-10}{15+10} = \frac{5}{25} = \frac{1}{5}$

and $\frac{a+b}{a-b} = \frac{15+10}{15-10} = \frac{25}{5} = 5$

So, (a +b) always greater than (a-b) when denominator is less number is greater then,

$\left(\frac{a+b}{a-b}\right) > \left(\frac{a-b}{a-b}\right)$.

5. Find a rational number exactly halfway between:

a) $\frac{-1}{3}$ and $\frac{1}{3}$ b) $\frac{1}{6}$ and $\frac{1}{9}$

a) We have, $\frac{-1}{3}$ and $\frac{1}{3}$

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

$= \frac{\left(\frac{0}{3}\right)}{2} = \frac{0}{2} = 0.$

b)We have $\frac{1}{6}$ and $\frac{1}{9}$

LCM of 6 and 9 = 3 x 2 = 18

$\therefore$ Half of $\frac{1}{6}$ and $\frac{1}{9} = \left(\frac{\frac{1}{6}+\frac{1}{9}}{2}\right) = \left(\frac{\frac{3}{18}+\frac{2}{18}}{2}\right)$

$\left[\frac{1}{6} \times \frac{3}{3} = \frac{3}{18}, \frac{1}{9} \times \frac{2}{2} = \frac{2}{18}\right]$

$\frac{\left(\frac{5}{18}\right)}{2} = \frac{5}{18} \times \frac{1}{2} = \frac{5}{36}$.

3	6, 9
3	2, 3
2	2, 1
	1, 1

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

We have, $\frac{-8}{28}$ and $\frac{32}{-112}$

$8 = \boxed{2} \times \boxed{2} \times 2$

$28 = \boxed{2} \times \boxed{2} \times 7$

HCF OF 8 and 28 = 2 x 2 =4

2	8
2	4
2	2
	1

2	28
2	14
7	7
	1

2	32
2	16
2	8
2	4
2	2
	1

2	112
2	56
2	28
2	14
7	7
	1

$32 = \boxed{2} \times \boxed{2} \times \boxed{2} \times \boxed{2} \times 2$

$28 = \boxed{2} \times \boxed{2} \times \boxed{2} \times \boxed{2} \times 7$

HCF OF 32 and 112 = 2 x 2 x 2 x 2 = 16

$\therefore \frac{-8}{28} = \frac{-8 \div 4}{28 \div 4} = \frac{-2}{7}$

On converting the rational number into positive denominator, we get

$\frac{32}{-112} + \frac{-16}{-16} = \frac{-2}{7}$

So, both rational numbers are equivalent.

7. If 12 shirts of equal size can be prepared from 27 m cloth, what is length of cloth required for each shirt?

∵ Length of cloth = 27 m

Since, 12 shirts of equal size is to be prepared.

∴ Length of cloth required for each shirt

$= 27 \div 12 \text{ m} = \frac{27}{12} \text{ m}$

∵ $27 = 3 \times 3 \times 3$

And $12 = 2 \times 2 \times 3$

∴ HCF of 27 and 12 = 3

3	27
3	9
3	3
0	1

2	12
2	16
3	3
	1

On dividing numerator and denominator by their HCF, we get

$\frac{27 \div 3}{12 \div 3} = \frac{9}{4} = 2.25$ m

So, for each shirt 2.25 m cloth is required.

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

∵ Total length of rope = 68 m

Here, the pieces of equal size are cut.

Length of 1 piece = $4\frac{1}{4}$ m = $\frac{4X4+1}{4} = \frac{17}{4}$ m

Number of pieces of the rope = $68 \div \frac{17}{4} = 68 \times \frac{4}{17}$

[∵ reciprocal of $\frac{17}{4} = \frac{4}{17}$]

$= \frac{68 \times 4}{17}$ = 4 x 4 =16 pieces.

Thus, total equal length pieces are 16.

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

Let the total volume = 1; Body floats volume = $\frac{2}{9}$

Body submerged volume = $\frac{1}{1} - \frac{2}{9}$

∵ LCM of 1 and 9 = 9.

On multiplying numerator and denominator by their LCM, we get

$\frac{1 \times 9}{1X9} = \frac{9}{9}$

∴ Body submerged volume = $\frac{9}{9} - \frac{2}{9} = \frac{7}{9}$

Ratio

Body submerged volume : Body floats volume

$\frac{7}{9}$: $\frac{2}{9}$

On multiplying both sides by 9, we get

$\frac{7}{9}$ x 9: $\frac{2}{9}$ x 9 = 7: 2

In rational number form = $\frac{7}{2}$.

II. Short Answer Questions

1. Which is greater in each of the following :

a) $\frac{4}{3}, \frac{7}{5}$ **b)** $\frac{3}{4}, \frac{7}{11}$

a) $\frac{4}{3}, \frac{7}{5}$ $\frac{4}{3} \times \frac{5}{5} = \frac{20}{15}$

Similarly $\frac{7}{5} \times \frac{3}{3} = \frac{21}{15}$

Clearly $\frac{20}{15} < \frac{21}{15}$

$\therefore \frac{4}{3} < \frac{7}{5}$

b) $\frac{3}{4}$ and $\frac{7}{11}$

L.C.M. of 4 and 11 = 44

$\therefore \frac{3}{4} = \frac{3 X 11}{4 X 11} = \frac{33}{44}$

and $\frac{7}{11} = \frac{7 X 4}{11 x 4} = \frac{28}{4}$

Since, $\frac{33}{44} > \frac{28}{4}$

$\therefore \frac{3}{4} > \frac{7}{4}$

2. Find :

a) $\frac{5}{6}, \frac{7}{3}$ **b)** $3\frac{1}{5} - \left(-\frac{2}{3}\right)$

$\frac{5}{6} - \frac{7}{3} = \frac{5}{6} - \frac{7}{3} \times \frac{2}{2}$

$= \frac{5}{6} - \frac{14}{6}$

$= \frac{5-14}{6}$

$= \frac{-9}{6} = -\frac{3}{2}$

b) $3\frac{1}{5} - \left(-\frac{2}{3}\right) = \frac{16}{5} + \frac{2}{3}$

$= \frac{16 X 3}{5 X 3} + \frac{2 X 5}{3 X 5}$

$= \frac{48}{15} + \frac{10}{15}$

$= \frac{48+10}{15} = \frac{58}{15}$.

3. Fill in the blanks :

$\frac{27}{16}$ + (...) = $-\frac{15}{8}$

Let the missing number be $\frac{a}{b}$, then

$\frac{27}{16} \div \left(\frac{a}{b}\right) = \frac{-15}{8}$

$= \frac{27}{16} \times \frac{b}{a} = \frac{-15}{8}$

$\Rightarrow \frac{b}{a} = \left(\frac{-15}{8}\right) \div \frac{27}{16}$

$\Rightarrow \frac{b}{a} = \frac{-15}{8} \times \frac{16}{27}$

$\Rightarrow \frac{b}{a} = \frac{-10}{9}$

$\therefore$ **Number is** $\frac{a}{b} = \frac{-9}{10}$.

4. The product of two rational number is $\frac{-8}{9}$. If one of the number is $\frac{-4}{15}$, find the other.

Let the required number be x

$\therefore \frac{-4}{15} \times x = \frac{-8}{9}$

$= x = \frac{-8}{9} \div \frac{-4}{15}$

$= x = \frac{-8}{9} \times \frac{15}{-4}$

$= x = \frac{8 X 15}{9 X 4}$

$= \frac{10}{3}$.

5. Find : a) $\frac{-3}{7} + \frac{2}{3}$ b) $\frac{-5}{6} + \frac{-3}{11}$

a) $\frac{-3}{7} + \frac{2}{3}$

$\because$ **LCM of 7 and 3 = 21**

So, $\frac{-3}{7} = \frac{-3 \ x \ 3}{7 \ x \ 3} = \frac{-9}{21}$ and $\frac{2}{3} = \frac{2 X 7}{3 X 7} = \frac{14}{21}$

$\therefore \frac{-3}{7} + \frac{2}{3} = \frac{-9}{21} + \frac{14}{21} = \frac{-9+14}{21} = \frac{5}{21}$.

b) Given $\frac{-5}{6} + \frac{-3}{11}$

$\because$ LCM of 6 and 11 = 66

$\therefore \frac{-5}{6} = \frac{-5\ x\ 11}{6\ x\ 11} = \frac{-55}{66}$ and $\frac{-3}{11} = \frac{-3\ X\ 6}{6\ X\ 11} = \frac{-18}{66}$

Now, $\frac{-5}{6} + \frac{-3}{11} = \frac{-55}{66} + \frac{-18}{66} = \frac{-55+(-18)}{66}$

$= \frac{-55-18)}{66} = \frac{-73}{66}$.

6. Find : **a)** $\frac{7}{48} - \frac{17}{36}$ **b)** $\frac{5}{63} - \left(\frac{-6}{21}\right)$ **c)** $\frac{-6}{13} - \left(\frac{-7}{15}\right)$ **d)** $\frac{-3}{8} - \frac{7}{11}$

a) $\frac{7}{48} - \frac{17}{36} = \frac{7(3)-17(4)}{144}$

$= \frac{21-68}{48} = \frac{-47}{144}$

b) $\frac{5}{63} - \left(\frac{-6}{21}\right) = \frac{5}{63} + \frac{6}{21}$

$= \frac{5-6(3)}{63} = \frac{5+18}{63} = \frac{23}{63}$

c) $\frac{-6}{13} - \left(\frac{-7}{15}\right) = \frac{-6}{13} + \frac{7}{15}$

$= \frac{-6(15)+7(13)}{195} = \frac{-90+91}{63} = \frac{1}{195}$

d) $\frac{-3}{8} - \frac{7}{11} = \frac{-3(11)-7(8)}{88}$

$= \frac{-33-56}{88} = \frac{-89}{88} = -1\frac{1}{88}$.

III. Short Answer Questions

1. Write four more rational numbers in the pattern below.

$\frac{-3}{5}, \frac{-6}{10}, \frac{-9}{15}, \frac{-12}{20}$

$\frac{-3}{5} = \frac{(-3)X\ 1}{5\ X1}$

$\frac{-6}{10} = \frac{(-3)X\ 2}{5\ X2}$

$\frac{-9}{15} = \frac{(-3)X3}{5\ X3}$

$\frac{-12}{20} = \frac{(-3)X4}{5\ X4}$

We have pattern in these numbers. So, next four are

$\frac{(-3)X\,5}{5\,X5} = \frac{-15}{25}$

$\frac{(-3)X\,6}{5\,X6} = \frac{-18}{30}$

$\frac{(-3)X\,7}{5\,X7} = \frac{-21}{35}$

$\frac{(-3)X\,8}{5\,X8} = \frac{-24}{40}$

Therefore, required next four rational numbers are

$\frac{-15}{25}, \frac{-18}{30}, \frac{-21}{35}, \frac{-24}{40}$.

2. Find the sum of $\frac{-8}{19} + \frac{(-2)}{57}$

LCM of 19 and 57 is 57

$\therefore \frac{-8}{19} = \frac{(-8)x\,3}{19\,x\,3} = \frac{-24}{57}$

$\frac{-8}{19} + \frac{(-2)}{57} = \frac{-24}{57} + \frac{(-2)}{57} = \frac{-24+(-2)}{57} = \frac{-26}{57}$

$\frac{-8}{19} + \frac{(-2)}{57} = \frac{-26}{57}$

3. Find the product of $\frac{3}{10}$ x (- 9).

We have, $\frac{3}{10}$ x (-9) $= \frac{3}{10}$ x $\frac{(-9)}{1} = \frac{3\,X\,(-9)}{10\,X\,1} = \frac{-27}{10} = -2\,\frac{7}{10}$.

4. Find the value of $\frac{3}{13} \div \left[\frac{-4}{65}\right]$

The reciprocal of $\frac{-4}{65}$ is $\left[\frac{-65}{4}\right]$

$\therefore \frac{3}{13} \div \left[\frac{-4}{65}\right] = \frac{3}{13}$ x $\left[\frac{-65}{4}\right]$

$= \frac{3\,x\,(-65)}{13\,x\,4} = \frac{-195}{52}$

$= \frac{(-195)\div 13}{52\div 13} = \frac{-15}{4} = -3\,\frac{3}{4}$

Thus, $\frac{3}{13} \div \left[\frac{-4}{65}\right] = -3\,\frac{3}{4}$.

5. What number should be added to $\frac{-5}{8}$ so that the sum is $\frac{5}{9}$?

The number will be obtained by subtracting $\frac{-5}{8}$ from $\frac{5}{9}$

So, $\frac{5}{9} - \left[\frac{-5}{8}\right] = \frac{5}{9} + \frac{5}{8} = \frac{5\,X\,8+5\,X\,9}{9\,X\,8}$

$= \frac{40+45}{75} = \frac{85}{72}$ = Therefore, the required number is $\frac{85}{72}$

6. The sum of two rational numbers is $\frac{-3}{5}$. If one of them is $\frac{-9}{10.}$ Fine the other.

Given,

Sum of two numbers = $\frac{-3}{5}$.

One of the numbers = $\frac{-9}{10}$

The other number = Sum of two numbers - one of the numbers

= $\frac{-3}{5} - \frac{(-9)}{10} = \frac{-3}{5} + \frac{9}{10}$

LCM of 5 and 10 is 10 = $\frac{-3X\ 2+9\ X\ 1}{10} = \frac{-6+9}{10} = \frac{3}{10}$

Therefore the required number is = $\frac{3}{10}$

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

Given, $\frac{-5}{7} = \frac{X}{28}$

By cross multiplication, we get

(-5) x 28 = (7 x x)

-140 = 7 x

$x = \frac{-140}{7}$ = -20

∴ The required value of $x\ is -20$.

I. Long Answer Questions

1. Write four numbers in the following pattern.

$\frac{-1}{3}, \frac{-2}{6}, \frac{-3}{9}, \frac{-4}{12}, \ldots\ldots$

Given pattern is - $\frac{1}{3}, -\frac{2}{6}, -\frac{3}{9}, -\frac{4}{12}, \ldots\ldots$

Here

- $\frac{1}{3} = \frac{(-1)\ X\ 1}{3\ X\ 1}$

- $\frac{2}{6} = \frac{(-1)\ X\ 2}{3\ X\ 2}$

- $\frac{3}{9} = \frac{(-1)\ X\ 3}{3\ X\ 3}$

and - $\frac{4}{12} = \frac{(-1)\ X\ 4}{3\ X\ 4}$

Hence next four numbers are

$\frac{(-1)\ X\ 5}{3\ X\ 5} = -\frac{5}{15}$

$\frac{(-1)\ X\ 6}{3\ X\ 6} = -\frac{6}{18}$

$\frac{(-1)\ X\ 7}{3\ X\ 7} = -\frac{7}{21}$

$\frac{(-1)\ X\ 8}{3\ X\ 8} = -\frac{8}{24}$.

2. Arrange the rational numbers $\frac{-3}{5}, \frac{7}{-10}, \frac{-5}{6}$ in ascending order.

Sequence is $\frac{-3}{5}, \frac{7}{-10}, \frac{-5}{6}$

L.C.M. of 5, 10 and 6 = 30

$= \frac{-3}{5}, \frac{7}{-10}, \frac{-5}{6}$

$= \frac{-3\ X\ 6}{5\ X\ 6}, \frac{7\ X\ 3}{-10\ X\ 3}, \frac{-5\ X\ 5}{6\ X\ 5}$

$= -\frac{18}{30}, -\frac{21}{30}, -\frac{25}{30}$

Since $-\frac{25}{30} < -\frac{21}{30} < -\frac{18}{30}$

Hence sequence in ascending order is

$\frac{-5}{6} < \frac{7}{-10} < \frac{-3}{5}$.

3. Taking x = $\frac{-4}{9}$, y = $\frac{5}{12}$ z = $\frac{7}{18}$, find:

a) the rational number which when added to x gives y.

b) the rational number which subtracted from y gives z.

c) the rational number which when added to z gives x.

d) the rational number which when multiplied by y to get x.

a) Let we add A to x then gives y

A + x = y = A + $\left(\frac{-4}{9}\right)$ = $\frac{5}{12}$

A = $\frac{5}{12}$ - $\left(\frac{-4}{9}\right)$

= $\frac{5}{12}$ + $\frac{4}{9}$

= $\frac{5\ X\ 3+4\ X4}{36}$

= $\frac{15+16}{36}$ = $\frac{31}{36}$

b) Let we subtract A from y gives z

y - A = z = $\frac{5}{12}$ − A = $\frac{7}{18}$

-A = $\frac{7}{18}$ − $\frac{5}{12}$ = $\frac{7\ X\ 2-5\ X\ 3}{36}$

= $\frac{14-15}{36}$ = $\frac{-1}{6}$.

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

c) Let A is added to z gives x

A + z = x = A + $\left(\frac{7}{18}\right)$ = $\frac{-4}{9}$

A = $\frac{-4}{9}$ − $\frac{7}{18}$ = $\left(\frac{-4\ X\ 2-7}{18}\right)$ = $\frac{-8-7}{18}$ = $\frac{-15}{18}$ = $\frac{-5}{6}$

[both are divided by 3]

d) Let A be multiplied by y to get x

= A x $\frac{5}{12}$ = $\frac{-4}{9}$

= A = $\frac{-4}{9}$ x $\frac{12}{5}$

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

II. Long Answer Questions

1. Satpal walks $\frac{2}{3}$ km from a place, P, towards East and then from there 1 $\frac{5}{7}$ km towards West, Where will he be now from P?

Let us denote the distance travelled towards. East by positive sign. So, the distances towards West would be denoted by negative sign.

Thus, distance of Satpal from the point P would be

$\frac{2}{3} + \left[-1\frac{5}{7}\right] = \frac{2}{3} + \frac{(-12}{7} = \frac{2\,x\,7}{3\,x\,7} - \frac{(12)X\,3}{7\,X\,3}$

$= \frac{14-36}{21} = \frac{-22}{21} = 1\frac{1}{21}$

Since it is negative, it means Satpal is at a distance of $1\frac{1}{21}$km towards West of P.

2. Divide the sum of $\frac{12}{5}$ and $\frac{21}{25}$ by their difference?

Sum of $\frac{12}{5}$ and $\frac{21}{25} = \frac{12}{5} + \frac{21}{25} = \frac{5\,(12)+1\,(21)}{25}$

$= \frac{60+21}{25} = \frac{81}{25}$

Difference of $\frac{12}{5}$and $\frac{21}{25} = \frac{12}{5} - \frac{21}{25}$

$= \frac{5(12)-21\,(1)}{25} = \frac{60-21}{25} = \frac{39}{25}$

Now, $\left[\frac{12}{5} + \frac{21}{25}\right] \div \left[\frac{12}{5} - \frac{21}{25}\right] = \left[\frac{81}{25}\right] \div \left[\frac{39}{25}\right]$

$= \frac{81}{25}$ x $\frac{25}{39} = \frac{27}{13}$.

3. Simplify : $\left[\frac{14}{15}\,X\left[\frac{-25}{28}\right]\right]$ + $\left[\frac{2}{3}\,X\frac{6}{7}\right]$

$\therefore \frac{14}{15}$ x $\frac{(-25)}{28} = \frac{14}{15}\,X\,\frac{25}{28}$ x (-1)

$= \frac{1\,x\,5\,x\,(-1)}{3\,X\,2} = \frac{-5}{6}$

and $\frac{2}{3}$ x $\frac{6}{7} = \frac{2X\,2}{1\,X\,7} = \frac{4}{7}$

$\therefore \left[\frac{14}{15}\,X\left[\frac{-25}{28}\right]\right] + \left[\frac{2}{3}\,X\frac{6}{7}\right]$

$= \left[\frac{-5}{6}\right] + \left[\frac{4}{7}\right]$

$= \frac{(-5)\,X\,7+4\,X6}{6}$

[∴ LCM OF 6 AND 7 IS 42]

$= \frac{-35+24}{42} = \frac{-11}{42}$.

4. Find the reciprocal of the following

i. $\left[\frac{1}{2}\ X\ \frac{1}{4}\right]$ **+** $\left[\frac{1}{2}\ X6\right]$ **ii.** $\left[-5\ X\ \frac{12}{15}\right]$ **-** $\left[-3\ X\ \frac{2}{9}\right]$

i. $\left[\frac{1}{2}\ X\ \frac{1}{4}\right] + \left[\frac{1}{2}\ X6\right]$

As we know,

$\frac{1}{2}\ X\ \frac{1}{4} = \frac{1}{8}$

= and $\frac{1}{2}\ X\ 6 = 3$

Now $\left[\frac{1}{2}\ X\ \frac{1}{4}\right] + \left[\frac{1}{2}\ X6\right] = \frac{1}{8} + 3 = \frac{1+8\ x\ 3}{8} = \frac{25}{8}$

Reciprocal $\left[\frac{25}{8}\ is\ \frac{8}{25}\right]$

ii. $\left[-5\ X\ \frac{12}{15}\right]$ - $\left[-3\ X\ \frac{2}{9}\right]$

As we know

$\left[-5\ X\ \frac{12}{15}\right] = \frac{-12}{3}$

and $\left[-3\ X\ \frac{2}{9}\right] = \frac{-2}{3}$

Now, $\left[-5\ X\ \frac{12}{15}\right]$ - $\left[-3\ X\ \frac{2}{9}\right] = \frac{-12}{3}$ - $\left[\frac{-2}{3}\right]$

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

$= \frac{-12}{3} + \frac{2}{3} = \frac{-10}{3}$

Reciprocal of $\frac{-10}{3}$ is $\frac{-3}{10}$.

5. Taking x = $\frac{-4}{9}$ **y =** $\frac{5}{12}$ **and x =** $\frac{7}{18}$ **Find :**

a. Rational number which when multiplies by y to get x

b. $(x \div y)\ xz$

c. x – (y +z)

d. Rational number which when added to z give us x.

a. Rational number which when multiplies by y to get x

Let the rational number be a

From above statement we get,

a X y = x

$\Rightarrow$ a x $\frac{5}{12}=\frac{-4}{9}$

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

By cross multiplication ; we get

5a x 9 = -4 x 12

$a=\frac{-4 \text{ x } 12}{5 \text{ x } 9}=\frac{-4 \text{ x } 4}{5 \text{ x } 3}=\frac{-16}{15}$

∴ Rational number we get $=\frac{-16}{15}$

b. $(x \div y)\, Xz$

Putting the value of x, y, z we get

$\left(\frac{-4}{9} \div \frac{5}{12}\right) x \left(\frac{7}{8}\right) \Rightarrow \left(\frac{-4}{9} \div \frac{5}{12}\right)$

Reciprocal of $\frac{5}{12}$ is $\frac{12}{5}$

$\therefore \frac{-4}{9} \div \frac{12}{5}=\frac{-4}{3} \text{ x } \frac{4}{5}=\frac{-16}{15}$

Now we get, $=\frac{-16}{15} \text{ x } \frac{7}{18}=\frac{-8}{15} x \frac{7}{9}=\frac{-56}{135}$

c. x – (y +z)

Putting two value of x, y and z we get

$\frac{-4}{9}-\left[\frac{5}{12}+\frac{7}{18}\right]$

Solving $\frac{5}{12}+\frac{7}{18}$ we get,

$=\frac{15+14}{36}=\frac{7}{18}$ we get [∴ LCM OF 12 AND 18 I S 36]

=Now subtracting $\frac{29}{36} and \frac{-4}{9}$ we get,

$\frac{-4}{9}-\frac{29}{36}=\frac{-16-29}{36}=\frac{-45}{36}=\frac{-5}{4}$

d. Let the rational number be a from above statement we get,

$\Rightarrow$ a + z = x

Putting one value of z and x

$= a + \frac{7}{18} = \frac{-4}{9}$

$a = \frac{-4}{9} - \frac{7}{18}$

$a = \frac{-4\ X\ 2-7}{18} = \frac{-8-7}{18} = \frac{-15}{18} = \frac{-5}{6}$

∴ The required rational number is $\frac{-5}{6}$.

Value Based Questions

1. a) Arrange the following rational numbers in ascending order ;

$\frac{2}{5}, \frac{7}{10}, \frac{8}{15}, \frac{13}{30}$.

(b)Which mathematical concept is used in this problem?

(c) What is its value?

a) Sequence $\frac{2}{5}, \frac{7}{10}, \frac{8}{15}, \frac{13}{30}$

L.C.M. of 5, 10, 15, 30 = 30

Sequence be $\frac{2\ X\ 6}{5\ X\ 6}, \frac{7\ X\ 3}{10\ X\ 3}, \frac{8\ X\ 2}{15\ X\ 2}, \frac{13}{30}$

Or $\frac{12}{30}, \frac{21}{30}, \frac{16}{30}, \frac{13}{30}$

Its ascending order is

$\frac{12}{30} < \frac{13}{30} < \frac{16}{30} < \frac{21}{30}$

$\frac{2}{5} < \frac{13}{30} < \frac{8}{15} < \frac{7}{10}$

b) L.C.M. and to find ascending order.

c) In a class, the students should stand in ascending order of height.

2. a) List six rational numbers between - 1 and 0

b) Which mathematical concept is used in this problem?

c) What is its value?

a) We have

$-1 = \frac{7}{7}$ and $0 = \frac{0}{7}$

$$-\frac{7}{7} < -\frac{6}{7} < \frac{-5}{7} < -\frac{4}{7} < -\frac{3}{7} < -\frac{2}{7} < -\frac{1}{7} < \frac{0}{7}$$

$$-1 < -\frac{6}{7} < \frac{-5}{7} < -\frac{4}{7} < -\frac{3}{7} < -\frac{2}{7} < -\frac{1}{7} < 0$$

Hence six rational numbers between -1 and 0 are

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

b) To find more rational numbers between two rational numbers.

c) Value : We should give space to others.

HOTS (Higher order thinking skills)

1. Write a rational number in which the numerator is less than '- 7 x 11' and the denominator is greater than ' 12 + 4 '.

Rational number in which numerator is less than '-7 x 11' i.e., -77 and, denominator greater than ' 12 + 4 '. i.e. 16 are many like $\frac{-78}{17}, \frac{-79}{18}$...and so on.

2. If $x = \frac{1}{10}$ and $y = \frac{-3}{8}$, then evaluate x + y , x – y, x X y and x ÷ y.

Given $x = \frac{1}{10}$ and $y = \frac{-3}{8}$

$x + y = \frac{1}{10} + \left(\frac{-3}{8}\right) = \frac{4+(-15)}{40} = \frac{4-15}{40} = \frac{-11}{40}$

$x - y = \frac{1}{10} + \left(\frac{-3}{8}\right) = \frac{4-(-15)}{40} = \frac{19}{40}$

$x + y = \frac{1}{10} + \left(\frac{-3}{8}\right) = \frac{1}{10} \times \frac{-3}{8} = \frac{-3}{80}$

$x \div y = \frac{1}{10} + \left(\frac{-3}{8}\right)$

$= \frac{1}{10} - \frac{-8}{3} = \frac{-4}{15}$.

3. If p = m x t and q = n x t then $\frac{p}{q}$ =

Given , p = m x t and q = n x t

Putting value of p and q we get.

$\therefore \frac{p}{q} = \frac{m\,x\,t}{n\,x\,t} = \frac{m}{n}$.

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

She simplified rational number $\frac{-25}{-30} = \frac{-5}{-6}$ which is wrong as she divided numerator by 5 and denominator by -5 . As the correct answer should be.

$= \frac{5}{6}\left(\frac{-25 \div -5}{-30 \div -5}\right)$.

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