Name : _____

Grade : VIII

Subject : Mathematics

Chapter : 1. Rational Numbers

Objective Type Questions

I. Multiple choice questions

1. The additive inverse of $\frac{-7}{19}$ is **[NCERT Exemplar]**

a. $\frac{-7}{19}$ b. $\frac{7}{19}$ c. $\frac{19}{7}$ d. $\frac{-19}{7}$

2. The multiplicative inverse of $-1\frac{1}{7}$ is

a. $\frac{8}{7}$ b. $\frac{-8}{7}$ c. $\frac{7}{8}$ d. $\frac{7}{-8}$

3. A number which can be expressed as $\frac{p}{q}$, where p and q are integers and $q \neq 0$ is **[NCERT Exemplar]**

a. natural number b. whole number c. integer d. rational number

4. $\left(-\frac{3}{8}\right) + \frac{1}{7} = \frac{1}{7} + \left(\frac{-3}{8}\right)$ is an example to show that **[NCERT Exemplar]**

a. addition of rational numbers is commutative

b. rational number are closed under addition

c. addition of rational number is associative

d. rational numbers are distributive under addition

5. Which of the following numbers is its own reciprocal. **[NCERT Exemplar]**

a. 10 b. zero c. $\frac{1}{5}$ d. 1

6. Zero (0) is **[NCERT Exemplar]**

a. the identify for addition of rational numbers

b. the identify for subtraction of rational numbers

c. the identify for multiplication or rational number

d. the identify for division of rational numbers

7. Which of the following number lies in the middle of $\frac{3}{4} and \frac{7}{4}$ **[NCERT Exemplar]**

a. 5.0 b. 3.0 c. 2.5 d. 1.25

8. If $x + 0 = 0 + x = x$, is rational numbers, then 0 is called **[NCERT Exemplar]**

a. identify for addition of rational numbers b. additive inverse of x

c. multiplicative inverse of x d. reciprocal of x

9. Which of the following numbers is the simplest form of $\frac{3}{4} + \left(-\frac{1}{4}\right) + \left(-\frac{5}{4}\right)$ **[NCERT Exemplar]**

a. $\frac{9}{4}$ b. $-\frac{3}{4}$ c. $\frac{21}{8}$ d. $\frac{-21}{8}$

10. Which of the following properties indicates the given operation

$\left[\left(\frac{1}{8}\right) + \left(-\frac{3}{5}\right)\right] + \left(\frac{1}{7}\right) = \left(-\frac{1}{5}\right) + \left[\left(-\frac{3}{5}\right) + \left(-\frac{1}{7}\right)\right]$ **[NCERT Exemplar]**

a. commutative b. associative c. distributive d. none of these

11. What should be added to $\frac{-3}{4}$ to get '-1'? **[NCERT Exemplar]**

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

12. To get the product 1, we should multiply $\frac{8}{21}$ by **[NCERT Exemplar]**

a. $\frac{8}{21}$ b. $\frac{-8}{21}$ c. $\frac{21}{8}$ d. $\frac{-21}{8}$

13. The value of $-\frac{3}{5} \times \frac{4}{7} \times \frac{15}{16} \times \left(-\frac{14}{9}\right)$ is equal to **[NCERT Exemplar]**

a. $\frac{1}{4}$ b. $\frac{1}{2}$ c. $\frac{1}{8}$ d. $\frac{1}{6}$

14. The reciprocal of any rational number $\frac{p}{q}$, where p and q are integers and $q \neq 0$, is **[NCERT Exemplar]**

a. $\frac{p}{q}$ b. 1 c. 0 d. $\frac{q}{p}$

15. The reciprocal of $\frac{-3}{8} \times \left(\frac{-7}{13}\right)$ is **[NCERT Exemplar]**

a. $\frac{104}{21}$ b. $\frac{-104}{21}$ c. $\frac{21}{104}$ d. $\frac{-21}{104}$

16. Which of the following is the product of $\left(\frac{-7}{8}\right)$ and $\frac{2}{21}$? **[NCERT Exemplar]**

a. $-\frac{1}{12}$ b. 12 c. $\frac{-63}{16}$ d. $\frac{-16}{147}$

17. What should be subtracted from $\frac{-3}{5}$ to get -2? **[NCERT Exemplar]**

a. $\frac{-7}{5}$ b. $\frac{-13}{5}$ c. $\frac{13}{5}$ d. $\frac{7}{5}$

18. If $1 \leq k \leq 25$, how many prime numbers are there which are of the form $6k + 1$ **[NCERT Exemplar]**

a. 15 b. 16 c. 17 d. 18

19. Alok wanted to type the first 200 natural numbers. How many times does he have to press the keys?

a. 400 b. 365 c. 492 d. 489

20. Which of the following is an example of distributive property of multiplication over addition for rational number.

a. $-\frac{1}{4} \; x \; \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left[-\frac{1}{4} \; x \; \frac{2}{3}\right] + \left[-\frac{1}{4} \; x \left(\frac{-4}{7}\right)\right]$

b. $-\frac{1}{4} \; x \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left[\frac{1}{4} \; x \; \frac{2}{3}\right] - \left(\frac{-4}{7}\right)$

c. $-\frac{1}{4} \; x \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \frac{2}{3} + \left(-\frac{1}{4}\right) x \frac{-4}{7}$

d. $-\frac{1}{4}\left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} - \frac{1}{4}$

1. b	2. d	3. d	4. a	5. d	6. a	7. d	8. a	9. b	10. b
11. b	12. c	13. b	14. d	15. a	16. a	17. d	18. b	19. c	20. a

II. Multiple choice questions

1. Which of the following is not true? **[NCERT Exemplar]**

a. $\frac{2}{3} + \frac{5}{4} = \frac{5}{4} + \frac{2}{3}$ b. $\frac{2}{3} - \frac{5}{4} = \frac{5}{4} - \frac{2}{3}$ c. $\frac{2}{3} \times \frac{5}{4} = \frac{5}{4} \times \frac{2}{3}$ d. $\frac{2}{3} \div \frac{5}{4} = \frac{2}{3} \times \frac{4}{5}$

2. Multiplicative inverse of a negative rational number is **[NCERT Exemplar]**

a. a positive rational number b. a negative rational number

c. 0 d. 1

3. –(-x) is same as [NCERT Exemplar]

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

4. To get the product 1, we should multiply $\frac{8}{21}$ by **[NCERT Exemplar]**

a. $\frac{8}{21}$ b. $\frac{-8}{21}$ c. $\frac{21}{8}$ d. $\frac{-21}{8}$

5. The reciprocal of 0 is **[NCERT Exemplar]**

a. 1 b. -1 c. 0 d. Not defined

6. Which of the following is an example of distributive property of multiplication over addition for rational numbers. **[NCERT Exemplar]**

a. $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left[-\frac{1}{4} \times \frac{2}{3}\right] + \left[\frac{1}{4} \times \left(\frac{-4}{7}\right)\right]$ b. $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left[\frac{1}{4} \times \frac{2}{3}\right] - \left(\frac{-4}{7}\right)$

c. $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \frac{2}{3} + \left(-\frac{1}{4}\right) \times \frac{-4}{7}$ d. $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left\{\frac{2}{3} + \frac{-4}{7}\right\} - \frac{1}{4}$

7. Which of the following statement is always true?

a. $\frac{x-y}{2}$ is a rational number between x and y

b. $\frac{x+y}{2}$ is a rational number between x and y

c. $\frac{x \; x \; y}{2}$ is a rational number between x and y

d. $\frac{x \div y}{2}$ is a rational number between x and y

1. b	2. b	3. b	4. c	5. d	6. a	7. b

III. Multiple choice questions.

1. Which of the following is not true?

a) $\frac{10}{11}+\frac{11}{12}=\frac{11}{12}+\frac{10}{11}$ b) $\frac{10}{11}\times\frac{11}{12}=\frac{11}{12}\times\frac{10}{11}$

c) $\frac{10}{11}\div\frac{11}{12}=\frac{11}{12}\div\frac{10}{11}$ d) $\frac{10}{11}\div\frac{11}{12}=\frac{10}{11}\times\frac{12}{11}$

2. Three rational numbers lying between $\frac{-5}{4}$ and $\frac{1}{2}$ are

a) -1, 0, $\frac{4}{3}$ b) $\frac{-3}{4}, \frac{-1}{2}, \frac{1}{4}$ c) $\frac{-3}{4}, \frac{4}{3}, \frac{1}{4}$ d) $\frac{-7}{4}$, -1, 0

3. $\frac{x+y}{2}$ is a rational number [NCERT Exemplar]

a) between x and y b) less than x and y both

c) greater than x and y both d) less than X but greater than y

4. Which of the following statements is always true?

a) $\frac{x-y}{2}$ is a rational number between x and y

b) $\frac{x+y}{2}$ is a rational number between x and y

c) $\frac{x\times y}{2}$ is a rational number between x and y

d) $\frac{x\div y}{2}$ is a rational number between x and y

5. The reciprocal of $\frac{-3}{8}\times\left[\frac{-24}{13}\right]$ is

a) $\frac{9}{13}$ b) $\frac{-9}{13}$ c) $\frac{-13}{9}$ d) $\frac{13}{9}$

6. The reciprocal of 0 is

a) -1 b) 1 c) 0 d) not defined

7. Zero (0) is **[NCERT Exemplar]**

a) the identity for addition of rational numbers

b) the identity for subtraction of rational numbers

c) the identity for multiplication of rational numbers

d) the identity for division of rational numbers

8. One (1) is

a) the identity for addition of rational numbers

b) the identity for subtraction of rational number

c) the identity for multiplication of rational number

d) the identity for division of rational number [NCERT Exemplar]

9. Multiplicative inverse of a negative rational number is

a) 0 b) -1

c) a negative rational number d) a positive rational number

10.To get the product $\frac{-4}{5}$, we should multiply $\frac{10}{11}$ by

a) $\frac{14}{5}$ b) $\frac{-4}{5}$ c) $\frac{-22}{25}$ d) $\frac{-9}{5}$

11. The numerical expression $\frac{3}{8} + \frac{(-5)}{7} = \frac{-19}{56}$ shows that

a) rational numbers are closed under addition

b) rational numbers are not closed under addition

c) rational numbers are closed under multiplication

d) addition of rational numbers is not commutative

12. Which of the following is not true? **[NCERT Exemplar]**

a) rational numbers are closed under addition

b) rational numbers are closed under subtraction

c) rational numbers are closed under multiplication

d) rational numbers are closed under division.

1. c	2. b	3. a	4. b	5. d	6. d	7. a	8. c	9. c	10. c	11. a	12. d

IV. Multiple choice questions.

1. What should be added to $\frac{-3}{4}$ to get -1?

i) $\frac{1}{4}$ ii) $\frac{-1}{4}$ iii) 1 iv) $\frac{-3}{4}$

2. What should be subtracted from $\frac{-3}{4}$ to get -1?

i) $\frac{1}{4}$ ii) $\frac{-1}{4}$ iii) 1 iv) - $\frac{3}{4}$

3.Which of the following is the identity element?

i) 1 ii) -1 iii) 0 iv) None of these

4.Which of the following is the multiplicative identity for rational numbers?

i) 1 ii) -1 iii) 0 iv) None of these

5.Which of the following is neither positive nor a negative rational numbers?

i) 1 ii) 0

iii) Such a rational number does not exist iv) None of the above

6. Which of the following rational numbers lies between 0 and -1?

i) 0 ii) -1 iii) $-\frac{2}{3}$ iv) $\frac{2}{3}$

7. Which of the following is the reciprocal of p?

i) –p ii) p iii) $\frac{1}{p}$ iv) $\frac{-1}{p}$

8. Which of the following is the product of $\frac{7}{8}$ and $\frac{-2}{21}$?

i) $-\frac{1}{12}$ ii) $\frac{1}{12}$ iii) $\frac{-16}{63}$ iv) $\frac{-147}{16}$

9. Which of the following is the product of $\left[\frac{-7}{8}\right]$ and $\frac{2}{21}$?

i) $-\frac{1}{12}$ ii) 12 iii) $\frac{-63}{16}$ iv) $\frac{-16}{147}$

10. Which of the following is the reciprocal of the reciprocal of a rational number?

i) -1 ii) 1

iii) 0 iv)The rational number itself

1. ii	2. i	3. iii	4. i	5. ii	6. iii	7. iii	8.i	9. i	10. iv

V. Multiple choice questions.

1. Which of the following statements is false?

a) Natural numbers are closed under addition

b) Whole numbers are closed under addition

c) Integers are closed under addition

d) Rational numbers are not closed under addition

2. Which of the following statements is false?

a) Natural numbers are closed under subtraction

b) Whole numbers are not closed under subtraction

c) Integers are closed under subtraction

d) Rational numbers are closed under subtraction

3.Which of the following statements is true?

a) Natural numbers are closed under multiplication

b) Whole numbers are not closed under multiplication

c) Integers are not closed under multiplication

d) Rational numbers are not closed under multiplication

4.Which of the following statements is true?

a) Natural numbers are closed under division

b) Whole numbers are not closed under division

c) Integers are closed under division

d) Rational numbers are closed under division.

5. Which of the following statements is false?

a) Natural numbers are commutative for addition

b) Whole numbers are commutative for addition

c) Integers are not commutative for addition

d) Rational numbers are commutative for addition

6.Which of the following statements is true?

a) Natural numbers are commutative for subtraction

b) Whole numbers are commutative for subtraction

c) Integers are commutative for subtraction

d) Rational numbers are not commutative for subtraction

7.Which of the following statements is false?

a) Natural numbers are commutative for multiplication

b) Whole numbers are commutative for multiplication

c) Integers are not commutative for multiplication

d) Rational numbers are commutative for multiplication

8.Which of the following statements is true?

a) Natural numbers are commutative for division

b) Whole numbers are not commutative for division

c) Integers are commutative for division

d) Rational numbers are commutative for division

9. Which of the following statements is true?

a) Natural numbers are associative for addition

b) Whole numbers are not associative for addition

c) Integers are not associative for addition

d) Rational numbers are not associative for addition

10.Which of the following statements is true?

a) Natural numbers are associative for subtraction

b) Whole numbers are not associative for subtraction

c) Integers are associative for subtraction

d) Rational numbers are associative for subtraction

11. Which of the following statements is true?

a) Natural numbers are not associative for multiplication

b) Whole numbers are not associative for multiplication

c) Integers are associative for multiplication

d) Rational numbers are not associative for multiplication

12. Which of the following statements is true?

a) Natural numbers are associative for division

b) Whole numbers are associative for division

c) Integers are associative for division

d) Rational numbers are not associative for division

13. 0 is not

a) a natural number b) a whole number c) an integer d) a rational number

14. $\frac{1}{2}$ is

a) a natural number b) a whole number c) an integer d) a rational number

15. $a + b = b + a$ is called

a) Commutative law of addition b) associative law of addition

c) distributive law of addition d) none of these

16. $a \times b = b \times a$ is called

a) Commutative law for addition b) Commutative law for multiplication

c) associative law for addition d) associative law for multiplication

17. $(a + b) + c = a + (b + c)$ is called

a) Commutative law for multiplication b) Commutative law for addition

c) associative law for addition d) associative law for multiplication.

18. $a \times (b \times c) = (a \times b) \times c$ is called

a) associative law for addition b) associative law for multiplication.

c) Commutative law for addition d) Commutative law for multiplication

19. $a(b + c) = ab + ac$ is called

a) commutative law b) associative law c) distributive law d) none of these

20. The additive identify for rational number is

a) 1 b) -1 c) 0 d) None of these

21. The multiplicative identity for rational number is

a) -1 b) 1 c) 0 d) none of these

22. The additive inverse 0f $\frac{2}{3}$ is

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

23. The additive inverse 0f $-\frac{3}{4}$ is

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

24. The multiplicative inverse 0f $\frac{1}{2}$ is

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

25. The multiplicative inverse 0f $-\frac{2}{5}$ is

a) $-\frac{2}{5}$ b) $-\frac{5}{2}$ c) $\frac{5}{2}$ d) 1

26. The multiplicative inverse of 1 is

a) 0 b) -1 c) 1 d) none of these

27. The multiplicative inverse of -1 is

a) 0 b) -1 c) 1 d) None of these

28. How many rational numbers are there between any two given rational numbers?

a) Only one b) Only two c) Countless d) Nothing can be said

29.The negative of 2 is

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

30. The negative of -2 is

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

31. If a and be are two rational numbers, then

a) $\frac{a+b}{2} < a$ b) $\frac{a+b}{2} < b$ c) $\frac{a+b}{2} = a$ d) $\frac{a+b}{2} > b$

32. The rational number that does not have a reciprocal is

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

33. The rational number which is equal to its negative is

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

34. The reciprocal of $\frac{1}{x}$ $(x \neq 0)$ is

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

35. The reciprocal of a positive rational number is

a) a positive rational number b) a negative rational number

c) 0 d) 1

36. The reciprocal of a negative rational number is

a) a positive rational number b) a negative rational number

c) 0 d) –1

1. d	2. a	3. a	4. b	5. c	6. d	7. c	8. b	9. a	10. b	11. c	12. d
13. a	14. d	15. a	16. b	17. c	18. b	19. c	20. c	21. b	22. a	23. d	24. c
25. b	26. c	27. b	28. c	29. c	30. b	31. b	32. a	33. a	34. a	35. a	36. b

I. Fill in the blanks.

1. Zero has _____ reciprocal. **[NCERT Exemplar]**

2. Rational numbers can be added or multiplied in any _____. **[NCERT Exemplar]**

3. The multiplicative inverse of $\frac{4}{3}$ _____. **[NCERT Exemplar]**

4. Reciprocal of $\frac{1}{x}$, where $x \neq 0$ is _____. **[NCERT Exemplar]**

5. The product of two rational numbers is always a _____. **[NCERT Exemplar]**

1. no	2. order	3. $\frac{3}{4}$	4 x	5. rational number

II. Fill in the blanks.

1. The equivalent rational number of $\frac{17}{9}$, whose numerator is 136, is .....

2. $(534 \times 991)^{-1}$ $= (534)^{-1}$ x .....

3. The rational number 9.99 in the form of $\frac{p}{q}$ is .....

4. $\frac{1}{15} \times \left[\frac{27}{31} + \frac{32}{37}\right] = \left[\frac{1}{15} \times \frac{27}{31}\right] +$ .....

5.The rational numbers $\frac{4}{17}$ and $\frac{-4}{17}$ are on the .....sides of zero on the number line

6. $-\frac{4}{7}$ is ..... than $-\frac{4}{5}$

7. There are.....rational numbers between any two rational numbers

8. The additive inverse of a positive rational number is always a .....rational number

9.The reciprocal of $\frac{-15}{17}$ is .....

10. Rational number $\frac{-3}{5}$ lies between consecutive integers -1 and .....

Answers

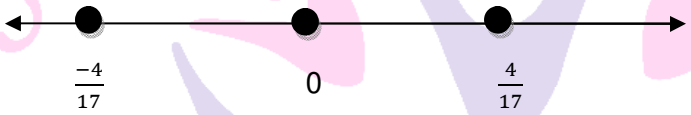
1.$\frac{136}{72}$ =∵ $\frac{17}{9} \times \frac{8}{8} = \frac{136}{72}$

2.$(991)^{-1}$, ∵ $(534 \times 991)^{-1})\ (534)^{-1} \times (991)^{-1}$

3. $\frac{999}{100}$, ∵ 9.99 = $\frac{999}{100}$

4. $\left[\frac{1}{15} \times \frac{32}{37}\right]$ $[using\ distributive\ property\ over\ addition]$

5. Opposite



6. Greater

∵. $\frac{-4}{7} = \frac{-4\,x\,5}{7\,x\,5} = \frac{-20}{35}$ and $\frac{-4}{5} = \frac{-4\,x\,7}{5\,x\,7} = \frac{-28}{35}$

∴ $\frac{-20}{35}$ is greater than $\frac{-28}{35}$

7.Infinite

8. Negative

9. $\frac{-17}{15}$, $\frac{-15}{17}$ x $\frac{-17}{15}$ = 1

10. Zero

I. True or False

1. The additive inverse of $\frac{1}{2}$ is -2. **[NCERT Exemplar]**

2. $\frac{1}{2}$ is natural number. **[NCERT Exemplar]**

3. The multiplicative inverse of $\frac{-3}{5}$ $is \frac{5}{3}$.

4. The negative of the negative of any rational number is the number itself. **[NCERT Exemplar]**

5. If $\frac{p}{q}$ is a rational number, then p cannot be equal to zero. **[NCERT Exemplar]**

1. False	2. False	3. False	4. True	5. False

II. True or False

1. If $\frac{a}{b}$ is a rational number, then b can be any whole number.

2. $\frac{-5}{10}$ lies between $\frac{-1}{2}$ and 1

3. If $P \neq 0$, the multiplicative inverse of $\frac{p}{q}$ is $\frac{q}{p}$

4. The negative of the negative of any rational number is the number itself.

5. The negative of 0 does not exist

6. For any rational number a and b, a – b, = b – a

7. For every rational numbers x , y and z , x + (y x z) = (x + y) x (x + z) [NCERT Exemplar]

8. 1 is the only number, which is own reciprocal.

9. -1 is not the reciprocal of any rational number [NCERT Exemplar]

10. If x and y are negative rational numbers, then so is (x + y) [NCERT Exemplar]

11. The reciprocal of x^{-1} is $\frac{1}{x}$

12. Zero is the smallest rational number [NCERT Exemplar]

Answers

1. False, since, if b=0, than $\frac{a}{b}$ is not defined

2. False, $\frac{-5}{10}$ $=\frac{-1}{2}$

3. True, $\frac{p}{q}$ x $\frac{q}{p}$ = 1

4. True, - (-x) = x

5. True, since, zero is neither a positive integer nor negative integer.

6. False, for e.g.1-$\frac{1}{2}$ $\neq$ $\frac{1}{2}$ -1

7. 2

8. False, reciprocal of 1 is 1 and reciprocal of -1 is -1

9. False, -1 is the reciprocal of -1

10. True, e.g. $\left[-\frac{1}{2}\right]$ + $\left[-\frac{1}{2}\right]$ = -1, which is again a negative rational number.

11. False, $x^{-1} = \frac{1}{x}$; ∴reciprocal of $\frac{1}{x}$ is x

12. False, as smallest rational number does not exist.

I. Match the following

I. Column - A	Column - B
(a) a (b+c) = ab +ac is called	(i)Associative property for multiplication
(b) a x (b x c) = (a x b) x c is called	(ii) Distributive property for addition
(c) a + b = b + a is called	(iii) Associative property for addition
d) a x b = b x a is called	(iv) Commutative property for multiplication
e) (a + b) + c = a + (b + c) is called	(v) Commutative property for addition

a) (ii)	b) (i)	c) (v)	d) (iv)	e) (iii)

II. Match the following

Column - A	Column - B
(a) Natural numbers are not closed under	(i) Division
(b) Rational numbers are not associative for	(ii) Subtraction
(c) Multiplicative inverse of -13 is	(iii) $\frac{1}{13}$
d) Additive inverse of $-\frac{1}{13}$ is	(iv) $-\frac{1}{13}$

a) (ii)	b) (i), (ii)	c) (iv)	d) (iii)

I. Very Short Answer Type Questions.

1. Is 1 the multiplicative identify for integers? Also for whole numbers.

[NCERT Exemplar]

Yes, 1 is the multiplicative identify for integers as well as for whole numbers.

2. Solve the following: select the rational number for the list which are also the integers.

$\frac{9}{4}, \frac{8}{4}, \frac{7}{4}, \frac{6}{4}, \frac{8}{3}, \frac{7}{3}, \frac{6}{3}, \frac{5}{2}, \frac{4}{2}, \frac{3}{1}, \frac{3}{2}, \frac{1}{1}, \frac{0}{1}, \frac{-1}{1}, \frac{-2}{1}, \frac{-3}{2}, \frac{-4}{2}, \frac{-5}{2}, \frac{-6}{2},$ **[NCERT Exemplar]**

Sol. $\frac{8}{4}, \frac{9}{3}, \frac{6}{3}, \frac{4}{2}, \frac{3}{1}, \frac{0}{1}, \frac{-1}{1}, \frac{-2}{1}, \frac{-4}{2}, \frac{-6}{2}$

3. Find the multiplicative inverse of the following.

a. -15 b. $\frac{-13}{17}$ **[NCERT Exemplar]**

a. The multiplicative inverse of $-15\ is\ -\frac{1}{15}$.

b. The multiplicative inverse of $\frac{-13}{17}\ \ is \frac{-17}{13}$.

4. Write the rational number that does not have a reciprocal. [NCERT Exemplar]

The rational number '0' does not have a reciprocal.

5. The rational numbers that are equal to their reciprocals.

The rational numbers 1 and -1) are equal to their reciprocals respectively.

6. How many integers are there between - 9 and - 10?

The is no integer between -9 and -10.

7. Tell which property allows you to compute $\frac{1}{5}\ x\ \left[\frac{5}{6}\ x\ \frac{7}{9}\right]\ as\ \left[\frac{1}{5}\ x\ \frac{5}{6}\right]\ x\ \frac{7}{9}$ [NCERT Exemplar]

Sol. $(a\ x\ b\ x\ c) = (a\ x\ b)\ x\ c$

Associative property.

8. Select those which can be written as a rational number with denominator 4 in their lowest form:

$\frac{7}{8}, \frac{64}{16}, \frac{36}{-12}, \frac{16}{17}, \frac{5}{-4}, \frac{140}{28}$ **[NCERT Exemplar]**

Sol. $\frac{64}{16} = \frac{16}{4}; \frac{36}{-12} = \frac{-12}{4}; \frac{5}{-4} = \frac{5}{-4}; \frac{140}{28} = \frac{20}{4}$

Hence, $\frac{16}{4}, \frac{-12}{4}, \frac{-5}{4}\ and \frac{20}{4}$ are rational number with denominator 4.

9. The cost of $\frac{19}{4}$ meters of wire is ` $\frac{171}{2}$. Find the cost of one metre of the wire. [NCERT Exemplar]

Sol. Cost of $\frac{19}{4}$ meter wire = ` $\frac{171}{2}$

171

Cost of 1 meter wire = $\frac{2}{\frac{19}{4}} = \frac{171\ x\ 4}{2\ x\ 19}$

= ` 18

10. Roller Coaster at an amusement park is $\frac{2}{3}m$ high. If a new roller coaster is built that is $\frac{3}{5}$ time the height of the existing coaster, what will be the height of the new roller coaster? [NCERT Exemplar]

Sol. Given,

The height of roller coaster = $\frac{2}{3}m$

The height of new roller coaster = 3/5 x height of existing roller coaster

= $\frac{3}{5}x\frac{2}{3} = \frac{2}{5}m$

Hence, the height of new roller coaster is $\frac{2}{5}m$.

II. Very Short Answer Type Questions.

1. Identify the rational number which is different from the other three: $\frac{2}{3}, \frac{-4}{5}, \frac{1}{2}, \frac{1}{3}$

Explain your reasoning. **[NCERT Exemplar]**

Sol. $-\frac{4}{5}$ is the rational number which is different from the other three, as it lies on the left side of zero while others lie on the right side of zero on the number line.

III. Very Short Answer Type Questions.

1. Find the multiplicative inverse of $\frac{-11}{13}$

2. Find a rational number between 10 and 11

3. Represent $\frac{-7}{4}$ on the number line

4. ' Rational numbers are commutative under addition but not commutative under subtraction '
   Justify the statement with an example

5. Give an example to show that subtraction is not associative for rational numbers

6. Find the additive inverse of (1) $\frac{-6}{-7}$ (ii) $\frac{17}{-3}$

7. Write the multiplicative inverse of 312

8. Write the equivalent rational number of $\frac{-13}{17}$ whose denominator is 289

9. How many rational numbers are there between $-\frac{3}{2}$ and 0 with denominator as 1?

10. If $\frac{a}{b}$ is the additive inverse of $\frac{c}{d}$, then find the value of $\frac{a}{b} + \frac{c}{d}$

11. Find the sum of additive inverse and multiplicative inverse of $\frac{7}{3}$.

12. Find the product of additive inverse and multiplicative inverse of $\frac{-11}{13}$

13. A farmer has field of area $49\frac{4}{5}$ hec. He wants to divide it equally among his one son and two daughters. Find the area of each one's share (hec. means hectare;
    1 hectare = 10000 m^2 [NCERT Exemplar]

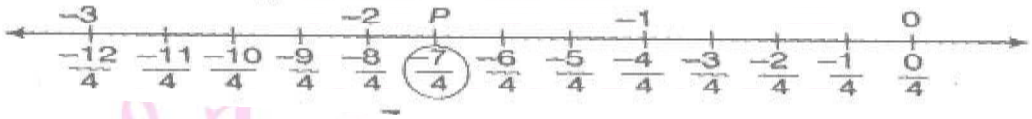
Answers

1. The multiplicative inverse of $\frac{-11}{13}$ is $\frac{-13}{11}$

2. Here, 10 and 11 are two rational numbers. Now, mean of 10 and 11 = $\frac{10+11}{2} = \frac{21}{2}$

This is a required rational number lying between 10 an 11

3. To represent $\frac{-7}{4}$ on the number line, we make 7 markings each of a distance equal to $\frac{1}{4}$ on the left of zero. The 7th point represents the rational number $\frac{-7}{4}$, as shown below on the number line



The point p is $\frac{-7}{4}$

4. Let $\frac{1}{2}$ and $\frac{1}{4}$ be two rational numbers.

Now, $\frac{1}{2}+\frac{1}{4}=\frac{1}{4}+\frac{1}{2}=\frac{3}{4}$

Which implies that rational numbers are commutative under addition.

Now, $\frac{1}{2}-\frac{1}{4}=\frac{2-1}{4}=\frac{1}{4}$

But, $\frac{1}{4}-\frac{1}{2}=\frac{1-2}{4}=-\frac{1}{4}$

Thus, $\frac{1}{2}-\frac{1}{4}\neq\frac{1}{4}-\frac{1}{2}$

So, rational numbers are not commutative under subtraction.

5. For rational numbers $\frac{5}{4},\frac{3}{4}\ and\ \frac{1}{4}$ we see that,

$\frac{5}{4}-\left[\frac{3}{4}-\frac{1}{4}\right]=\frac{5}{4}-\frac{2}{4}=\frac{3}{4}$

and $\left[\frac{5}{4}-\frac{3}{4}\right]-\frac{1}{4}=\frac{2}{4}-\frac{1}{4}=\frac{1}{4}$

Thus, $\frac{5}{4}-\left[\frac{3}{4}-\frac{1}{4}\right]\neq\left[\frac{5}{4}-\frac{3}{4}\right]-\frac{1}{4}$

So, we can say that subtraction is not associative for rational numbers.

6. (i) The negative (or additive inverse) of $\frac{-6}{-7}\left[=\frac{6}{7}\right]=\frac{-6}{7}$

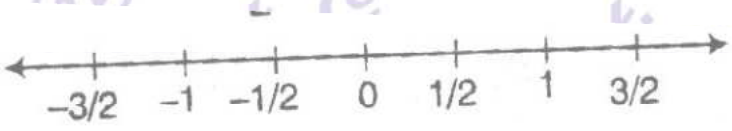
(ii) The additive inverse of $\frac{17}{-3}\ is\ \frac{17}{3}$

7. The multiplicative inverse of 312 is $\frac{1}{312}$

8. We know that, 289 = 17 x 17

∴ Equivalent rational number of $\frac{-13}{7}=\frac{-13\ x\ 17}{17\ x\ 17}=\frac{-221}{289}$

9. We know that, $\frac{-3}{2}=-1\frac{1}{2}$



So, only one such rational number exist, which is -1

10. $\frac{a}{b} + \frac{c}{d} = 0$

Since, additive inverse of $\frac{c}{d}$ $is -\frac{c}{d}$

So, $\frac{-c}{d} + \frac{c}{d} = 0$

11. Additive inverse of $\frac{7}{3}$ is $\frac{-7}{3}$ and multiplicative inverse of $\frac{7}{3}$ is $\frac{3}{7}$

So, required sum = $\frac{-7}{3} + \frac{3}{7} = \frac{-49+9}{21} = \frac{-40}{21}$

12.The additive inverse of $\frac{-11}{13}$ is $\frac{11}{13}$

The multiplicative inverse of $\frac{-11}{13}$ is $\frac{-13}{11}$

So, required product = $\frac{11}{13} \times \frac{-13}{11} = -1$

13. 49 $\frac{4}{5}$ hec = $\frac{249}{5}$ hec

Each share = $\frac{1}{3} \times \frac{249}{5}$ $hec = \frac{83}{5}$ $hec = 16\frac{3}{5}$ hec

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I. Short Answer Type Questions.

1. Simply : $\frac{16}{39} + \frac{9}{-26}$

Sol. We have $\frac{16}{39} + \frac{9}{-26} = \frac{16}{39} + \frac{-9}{26}$

Now, the LCM of 39 and 26 is 78.

∴ Rewriting $\frac{16}{39}$ and $\frac{-9}{26}$ in such a manner they have the same denominator 78.

$\frac{16}{39} = \frac{16 \times 2}{39 \times 2} = \frac{32}{78}$

$\frac{-9}{26} = \frac{-9 \times 3}{26 \times 3} = \frac{27}{78}$

$\frac{16}{39} + \frac{-9}{26} = \frac{32}{78} + \frac{(-27)}{78}$

$= \frac{32 + (-27)}{78}$

$= \frac{32-27}{78} = \frac{5}{78}$

2. Subtract $-\frac{3}{8}$ $from$ $-\frac{5}{7}$.

Sol. The additive inverse of $-\frac{3}{8}$ $is \frac{3}{8}$

$-\frac{5}{7} - \left(-\frac{3}{8}\right) = \frac{-5}{7} + \frac{3}{8}$

$= \frac{(-5) \times 8 + 3 \times 7}{56}$

$= \frac{-40 + 21}{56}$

$= \frac{-19}{56}$

3. Verity the following: $-\frac{5}{8}+\frac{3}{5}=\frac{3}{5}+\frac{-5}{8}$

Sol. Verification: L.H.S. $= -\frac{5}{8}+\frac{3}{5}$

$$= \frac{-5\ x\ 5+3\ x\ 8}{40}$$

$$= \frac{-25+24}{40} = \frac{-1}{40}$$

R.H.S $= \frac{3}{5}+\frac{-5}{8}$

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

$$= \frac{24-25}{40} = -\frac{1}{40}$$

L.H.S. = R.H.S Hence verified.

4. Find using distributivity : $\left[\frac{7}{5}\ x\ \left(\frac{13}{12}\right)\right]+\left[\frac{7}{5}\ x\ \frac{5}{12}\right]$

Sol. $\left[\frac{7}{5}\ x\ \left(\frac{3}{12}\right)\right]+\left[\frac{7}{5}\ x\ \frac{5}{12}\right] = \frac{7}{5}\left\{\left(\frac{3}{12}\right)+\frac{5}{12}\right\}$

$$= \frac{7}{5}\ x\ \left\{\frac{-3+5}{12}\right\}$$

$$= \frac{7}{5}\ x\ \frac{2}{12} = \frac{7}{5}\ x\frac{1}{6} = \frac{7}{30}$$

5. Multiply the reciprocal of $\frac{7}{8}$ by the reciprocal of $\frac{-2}{21}$.

Sol. $\therefore$ Reciprocal of $\frac{7}{8}\ is \frac{8}{7}$

Reciprocal of $\frac{-2}{21}\ is\ \frac{-21}{2}$

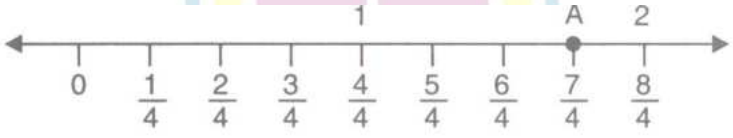
$$\therefore \left[Reciprocal\ of \frac{7}{8}\right]\ x\ \left[Reciprocal\ fo\ \left(\frac{2}{21}\right)\right]$$

$$= \frac{8}{7}\ x\ \left(\frac{-21}{2}\right)$$

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

6. Represent the number $\frac{7}{4}$ on the number line.

Sol. To represent $\frac{7}{4}$, we amke 7 marking each of a distance equal to $\frac{1}{4}$ on the right of 0. The 7th point represent the rational number $\frac{7}{4}$ as shown in the figure.



The point A is $\frac{7}{4}$.

7. If 16 shirts of equal size can be made out of 24 m of cloth, how much cloth is needed for making one shirt? [NCERT Exemplar]

Cloth needed of 16 shirt = 24 m

Cloth needed for 1 shirt $= \frac{24}{16} = \frac{3}{2}$

$$= 1.5\ m$$

8. A 117 $\frac{1}{3}$ m long rope is cut into equal pieces measuring 7$\frac{1}{2}$ m each. How many such small pieces are there? **[NCERT Exemplar]**

Sol. Given, Length of rope = $117\frac{1}{3} = \frac{352}{3}$ m

Length of each small piece = $7\frac{1}{3}m = \frac{22}{3}m$

Number of such small pieces $\frac{\frac{352}{3}}{\frac{22}{3}} = \frac{352 \times 3}{3 \times 22}$

$= 16$

9. The product of two rational number is $\frac{-14}{27}$. If one of the numbers be $\frac{7}{9}$, find the other. **[NCERT Exemplar]**

Sol. Given product of two rational number = $\frac{-14}{27}$

One number = $\frac{7}{9}$

Other number = $\frac{\frac{-14}{27}}{\frac{7}{9}} = \frac{-14 \times 9}{27 \times 7}$

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

II. Short Answer Type Questions.

1. Use the distributivity of multiplication of rational numbers over addition to simplify $\frac{2}{7} \times \left[\frac{7}{16} - \frac{21}{4}\right]$

Sol. $a \times (b - c) = a \times b - a \times c$

$\frac{2}{7} \times \left[\frac{7}{16} - \frac{21}{4}\right] = \frac{2}{7} \times \frac{7}{16} - \frac{2}{7} \times \frac{21}{4}$

$-\frac{1}{8} - \frac{3}{2} = \frac{1-12}{8} = -\frac{11}{8}$

2. The product of two rational numbers is $\frac{-14}{27}$. If one of the numbers be $\frac{7}{9}$, find the other.

Sol. Product of two rational numbers = $-\frac{14}{27}$

One number = $\frac{7}{9}$

Other number = $-\frac{14}{27} \div \frac{7}{9}$

$= -\frac{14}{27} \times \frac{8}{7} = -\frac{2}{3}$

3. Saumya purchased $15\frac{3}{4}m$ of cloth from the market and gave $7\frac{1}{3}m$ of cloth to her sister. How much cloth is left with her?

Sol. Total cloth purchased = $15\frac{3}{4}m = \frac{63}{4}m$

Cloth given to her sister = $7\frac{1}{3}m = \frac{22}{3}m$

Therefore, cloth left with Saumya = $\frac{63}{4} - \frac{22}{3} = \frac{189-88}{12}$

$= \frac{101}{12}\ m\ or\ 8\frac{5}{12}m$

4. State whether the following statements are true T) or false F).

i. If $\frac{r}{s}$ is a rational number, then s cannot be equal to zero.

ii. $\frac{5}{6}$ lies between $\frac{2}{3}\ and\ 1$.

iii. If $a \neq 0$ the multiplicative inverse of $\frac{a}{b} is \frac{b}{a}$.

iv. For every rational number $x, x + 1 = x$.

v. $If \frac{x}{y}$ is the additive inverse fo $\frac{c}{d}, then \frac{x}{y} - \frac{c}{d} = 0$

vi. The negative of 1 is 1 itself. **[NCERT Exemplar]**

i. True	ii. True	iii. True	iv. False	v. False	vi. False

I. Long Answer Type Questions

1. The product of two rational number is $\frac{-28}{75}$. If one of the number is $\frac{14}{25}$. Find the other.

Sol. ∴ Product of two numbers $= -\frac{28}{75}$

Any one of the rational number $= \frac{14}{25}$

∴ The other number $= \left[\frac{-28}{75}\right] \div \frac{14}{25}$

$= \frac{-2\ x\ 1}{3\ x\ 1} = -\frac{2}{3}$

Thus, the required rational number is $-\frac{2}{2}$.

2. The sum of two rational number is $-\frac{4}{5}$. If one of them is $\frac{-11}{20}$, find the other.

Sol. ∴ $-\frac{11}{20}$ + a rational number) $= -\frac{4}{5}$

∴ The required rational number $= -\frac{4}{5} - \left(\frac{-11}{20}\right)$

$= -\frac{4}{5} + \frac{11}{20}$

$\left[\therefore Additive\ inverse\ of\ \frac{-11}{20}\ is \frac{11}{20}\right]$

$$= \frac{-4\ x\ 4\ +\ 11}{20}$$

[$\because$ *LCM of* 5 *and* 20 *is* 20]

$$= \frac{-16\ +\ 11}{20}$$

$$= \frac{-5}{20}\ or \frac{-1}{4}$$

Thus, the other rational number $= -\frac{1}{4}$.

3. Simplify : $\frac{5}{3} + \frac{11}{2} + \frac{-9}{4} + \frac{-8}{3} + \frac{-7}{2}$

Sol. $\frac{5}{3} + \frac{-9}{4} + \frac{-8}{3} + \frac{-7}{2} = \left(\frac{5}{3} + \frac{-8}{3}\right) + \left(\frac{11}{2} + \frac{-7}{2}\right) + \left(\frac{-9}{4}\right)$

$\frac{5}{3} + \frac{11}{2} + \frac{-9}{4} + \frac{-8}{3} + \frac{-7}{2} = \frac{5+\ (-8)}{3} + \frac{11\ +(-7)}{2} + \frac{-9}{4}$

$$= -\frac{3}{3} + \frac{4}{2} + \frac{-9}{4}$$

$$= (-1\ +\ 2) + \frac{-9}{4}$$

$$= 1 + \frac{(-9)}{4}$$

$$= \frac{1\ x\ 4\ +\ -9)}{4} = \frac{4-9}{4}$$

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

4. Simplify : $\left(-\frac{3}{2}\ x\ \frac{4}{5}\right) \div \left(\frac{9}{5}\ x\ \frac{-10}{3}\right) - \left(\frac{1}{2}\ x\ \frac{3}{4}\right)$

Sol. $\left(-\frac{3}{2}\ x\ \frac{4}{5}\right) \div \left(\frac{9}{5}\ x\ \frac{-10}{3}\right) - \left(\frac{1}{2}\ x\ \frac{3}{4}\right) = \left(-\frac{3\ x\ 2}{5}\right) \div (3\ x - 2) - \left(\frac{3}{8}\right)$

$$= -\frac{6}{5} + (-6) - \frac{3}{8}$$

$$= -\frac{6}{5}\ x - \frac{1}{6} - \frac{3}{8}$$

$$= \frac{1}{5} - \frac{3}{8}$$

$$= \frac{8-15}{40} = \frac{-7}{40}$$

5. Verify $x + y = y + x, if\ x = \frac{-3}{16}\ and\ y = \frac{1}{9}$.

Sol. $x + y = -\frac{3}{16} + \frac{1}{9}$

$$= \frac{-3\ x\ 9+1\ x\ 16}{144}$$

[$\therefore$ LCM of 16 and 9 is 144]

$$= \frac{-27+16}{144} = \frac{-11}{144}$$

$y\ +\ x = \frac{1}{9} + \frac{-3}{16}$

$$= \frac{1}{9} - \frac{3}{16}$$

$$= \frac{16\ x\ 1-9\ x\ 3}{144}$$

$$= \frac{16-27}{144} = -\frac{11}{144}$$

➔ $x + y = y + x$

6. Find the three rational numbers between $\frac{1}{2} and -2$.

Sol. A rational number between $\frac{1}{2}\ and -2$

$$= \left[\frac{1}{2} + (-2)\right] \div 2$$

$$= \left[\frac{1-4}{2}\right] \div 2$$

$$= \left[-\frac{3}{2}\right] x \frac{1}{2} = -\frac{3}{4}$$

A rational number between $\frac{1}{2}\ and \left(-\frac{3}{4}\right)$

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

$$= \left[\frac{2-3}{4}\right] x \frac{1}{2}$$

$$= -\frac{1}{4} x \frac{1}{2} = = -\frac{1}{8}$$

A rational number between $\left(-\frac{3}{4}\right) and (-2)$

$$= \left[\left(-\frac{3}{4}\right) + (-2)\right] \div 2$$

$$= \left[\frac{(-3) + -8)}{4}\right] x \frac{1}{2}$$

$$= \frac{-11}{4} x \frac{1}{2} = \frac{-11}{8}$$

Thus, the three rational numbers are $\left(-\frac{3}{4}\right), \left(\frac{1}{8}\right) and \left(-\frac{11}{8}\right)$.

II. Long Answer Type Questions

1. Find three rational numbers between - 2 and 7.

Sol. A rational number lying between $-2\ and\ 7 = 9 - 2 + 7) \div 2 = 5 \div 2 = \frac{5}{2}$

$\therefore -2 < \frac{5}{2} < 7$

Now, a rational number lying between $-2\ and \frac{5}{2} = \left(-2 + \frac{5}{2}\right) \div 2$

$$= \left(\frac{-4+5}{2}\right) \div 2 = \frac{1}{2} x \frac{1}{2} = \frac{1}{4}$$

$\therefore$ A rational number lying between $\frac{5}{2}\ and\ 7 = \left(\frac{5}{2} + 7\right) \div 2$

$$= \left(\frac{5 + 14}{2}\right) \div 2$$

$$= \frac{19}{2} x \frac{1}{2} = \frac{19}{4}$$

$\therefore \quad -2 < \frac{1}{4} < \frac{5}{2} < \frac{19}{4} < 7$

Hence, $\frac{1}{4}, \frac{5}{2}\ and \frac{19}{4}$ are three rational numbers between $-2\ and\ 7$.

2. Let a, b, c be three rational numbers where $a = \frac{2}{3}$, $b = \frac{4}{5}$ and $c = -\frac{5}{6}$.

Verify:

i. $a + (b + c) = a + b) + c$ (Associative property of addition).

ii. $a \times (b \times c) = (a + b) + c$ Associative property of multiplication).

Sol. i. $L.H.S = a + (b + c)$

$= \frac{2}{3} + \left[\frac{4}{5} + \left(\frac{-5}{6}\right)\right]$

$= \frac{2}{3} + \left[\frac{24 - 25}{30}\right]$

$= \frac{2}{3} + \left(\frac{-1}{30}\right) = \frac{20-1}{30} = \frac{19}{30}$

R.H.S. of i) $= (a + b) + c$

$= \left(\frac{2}{3} + \frac{4}{5}\right) + \left(\frac{-5}{6}\right)$

$= \left(\frac{10+12}{15}\right) + \left(\frac{-5}{6}\right)$

$= \frac{22}{15} - \frac{5}{6} = \frac{44 - 25}{30} = \frac{19}{30}$

So, $\frac{2}{3} + \left[\frac{4}{5} + \left(\frac{-5}{6}\right)\right] = \left(\frac{2}{3} + \frac{4}{5}\right) + \left(\frac{-5}{6}\right)$

Hence Verified

ii. L.H.S $= a \times (b \times c)$

$= \frac{2}{3} \times \left[\frac{4}{5} \times \left(\frac{-5}{6}\right)\right]$

$= \frac{2}{3} \times \left(\frac{-20}{30}\right) = \frac{2}{3} \times \left(\frac{-2}{3}\right)$

$= \frac{2 \times -2)}{3 \times 3} = \frac{-4}{9}$

R.H.S of ii) $= (a \times b) \times c$

$= \left(\frac{2}{3} \times \frac{4}{5}\right) \times \left(\frac{-5}{6}\right) = \frac{2 \times 4}{3 \times 5} \times \left(\frac{-5}{6}\right) = \frac{8}{15} \times \left(\frac{-5}{6}\right)$

$= \frac{8 \times (-5)}{15 \times 6} = \frac{-40}{90} = \frac{-4}{9}$

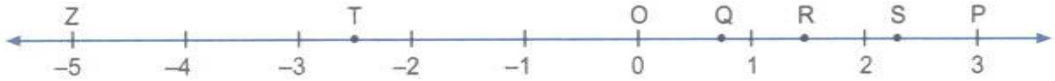
So, $\frac{2}{3} \times \left[\frac{4}{5} \times \left(\frac{-5}{6}\right)\right] = \left[\frac{2}{3} \times \frac{4}{5}\right] \times \left(\frac{-5}{6}\right)$

Hence Verified

3. Let O, P and Z represent the numbers $0, 3$ and -5 respectively on the number line. Points Q, R and S are between O and P such that $OQ = QR = RS = SP$. What are the rational numbers represented by the points Q, R and S. Next choose a point T between Z and O so that $ZT = TO$. Which rational number does T represent?

[NCERT Exemplar]

Sol.



As $OQ = OR = RS = SP$

and $OQ + QR + RS + SP = OP$

Therefore Q, R and S divide OP into four equal parts.

So, R is the mid-point of OP, i.e. $R = \frac{0+3}{2} = \frac{3}{2}$

Q is the mid-point of OR, i.e. $Q = \frac{1}{2}\left(0 + \frac{3}{2}\right) = \frac{3}{4}$

and S is the mid-point of RP, i.e. $S = \frac{1}{2}\left(\frac{3}{2} + 3\right) = \frac{9}{4}$

Therefore, $Q = \frac{3}{4}$, $R = \frac{3}{2}$ and $S = \frac{9}{4}$

Also, $ZT = TO$

So, T is the mid-point of OZ, i.e. $T = \frac{0+(-5)}{2} = \frac{-5}{2}$

4. The table given below shows the distances, in kilometers, between four villages of a state. To find the distance between two villages, locate the locate the square where the row for one village and column for the other village intersect.

	Sonapur	Ramgarh	Himgaon	Rawalpur
Sonapur		$40\frac{2}{3}$	$100\frac{5}{6}$	$16\frac{1}{2}$
Ramgarh	$40\frac{2}{3}$		$210\frac{3}{8}$	$16\frac{2}{3}$
Himgaon	$100\frac{5}{6}$	$210\frac{3}{8}$		$98\frac{3}{4}$
Rawalpur	$16\frac{1}{2}$	$30\frac{2}{3}$	$98\frac{3}{4}$	

i. Compare the distance between Himgaon and Rawalpur to Sonapur and Ramgarh.

ii. If you drove from Himgaon of Sonapur and then from Sonapur to Rawalpur, how far would you drive? **[NCERT Exemplar]**

Sol. i. Distance between Himgaon and Rawalpur $= 98\frac{3}{4} = \frac{395}{4}\ km$

Distance between Sonapur and Ramgarh $= 40\frac{2}{3} = \frac{122}{3}\ km$

Difference $= \frac{395}{4} - \frac{122}{3} = \frac{395\ x\ 3 - 122\ x\ 4}{12}$

$= \frac{1185 - 488}{12} = \frac{697}{12} = 58\frac{1}{2}\ km$

Hence, distance between Himgaon and Rawalpur is $58\frac{1}{12} km$ more than the distance between Sonapur and Ramgarh.

b. Distance between Himagaon to Sonapur $= 100\frac{5}{6} = \frac{605}{6}\ km$

Distance from Sonapur to Rawalpur $= 16\frac{1}{2} = \frac{33}{2}\ km$

Total distance covered $= \frac{605}{6} + \frac{33}{2} = \frac{605+99}{6} = \frac{704}{6}$

$= 117\frac{2}{6} = 117\frac{1}{3}\ km$

5. The table shows the portion of some common materials that are recycled.

Material	Recycled
Paper	$\frac{5}{11}$
Aluminium cans	$\frac{5}{8}$
Glass	$\frac{2}{5}$
Scrap	$\frac{3}{4}$

i. Is the rational number expressing the amount of paper recycled more than $\frac{1}{2} or\ less\ than$ ½?

ii. Which items have a recycled amount less than $\frac{1}{2}$

iii. Is the quantify of aluminium cans recycled more or less) than half of the quantity of aluminium cans? **[NCERT Exemplar]**

i. LCM of 11 and 2 = 22

Paper recycled $= \frac{5}{11} = \frac{5 \times 2}{11 \times 2} = \frac{10}{22}$

We can write $\frac{1}{2} = \frac{1 \times 11}{2 \times 11} = \frac{11}{22}$

Clearly, $\frac{10}{22} < \frac{11}{22}$

So, $\frac{5}{11} < \frac{1}{2}$

Hence, the amount of paper recycled is less than $\frac{1}{2}$.

ii. Aluminium cans $= \frac{5}{8}$

We can write $\frac{1}{2} = \frac{1 \times 4}{2 \times 4} = \frac{4}{8}$

Clearly, $\frac{5}{8} > \frac{4}{8} \Rightarrow \frac{5}{8} > \frac{1}{2}$

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

We can write $\frac{2}{5} = \frac{2 \times 2}{5 \times 2} = \frac{4}{10}$

And, $\frac{1}{2}$ can be written as $\frac{1 \times 5}{2 \times 5} = \frac{5}{10}$

Since $\frac{4}{10} < \frac{5}{10}$

So, $\frac{2}{5} < \frac{1}{2}$

Scrap recycled = $\frac{3}{4}$

$\frac{1}{2}$ can be written as $\frac{1 \times 2}{2 \times 2} = \frac{2}{4}$

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

So, $\frac{3}{4} > \frac{1}{2}$

Thus, items whose recycled amount are less than $\frac{1}{2}$ are paper and glass.

iii. Quantity of aluminium cans recycled = $\frac{5}{8}$

Half of the quantity of aluminium cans = $\frac{1}{2}$ (as quantity of aluminium cans = 1)

We have $\frac{5}{8}, \frac{1}{2}$

$= \frac{5}{8}, \frac{1 \times 4}{2 \times 4}$ $LCM\ of\ 8\ and\ 2 = 8$

$= \frac{5}{8}, \frac{4}{8}$

Since $\frac{5}{8} > \frac{4}{8}$ $(as > 4)$

So, $\frac{5}{8} > \frac{1}{2}$

I. High Order Thinking Skills (Hots) Questions

1. Identify the rational number which is difference from the other three : $\frac{2}{3}, \frac{-4}{5}, \frac{1}{2}, \frac{1}{3}$.

Explain your reasoning. **[NCERT Exemplar]**

Sol. $\frac{-4}{5}$ is the rational number which is different from the other three, as it lies on the left side of zero while others lie on the right side of zero on the number line.

2. The difference of two numbers is $\frac{5}{9}$. If one of the numbers is $\frac{1}{3}$, find the other number.

Sol. Let the other number = x According to question,

$$x - \frac{1}{3} = \frac{5}{9}$$

or $$x = \frac{5}{9} + \frac{1}{3}$$

or $$x = \frac{5+3}{9} = \frac{8}{9}$$

Therefore, other number $= \frac{8}{9}$

II. High Order Thinking Skills (Hots) Questions

1. Find the product of additive inverse and multiplicative inverse of $-\frac{1}{3}$.

[NCERT Exemplar]

Additive inverse of $-\frac{1}{3} = \frac{1}{3}$

Multiplicative inverse of $-\frac{1}{3} = -3$

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

2. The diagram shows the wingspans of different species of birds. Use the diagram to answer the questions given below.

Sol. i. Wingspan of Albatross $= 3\frac{3}{5}m = \frac{18}{5}m$

Wingspan of Sea gull $= 1\frac{7}{10}m = \frac{17}{10}m$

Difference $= \frac{18}{5} - \frac{17}{10} = \frac{36-17}{10} = \frac{19}{10}m = 1\frac{9}{10}m$

ii. Wingspan of Golden eagle $= 2\frac{1}{2}m = \frac{5}{2}m$

Wingspan of Blue jay $= \frac{41}{100}$

Difference $= \frac{5}{2} - \frac{41}{100} = \frac{250-41}{100} = \frac{209}{100}m = 2\frac{9}{100}m$

3. One fruit salad recipe requires $\frac{1}{2}$ cup of sugar. Another recipe for the same fruit salad requires 2 tablespoons of sugar. If 1 tablespoon is equivalent to $\frac{1}{16}$ cup, how much more sugar does the first recipe require? **[NCERT Exemplar]**

Sol. $\therefore$ 1 tables spoon $= \frac{1}{16}\ cup$

$\therefore$ 2 tablespoon $= \frac{1}{16} \times 2\ cup = \frac{1}{8}\ cup$

The quantity of more sugar the first recipe requires $= \frac{1}{2} - \frac{1}{8}$

$= \frac{4-1}{8} = \frac{3}{8}\ cup$

4. Identify the rational number that does not belong with the other three. Explain your reasoning. **[NCERT Exemplar]**

$\frac{-5}{11}, \frac{-1}{2}, \frac{-4}{9}, \frac{-7}{3}$

We have, $\frac{-5}{11}, \frac{-1}{2}, \frac{-4}{9}, \frac{-7}{3}$

The rational number that does not belong with the other three = $\frac{-7}{3}$

The is because $\frac{7}{3}$ is smaller than -1 whereas rest of the numbers are greater than-1.

5. What is the value of $\frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div 5 \div 5 \div 5$?

Sol. We have, $\frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div 5 \div 5 \div 5$

$= \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div 5 \div 1$

$= \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div 5$

$= \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div \frac{1}{25}$

$= \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \times 25$

$= \frac{1}{5} \div \frac{1}{5} \div \frac{1}{5} \div 5$

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

$= \frac{1}{5} \div \frac{1}{5} \div \frac{1}{25}$

$= \frac{1}{5} \div \frac{1}{5} \times 25$

$= \frac{1}{5} \div 5 \div \frac{1}{5 \times 5}$

$= \frac{1}{25}$

I. Value Based Questions.

1. a. Divide the sum of $\frac{65}{12}$ and $\frac{8}{3}$ by their difference.

b. Recall the associativity of the operations for whole numbers through this table.

Operation	Numbers	Remarks
Addition	.....	Addition is associative

Sol. a. The sum of $\frac{65}{12}$ and $\frac{8}{3} = \frac{65}{12} + \frac{8}{3}$

$= \frac{65 + 32}{12} = \frac{97}{12}$

and the difference of $\frac{65}{12}$ and $\frac{8}{3} = \frac{65}{12} - \frac{8}{3}$

$= \frac{65-32}{12} = \frac{33}{12}$

According to questions,

$$\frac{97}{12} \div \frac{33}{12} = \frac{97}{12} \times \frac{12}{33} = \frac{97}{33}$$

b.

Operation	Numbers	Remarks
Addition	$0 + (2 + 6) = (0 + 2) + 6 = 8$; $3 + (0 + 5) = (3 + 0) + 5 = 8$. For any three whole numbers a, b and c $a + (b + c) = (a + b) + c$	Addition is associative

2. a. Find the cost of $3\frac{2}{5}$ metres of cloth at $36\frac{3}{4}$ per meter.

b. Recall the associativity of the operations for whole numbers through this table.

Operation	Numbers	Remarks
Subtraction	.....	Subtraction is not associative

Sol. a. Since the cost of 1 metre cloth = ` $36\frac{3}{4}$

Then the cost of $3\frac{2}{5}$ meter cloth 1 = ` $36\frac{3}{4} \times 3\frac{2}{5}$

$$= \frac{147}{4} \times \frac{17}{5} = \frac{2499}{20} = ` 124\frac{19}{20}$$

b.

Operation	Numbers	Remarks
Subtraction	$(0 - 2) - 6 = -2 - 6 = -8$ $0 - (2 - 6) = 0 - (-4) = 0 + 4 = 4$ $So, (0 - 2) - 6 \neq 0 - (2 - 6)$	Subtraction is not associative

3. a. Find the area of rectangular park which is $36\frac{3}{5}m$ long and $16\frac{2}{3}m$ broad.

b. Write the name of property for any rational numbers $\frac{a}{b}$ and $\frac{c}{d}$, we have

$$\left(\frac{a}{b} \times \frac{c}{d}\right) = \left(\frac{c}{d} \times \frac{a}{b}\right)$$

Sol. a. Since length of rectangular park = $36\frac{3}{5}m = \frac{183}{5}m$

and breath of rectangular park = $16\frac{2}{3}m = \frac{50}{3}m$

Then area of park = $l \; x \; b$

$= \frac{183}{5} \; m \;\; x \;\; \frac{50}{3} \; m$

$= \;\; 61 \;\; x \;\; 10 \; m^2$

$= 610 \; m^2$

b. $\left(\frac{a}{b} \; x \; \frac{c}{d}\right) \;\; = \;\; \left(\frac{c}{d} \;\; x \;\; \frac{a}{b}\right)$, it is commutative law of property.