Chapter - 8
Rational Numbers

Exercise

In each of the following questions 1 to 12, there are four options, out of which, only one is correct. Write the correct one.

1. A rational number is defined as a number that can be expressed in the form p/q , where p and q are integers and
(a) q = 0 (b) q = 1 (c) q ≠ 1 (d) q ≠ 0

Solution:-

(d) $q \neq 0$

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.

2. Which of the following rational numbers is positive?
(a) –8 / 7 (b) 19 /–13 (c) –3 /–4 (d) –21/13

Solution:-

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

When the numerator and denominator both are positive integers or both are negative integers, it is a positive rational number.

3. Which of the following rational numbers is negative?
(a) –(–3/– 7) (b) –5/–8 (c) 9/8 (d) 3/–7

Solution:-

(d) $\frac{3}{-7}$

When either the numerator or the denominator is a negative integer, it is a negative rational number.

4. 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

Solution:-

(b) 1

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.

5. Which of the following rational numbers is equal to its reciprocal?
(a) 1 (b) 2 (c) 1/2 (d) 0

Solution:-

(a) 1

As,

Reciprocal of $\frac{1}{1} = 1$

6. The reciprocal of 1/2 is
(a) 3 (b) 2 (c) – 1 (d) 0

Solution:-

(b) 2

The reciprocal of $\frac{1}{2} = \frac{2}{1}$

7. The standard form of –48/60 is
(a) 48/60 (b) –60/48 (c) -4/5 (d) -4/-5

Solution:-

(c) $\frac{-4}{5}$

The standard form = $\frac{-48}{60}$

Dividing both numerator and denominator by 12,

$\frac{-48}{60} = \frac{-4}{5}$

8. Which of the following is equivalent to 4/5?
(a) 5/4 (b) 16/25 (c) 16/20 (d) 15/25

Solution: –

(c) $\frac{16}{20}$

$\frac{4}{5} = \frac{4\times4}{5\times4}$

$= \frac{16}{20}$

9. How many rational numbers are there between two rational numbers?
(a) 1 (b) 0 (c) unlimited (d) 100

Solution:-

(c) Unlimited

10. In the standard form of a rational number, the denominator is always a
(a) 0 (b) negative integer (c) positive integer (d) 1

Solution:-

(c) Positive integer
A rational number is said to be in the standard form, if its denominator is a positive integer.

11. 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

Solution:-

(b) HCF

12. Which is greater number in the following:
(a) –1/2 (b) 0 (c) 1/2 (d) – 2

Solution:-

(c) $\frac{1}{2}$

In Questions 13 to 46, fill in the blanks to make the statements true.

13. – (3/8) is a _____ rational number.

Solution:-

$\frac{-3}{8}$ is a negative rational number.

14. 1 is a _____ rational number.

Solution:-

1 is a positive rational number.

15. The standard form of –8/–36 is _____.

Solution:-

The standard form of $\frac{-8}{-36}$ is $\frac{2}{9}$

As,

$\frac{-8}{-36} = \frac{8}{36}$

Now,
Dividing both numerator and denominator by 4.
$\frac{8}{36} = \frac{2}{9}$

16. The standard form of 18/–24 is _____.

Solution:-

The standard form of $\frac{18}{-24}$ is $\frac{-3}{4}$.

17. On a number line, –1/2 is to the _____ of zero (0).

Solution:-

On a number line, $\frac{-1}{2}$ is to the left of zero (0).

On a number line, rational number comes to the left of the zero (0) are the negative rational numbers and rational numbers are coming to the right of the zero (0) are the positive rational numbers.

18. On a number line, 4/3 is to the _____ of zero (0).

Solution:-

On a number line, $\frac{4}{3}$ is to the right of zero (0).

On a number line, rational number comes to the left of the zero (0) are the negative rational numbers and rational numbers are coming to the right of the zero (0) are the positive rational numbers.

19. – (1/2) is _____ than 1/5.

Solution:-

$\frac{-1}{2}$ is smaller than $\frac{1}{5}$.

20. – (3/5) is _____ than 0.

Solution:-

$\frac{-3}{5}$ is smaller than 0.

21. –16/24 and 20/–16 represent _____ rational numbers.

Solution:-

$\frac{-16}{24}$ and $\frac{20}{-16}$ represent different rational numbers.

22. –27/45 and –3/5 represent _____ rational numbers.

Solution:-

$\frac{-27}{45}$ and $\frac{-3}{5}$ represent same rational numbers.

23. Additive inverse of 2/3 is _____.

Solution:-

Additive inverse of $\frac{2}{3}$ is $\frac{-2}{3}$.

24. –3/5 + 2/5 = _____.

Solution:-

$\frac{-3}{5} + \frac{2}{5} = \frac{-1}{5}$.

As,

$$\frac{-3}{5} + \frac{2}{5} = \frac{-3+2}{5}$$
$$= \frac{-1}{5}$$

25. –5/6 + –1/6 = _____.

Solution:-

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

As,

$$\frac{-5}{6} - \frac{1}{6} = \frac{-5-1}{6}$$
$$= \frac{-6}{6}$$
$$= -1$$

26. 3/4 x (–2/3) = _____.

Solution:-

$\frac{3}{4} \times \frac{-2}{3} = \frac{-1}{2}$

27. –5/3 x (–3/5) =_____.

Solution:-

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

28. –6/7 =? /42

Solution:-

$$\frac{-6}{7} = \frac{-36}{42}$$

As,

$$\frac{-6}{7} = \frac{x}{42}$$

$$x = \frac{-6 \times 42}{7}$$

$$= -36$$

29. 1/2 = 6/?

Solution:-

$$\frac{1}{2} = \frac{6}{12}$$

30. –2/9 – 7/9 = _____.

Solution:-

$$\frac{-2}{9} + \left(\frac{-7}{9}\right) = \frac{-2-7}{9}$$

$$= \frac{-9}{9}$$

$$= -1$$

In questions 31 to 35, fill in the boxes with the correct symbol >,< or =.

31. 7/-8 □ 8/9

Solution:-

$$\frac{7}{-8} < \frac{8}{9}$$

Negative rational number is less than positive rational number.

32. 3/7 □ –5/6

Solution:-

$\frac{3}{7} > \frac{-5}{6}$

Negative rational number is less than positive rational number.

33. 5/6 □ 8/4

Solution:-

$\frac{5}{6} < \frac{8}{4}$

34. –9/7 □ 4/-7

Solution:-

$\frac{-9}{7} < \frac{4}{-7}$

35. 8/8 □ 2/2

Solution:-

$\frac{8}{8} = \frac{2}{2}$

36. The reciprocal of _____ does not exist.

Solution:-

The reciprocal of 0 does not exist.

37. The reciprocal of 1 is _____.

Solution:-

The reciprocal of 1 is 1.

38. –3/7 ÷ (-7/3) = _____.

Solution:-

$$\frac{-3}{7} \div \frac{-7}{3} = \frac{9}{49}$$

39. 0 ÷ (-5/6) = _____.

Solution:-

$0 \div \frac{-5}{6} = 0.$
As, division of zero by any number is zero.

40. 0 x (–5/6) = _____.

Solution:-

$0 \times \frac{-5}{6} = 0.$
As, multiplication of zero by any number is zero.

41. _____ × (–2/5) = 1.

Solution:-

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

Let us assume the missing rational number be y.
So,
$y \times \frac{-2}{5} = 1$
$y = \frac{-5}{2}$

42. The standard form of rational number –1 is _____.

Solution:-

The standard form of rational number –1 is -1.

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.

43. If m is a common divisor of a and b, then a/b = a ÷ m/__

Solution:-

If m is a common divisor of a and b, then

$$\frac{a}{b} = \frac{a \div m}{b \div m}$$

44. If p and q are positive integers, then p/q is a _____ rational number and p/-q is a _____ rational number.

Solution:-

If p and q are positive integers, then p/q is a positive rational number and – p/q is a negative rational number.

As,
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.

45. Two rational numbers are said to be equivalent or equal, if they have the same _____ form.

Solution:-

Two rational numbers are said to be equivalent or equal, if they have the same simplest form.

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.

46. If p/q is a rational number, then q cannot be _____.

Solution:-

If p/q is a rational number, then q cannot be zero.

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

State whether the statements given in question 47 to 65 are True or False.

47. Every natural number is a rational number but every rational number need not be a natural number.

Solution:-

True.

48. Zero is a rational number.

Solution:-

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

49. Every integer is a rational number but every rational number need not be an integer.

Solution:-

True.
$\frac{6}{3}$ is an integer. As if we simplify $\frac{6}{3}$ to its lowest term we get 2, which is an integer.

50. Every negative integer is not a negative rational number.

Solution:-

False.

51. If p/q is a rational number and m is a non-zero integer, then p/q = p x m/q x m

Solution:-

True.
A fraction is not changed whether the both numerator and denominator are multiplied by the same number or divided by the same number.

52. If p/q is a rational number and m is a non-zero common divisor of p and q, then p/q = p ÷ m/q ÷ m.

Solution:-

True.

A fraction is not changed whether the both numerator and denominator are multiplied by the same number or divided by the same number.

53. In a rational number, denominator always has to be a non-zero integer.

Solution:-

True.

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

54. If p/q is a rational number and m is a non-zero integer, then p x m/q x m is a rational number not equivalent to p/q.

Solution:-

False.

We know that, a fraction is not changed whether the both numerator and denominator are multiplied by the same number or divided by the same number.

55. Sum of two rational numbers is always a rational number.

Solution:-

True.

Let us consider the two rational number $\frac{1}{2}$ and $\frac{3}{4}$

So, sum of two rational number,

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

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

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

Therefore, it is a rational number.

56. All decimal numbers are also rational numbers.

Solution:

True

57. The quotient of two rational is always a rational number.

Solution:

False

58. Every fraction is a rational number.

Solution:

True

59. Two rational with different numerators can never be equal.

Solution:

False

60. 8 can be written as a rational number with any integer as denominator.

Solution:

False

8 can be written as a rational number with having denominator 1, but not with any integers as the denominator.

61. 4/6 is equivalent to 2/3 .

Solution:

True

62. The rational number –3/4 lies to the right of zero on the number line.

Solution:

False

Because any number that is a negative always lies on the left side of the zero on the number line.

63. The rational numbers –12/–5 and –7/17 are on the opposite sides of zero on the number line.

Solution:

True

In given numbers, one is a positive and another is a negative number.
Hence, they lie on the opposite side of zero on the number line.

64. Every rational number is a whole number.

Solution:

False
We have, whole numbers = 0, 1, 2 3...

But,
$\frac{-1}{2}$ Rational number, not a whole number.

65. Zero is the smallest rational number.

Solution:

False
Negative rational numbers are smaller than zero.

66. Match the following:

Column I	**Column II**
(i) a/b ÷ a/b	**(a) –a/b**
(ii) a/b ÷ c/d	**(b) -1**
(iii) a/b ÷ (-1)	**(c) 1**
(iv) a/b ÷ -a/b	**(d) bc/ad**
(v) b/a ÷ (d/c)	**(e) ad/bc**

Solution:

(i) → (c)

(ii) $\rightarrow$ (e)

(iii) $\rightarrow$ (a)

(iv) $\rightarrow$ (b)

(v) $\rightarrow$ (d)

67. Write each of the following rational numbers with positive denominators: 5/–8 , 15/–28 , –17/–13.

Solution:

Rational numbers with positive denominators are,

$$\frac{5}{-8} = \frac{5 \times -1}{-8 \times -1}$$
$$= \frac{-5}{8}$$
$$\frac{15}{-28} = \frac{15 \times -1}{-28 \times -1}$$
$$= \frac{-15}{28}$$
$$\frac{-17}{-13} = \frac{-17 \times -1}{-13 \times -1}$$
$$= \frac{17}{13}$$

68. Express 3/4 as a rational number with denominator:
(i) 36 (ii) – 80

Solution:

i. To make the denominator 36,

$$\frac{3}{4} = \frac{3 \times 9}{4 \times 9}$$
$$= \frac{27}{36}$$

ii. To make the denominator -80,

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

69. Reduce each of the following rational numbers in its lowest form:
(i) – 60/72 (ii) 91/– 364

Solution:

i. It can be written as

$$\frac{-60}{72}=\frac{-60\times\frac{1}{12}}{72\times\frac{1}{12}}$$
$$=\frac{-5}{6}$$

ii. It can be written as,

$$\frac{91}{-364}=\frac{91\times\frac{1}{91}}{-364\times\frac{1}{91}}$$
$$=\frac{-1}{4}$$

70. Express each of the following rational numbers in its standard form:
(i) –12/– 30 (ii) 14/– 49 (iii) –15/35 (iv) 299/–161

Solution:

i. Standard form of rational number,

$$\frac{-12}{-30}=\frac{-12\div6}{-30\div6}$$
$$=\frac{-2}{-5}$$
$$=\frac{2}{5}$$

ii. Standard form of rational number

$$\frac{14}{-49} = \frac{14 \div 7}{-49 \div 7}$$
$$= \frac{2}{-7}$$
$$= \frac{-2}{7}$$

iii. Standard form of rational number,

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

iv. Standard form of rational number,

$$\frac{299}{-161} = \frac{299 \div 23}{-161 \div 23}$$
$$= \frac{13}{-7}$$
$$= \frac{-13}{7}$$

71. Are the rational numbers –8/28 and 32/–112 equivalent? Give reason.

Solution:

Standard form of given rational numbers,

$$\frac{-8}{28} = \frac{-8 \div 4}{28 \div 4}$$
$$= \frac{-2}{7}$$
$$\frac{32}{-112} = \frac{32 \div 16}{-112 \div 16}$$
$$= \frac{-2}{7}$$

Therefore, the standard form of given numbers are equal.

72. Arrange the rational numbers –7/10, 5/-8, 2/-3, -1/4, -3/5 in ascending order.

Solution:

For rearranging the number in ascending order first we have to make denominator same of all given rational numbers.

So,

LCM of 10, -8, -3, 4, and 5 is 120.
Now,

$$\frac{-7}{10}=\frac{-7\times12}{10\times12}$$
$$=\frac{-84}{120}$$
$$\frac{5}{-8}=\frac{5\times15}{-8\times15}$$
$$=\frac{-75}{120}$$
$$\frac{2}{-3}=\frac{2\times40}{-3\times40}$$
$$=\frac{-80}{120}$$
$$\frac{-1}{4}=\frac{-1\times30}{4\times30}$$
$$=\frac{-30}{120}$$
$$\frac{-3}{5}=\frac{-3\times24}{5\times24}$$
$$=\frac{-72}{120}$$

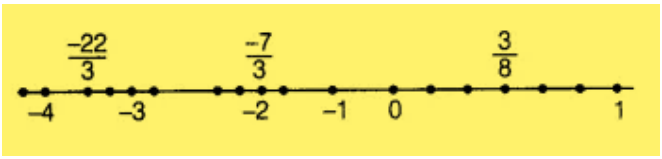
Now, we arrange the number according to the value of the numerator,

$$\frac{-84}{120}<\frac{-80}{120}<\frac{-75}{120}<\frac{-72}{120}<\frac{-30}{120}$$

73. Represent the following rational numbers on a number line: 3/8,–7/3, 22/-6.

Solution:

The given rational numbers are represented on a number line is given below.



74. If –5/7 = x/28, find the value of x.

Solution:

Given,

$$\frac{-5}{7} = \frac{x}{28}$$

$$x = \frac{-5 \times 28}{7}$$

$$= -5 \times 4$$

$$= -20$$

Therefore, the value of x is -20..

75. Give three rational numbers equivalent to:
(i) –3/4 (ii) 7/11

Solution:

i. Equivalent rational numbers are,

$$\frac{-3}{4} = \frac{-3 \times 2}{4 \times 2} = \frac{-6}{8}$$

$$\frac{-3}{4} = \frac{-3 \times 3}{4 \times 3} = \frac{-9}{12}$$

$$\frac{-3}{4} = \frac{-3 \times 4}{4 \times 4} = \frac{-12}{16}$$

ii. Equivalent rational numbers are,

$$\frac{7}{11} = \frac{7 \times 2}{11 \times 2} = \frac{14}{22}$$

$$\frac{7}{11} = \frac{7 \times 3}{11 \times 3} = \frac{21}{33}$$

$$\frac{7}{11} = \frac{7 \times 4}{11 \times 4} = \frac{28}{44}$$

76. Write the next three rational numbers to complete the pattern:

(i) 4/−5 , 8/–10 , 12/–15 , 16/–20 , _____, _____,_____.

(ii) –8/7, –16/14, –24/21, –32/28, _____, _____, _____.

Solution:

i. Next three equivalent rational numbers are:

$$\frac{4}{-5}=\frac{4\times5}{-5\times5}$$
$$=\frac{20}{-25}$$
$$\frac{4}{-5}=\frac{4\times6}{-5\times6}$$
$$=\frac{24}{-30}$$
$$\frac{4}{-5}=\frac{4\times7}{-5\times7}$$
$$=\frac{28}{-35}$$

ii. Next three equivalent rational numbers are,

$$\frac{-8}{7}=\frac{-8\times5}{7\times5}$$
$$=\frac{-40}{35}$$
$$\frac{-8}{7}=\frac{-8\times6}{7\times6}$$
$$=\frac{-48}{42}$$
$$\frac{-8}{7}=\frac{-8\times7}{7\times7}$$
$$=\frac{-56}{49}$$

77. List four rational numbers between 5/7 and 7/8.

Solution:

At first we make the denominator same,

$$\frac{5}{7}=\frac{5\times8}{7\times8}$$
$$=\frac{40}{56}$$
$$\frac{7}{8}=\frac{7\times7}{8\times7}$$
$$=\frac{49}{56}$$

So,

Four rational numbers are,

$\frac{42}{56}, \frac{44}{56}, \frac{46}{56}, \frac{48}{56}$

78. Find the sum of
(i) 8/13 and 3/11 (ii) 7/3 and –4/3

Solution:

$(i) \frac{8}{13} + \frac{3}{11}$

$$\frac{8}{13} + \frac{3}{11} = \frac{8 \times 11}{13 \times 11} + \frac{3 \times 13}{11 \times 13}$$
$$= \frac{88}{143} + \frac{39}{143}$$
$$= \frac{127}{143}$$

$(ii) \frac{7}{3} + \frac{-4}{3}$

$$\frac{7}{3} + \frac{-4}{3} = \frac{7}{3} - \frac{4}{3}$$
$$= \frac{7-4}{3}$$
$$= \frac{3}{3}$$
$$= 1$$

79. Solve:

$(i) \frac{29}{4} - \frac{30}{7}$

$(ii) \frac{5}{13} - \left(\frac{-8}{26}\right)$

Solution:

Taking (i) equation, we get,

$(i)\frac{29}{4}-\frac{30}{7}$

$$\frac{29}{4}-\frac{30}{7}=\frac{203-120}{28}$$
$$=\frac{83}{28}$$

$(ii)\frac{5}{13}-\left(\frac{-8}{26}\right)$

$$\frac{5}{13}-\left(\frac{-8}{26}\right)=\frac{10+8}{26}$$
$$=\frac{18}{26}$$
$$=\frac{9}{13}$$

80. Find the product of:
(i) –4/5 and –5/12 (ii) –22/11 and –21/11

Solution:

$(i)\frac{-4}{5}and\frac{-5}{12}$

$$\frac{-4}{5}\times\frac{-5}{12}=\frac{5\times4}{5\times12}$$
$$=\frac{20}{60}$$
$$=\frac{1}{3}$$

$(ii)\frac{-22}{11}and\frac{-21}{11}$

$$\frac{-22}{11}\times\frac{-21}{11}=\frac{462}{121}$$
$$=\frac{42}{11}$$

81. Simplify:

$(i)\frac{13}{11}\times\frac{-14}{5}+\frac{13}{11}\times\frac{-7}{5}+\frac{-13}{11}\times\frac{34}{5}$

$(ii)\frac{6}{5}\times\frac{3}{7}-\frac{1}{5}\times\frac{3}{7}$

Solution:

$(i)\frac{13}{11}\times\frac{-14}{5}+\frac{13}{11}\times\frac{-7}{5}+\frac{-13}{11}\times\frac{34}{5}$

$$\frac{13}{11}\times\frac{-14}{5}+\frac{13}{11}\times\frac{-7}{5}+\frac{-13}{11}\times\frac{34}{5}=\frac{-182}{55}+\frac{-91}{55}+\frac{-442}{55}$$

$$=\frac{-182-91-442}{55}$$

$$=\frac{-715}{55}$$

$$=-13$$

$(ii)\frac{6}{5}\times\frac{3}{7}-\frac{1}{5}\times\frac{3}{7}$

$$\frac{6}{5}\times\frac{3}{7}-\frac{1}{5}\times\frac{3}{7}=\frac{18}{35}-\frac{3}{35}$$

$$=\frac{18-3}{35}$$

$$=\frac{15}{35}$$

$$=\frac{3}{7}$$

82. Simplify:
(i) 3/7 ÷ (21/–55) (ii) 1 ÷ (-(1/2))

Solution:

$$(i)\frac{3}{7}\div\left(\frac{21}{-55}\right)=\frac{3}{7}\times\frac{-55}{21}$$

$$=\frac{-55}{49}$$

$$(ii)1\div\frac{-1}{2}=1\times\frac{2}{-1}$$

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

$$=-2$$

83. Which is greater in the following?
(i) 3/4, 7/8 (ii) –3(5/7) , 3(1/9)

Solution:

$(i)\frac{3}{4},\frac{7}{8}$

Making the denominator same of both rational numbers,

$\frac{3}{4}=\frac{3\times 2}{4\times 2}$

$=\frac{6}{8}$

$\frac{7}{8}=\frac{7}{8}$

So,

$\frac{3}{4}<\frac{7}{8}$

$(ii)-3\frac{5}{7},3\frac{1}{9}$

$-3\frac{5}{7}=\frac{-26}{7}$

$3\frac{1}{9}=\frac{28}{9}$

Making the denominator same of both rational numbers,

$\frac{-26}{7}=\frac{-26\times 9}{7\times 9}$

$=\frac{-234}{63}$

$\frac{28}{9}=\frac{28\times 7}{9\times 7}$

$=\frac{196}{63}$

So,

$\frac{-234}{63}<\frac{196}{63}$

$-3\frac{5}{7}<3\frac{1}{9}$

84. Write a rational number in which the numerator is less than '–7 × 11' and the denominator is greater than '12 + 4'.

Solution:

Let,
-7 x 11 = p
So,
p = -77
And,

12+4 = q
q = 16

Now,

Rational number = $\frac{p}{q}$

$= \frac{-77}{16}$

Therefore, it has more than one answer like, $\frac{-78}{17}, \frac{-79}{18}, \frac{-80}{19}$

85. If x = 1/10 and y = –3/8 , then evaluate x + y, x – y, x × y and x ÷ y.

Solution:

Given,

$x = \frac{1}{10}$

$y = \frac{-3}{8}$

According to question,

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

$= \frac{8 - 30}{80}$

$= \frac{-22}{80}$

$= \frac{-11}{40}$

$$x - y = \frac{1}{10} - \frac{-3}{8}$$
$$= \frac{8+30}{80}$$
$$= \frac{38}{80}$$
$$= \frac{19}{40}$$

$$x \times y = \frac{1}{10} \times \frac{-3}{8}$$
$$= \frac{-3}{80}$$

$$x \div y = \frac{1}{10} \div \frac{-3}{8}$$
$$= \frac{1}{10} \times \frac{8}{-3}$$
$$= \frac{8}{-30}$$
$$= \frac{4}{-15}$$

86. Find the reciprocal of the following:
(i) (1/2 x 1/4) + (1/2 x 6) **(ii) 20/51 x 4/91**
(iii) 3/13 ÷ -4/65 **(iv) (–5 x 12/15) – (-3 x 2/9)**

Solution:

$$(i)\left(\frac{1}{2} \times \frac{1}{4}\right) + \left(\frac{1}{2} \times 6\right) = \frac{1}{8} + \frac{6}{2}$$
$$= \frac{1+24}{8}$$
$$= \frac{25}{8}$$

Therefore, the reciprocal is $\frac{8}{25}$.

$(ii)\ \frac{20}{51}\times\frac{4}{91}=\frac{20\times4}{51\times91}$

$=\frac{80}{4641}$

Therefore, the reciprocal is $\frac{4641}{80}$.

$(iii)\ \frac{3}{13}\div\frac{-4}{65}=\frac{3}{13}\times\frac{65}{-4}$

$=\frac{15}{-4}$

Therefore, the reciprocal is $\frac{-4}{15}$.

$(iv)\left(-5\times\frac{12}{15}\right)-\left(-3\times\frac{2}{9}\right)=\left(\frac{-60}{15}\right)-\left(\frac{-6}{9}\right)$

$=-\frac{12}{3}-\left(\frac{-2}{3}\right)$

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

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

Therefore, the reciprocal is $\frac{-3}{10}$.

87. Complete the following table by finding the sums:

+	$-\frac{1}{9}$	$\frac{4}{11}$	$\frac{-5}{6}$
$\frac{2}{3}$			
$-\frac{5}{4}$		$\frac{-39}{44}$	
$-\frac{1}{3}$			

Solution:

Taking,

+	$-\frac{1}{9}$	$\frac{4}{11}$	$\frac{-5}{6}$
$\frac{2}{3}$	a	b	c
$-\frac{5}{4}$	d	$-\frac{39}{44}$	e
$-\frac{1}{3}$	f	g	h

So,

$$a = \frac{2}{3} + \frac{-1}{9}$$
$$= \frac{6-1}{9}$$
$$= \frac{5}{9}$$
$$b = \frac{2}{3} + \frac{4}{11}$$
$$= \frac{22+12}{33}$$
$$= \frac{34}{33}$$

$$c = \frac{2}{3} + \frac{-5}{6}$$
$$= \frac{4-5}{6}$$
$$= \frac{-1}{6}$$
$$d = \frac{-5}{4} + \frac{-1}{9}$$
$$= \frac{-45-4}{36}$$
$$= \frac{-49}{36}$$

$$e = \frac{-5}{4} + \frac{-5}{6}$$
$$= \frac{-30-20}{24}$$
$$= \frac{-50}{24}$$
$$= \frac{-25}{12}$$

$$f = \frac{-1}{3} + \frac{-1}{9}$$
$$= \frac{-3-1}{9}$$
$$= \frac{-4}{9}$$

$$g = \frac{-1}{3} + \frac{4}{11}$$
$$= \frac{-11+12}{33}$$
$$= \frac{1}{33}$$

$$h = \frac{-1}{3} + \frac{-5}{6}$$
$$= \frac{-2-5}{6}$$
$$= \frac{-7}{6}$$

So, the complete table is,

+	$-\frac{1}{9}$	$\frac{4}{11}$	$\frac{-5}{6}$
$\frac{2}{3}$	$\frac{5}{9}$	$\frac{34}{33}$	$\frac{-1}{6}$
$-\frac{5}{4}$	$\frac{-49}{36}$	$-\frac{39}{44}$	$\frac{-25}{12}$
$-\frac{1}{3}$	$\frac{-4}{9}$	$\frac{1}{33}$	$\frac{-7}{6}$

88. Write each of the following numbers in the form p/q , where p and q are integers:
(a) six-eighths
(b) three and half
(c) opposite of 1
(d) one-fourth
(e) zero
(f) opposite of three-fifths

Solution:

(a) six-eighths = $\frac{6}{8}$

(b) three and half = $3\frac{1}{2}$

$= \frac{7}{2}$

(c) opposite of 1 = $\frac{1}{1}$

(d) one-fourth = $\frac{1}{4}$

(e) zero = $\frac{0}{1}$

(f) opposite of three-fifths = $\frac{5}{3}$

89. If p = m × t and q = n × t, then p/q = $\frac{\square}{\square}$

Solution:

Given,
p = m × t
q = n × t,

So,
$\frac{p}{q} = \frac{m \times t}{n \times t}$

$= \frac{m}{n}$

90. Given that p/q and r/s are two rational numbers with different denominators and both of them are in standard form. To compare these rational numbers we say that:

(a) $\frac{\square}{\square} < \frac{\square}{\square}$ **, if p × s < r × q**

(b) $\frac{p}{q} = \frac{r}{s}$**, if _____ = _____**

(c) $\frac{\square}{\square} > \frac{\square}{\square}$ **, if p × s > r × q**

Solution:

(a) If p × s < r × q then,

By transferring sides,

$\frac{p}{q} < \frac{r}{s}$

(b) If $\frac{p}{q} = \frac{r}{s}$,

By cross-multiplication,

$p \times s = r \times q$

(c) If p × s > r × q

By transferring sides,

$\frac{p}{q} > \frac{r}{s}$

91. In each of the following cases, write the rational number whose numerator and denominator are respectively as under:

(a) 5 – 39 and 54 – 6 **(b) (–4) × 6 and 8 ÷ 2**

(c) 35 ÷ (–7) and 35 –18 **(d) 25 + 15 and 81 ÷ 40**

Solution:

(a) 5 – 39 and 54 – 6

Let numerator,

p = 5 – 39

= -34

Denominator,
q = 54-6
= 48

Hence, rational number,
$\frac{p}{q} = \frac{-34}{48}$

(b) (–4) × 6 and 8 ÷ 2

Let numerator,
p = -4 x 6
= -24

Denominator,
q = 8 ÷ 2
= 4

Hence, rational number,
$\frac{p}{q} = \frac{-24}{4}$

(c) 35 ÷ (–7) and 35 –18

Let numerator,
p = 35 ÷ -7
= -5

Denominator,
q = 35-18
= 17

Hence, rational number,
$\frac{p}{q} = \frac{-5}{17}$

(d) 25 + 15 and 81 ÷ 40

Let numerator,
p = 25+15
= 40

Denominator,
q = 81 ÷ 40
= 2.025

Hence, rational number,

$$\frac{p}{q}=\frac{40}{2.025}$$

92. Write the following as rational numbers in their standard forms:
(a) 35% (b) 1.2 (c) –6(3/7) (d) 240 ÷ (– 840) (e) 115 ÷ 207

Solution:

$(a)35\%$

$$35\%=\frac{35}{100}$$

By using prime factorization, we get,

$$35=7\times5$$

$$100=2\times2\times5\times5$$

$HCF\ is\ 5,$ so,

$$\frac{35\div5}{100\div5}=\frac{7}{20}$$

$(b)1.2$

$$1.2=\frac{12}{10}$$

So,

$$\frac{12\div2}{10\div2}=\frac{6}{5}$$

$$(c)-6\frac{3}{7}$$

$$-6\frac{3}{7}=\frac{-45}{7}$$

$(d)240\div(-840)$

$$240\div(-840)=\frac{240}{-840}$$

As,

$$HCF=120$$

So,

$$\frac{240 \div 120}{-840 \div 120} = \frac{2}{-7}$$
$$= \frac{2}{7}$$

$(e) 115 \div 207$

$$115 \div 207 = \frac{115}{207}$$
$$115 = 5 \times 23$$
$$307 = 23 \times 3 \times 3$$
$$HCF = 23$$
So,
$$\frac{115 \div 23}{207 \div 23} = \frac{5}{9}$$

93. Find a rational number exactly halfway between:
(a) -1/3 and 1/3 (b) 1/6 and 1/9 (c) 5/-13 and -7/9 (d) 1/15 and 1/12

Solution:

To calculate exactly halfway between two rational numbers a and b,

We have = $\frac{a+b}{2}$

So,

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

$$b = \frac{1}{3}$$

So,

$$\frac{a+b}{2} = \frac{\frac{-1}{3} + \frac{1}{3}}{2}$$
$$= \frac{0}{2}$$
$$= 0$$

(b) $a = \frac{1}{6}$

$b = \frac{1}{9}$

So,

$$\frac{a+b}{2} = \frac{\frac{1}{6}+\frac{1}{9}}{2}$$

$$= \frac{\frac{3+2}{18}}{2}$$

$$= \frac{5}{18\times 2}$$

$$= \frac{5}{36}$$

(c) $a = \frac{5}{-13}$

$b = \frac{-7}{9}$

So,

$$\frac{a+b}{2} = \frac{\frac{5}{-13}+\frac{-7}{9}}{2}$$

$$= \frac{\frac{-45-91}{117}}{2}$$

$$= \frac{-136}{117\times 2}$$

$$= \frac{-136}{234}$$

(d) $a = \frac{1}{15}$

$b = \frac{1}{12}$

So,

$$\frac{a+b}{2} = \frac{\frac{1}{15}+\frac{1}{12}}{2}$$
$$= \frac{\frac{4+5}{60}}{2}$$
$$= \frac{9}{60\times 2}$$
$$= \frac{9}{120}$$
$$= \frac{3}{40}$$

94. Taking x = -4/9, y = 5/12 and, z = 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 us x.
(d) the rational number which when multiplied by y to get x.
(e) the reciprocal of x + y.
(f) the sum of reciprocals of x and y.
(g) (x ÷ y) × z
(h) (x – y) + z
(i) x + (y + z)
(j) x ÷ (y ÷ z)
(k) x – (y + z)

Solution:
Given,

$$x = \frac{-4}{9}$$
$$y = \frac{5}{12}$$
$$z = \frac{7}{18}$$

(a) *We add A to x to get y.*

A+x = y

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

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

$$A=\frac{31}{36}$$

(b) *We Subtract A from y to get z*

$$y-A=z$$

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

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

$$A=\frac{1}{36}$$

(c) *We add A to z to give x.*

A+ z = x

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

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

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

(d) *We multiply A to y then we get x.*

A× y = x

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

$$A=\frac{-4\times12}{9\times5}$$

$$A=\frac{-48}{45}$$

(e) *the reciprocal of* $x + y$.

$$x+y=\frac{-4}{9}+\frac{5}{12}$$
$$=\frac{-1}{36}$$

Reciprocal of $x + y = -36$

(f) *the sum of reciprocals of* x *and* y.

$$\frac{1}{x}+\frac{1}{y}=\frac{1}{\frac{-4}{9}}+\frac{1}{\frac{5}{12}}$$
$$=\frac{-9}{4}+\frac{12}{5}$$
$$=\frac{3}{20}$$

$$(g)\ (x \div y) \times z=\left(\frac{-4}{9}\div\frac{5}{12}\right)\times\frac{7}{18}$$
$$=\frac{-56}{135}$$

$$(h)\ (x - y) + z =\left(\frac{-4}{9}-\frac{5}{12}\right)+\frac{7}{18}$$
$$=\left(\frac{-16-15}{36}\right)+\frac{7}{18}$$
$$=\frac{-17}{36}$$

$$(i)\ x + (y + z) =\frac{-4}{9}+\left(\frac{5}{12}+\frac{7}{18}\right)$$
$$=\frac{-4}{9}+\left(\frac{15+14}{36}\right)$$
$$=\frac{13}{36}$$

$$(j)\ x \div (y \div z)=\frac{-4}{9}\div\left(\frac{5}{12}\div\frac{7}{18}\right)$$
$$=\frac{-4}{9}\div\left(\frac{5\times18}{12\times7}\right)$$
$$=\frac{-56}{135}$$

$$(k)\ x - (y + z) = \frac{-4}{9} - \left(\frac{5}{12} + \frac{7}{18}\right)$$
$$= \frac{-4}{9} - \left(\frac{15+14}{36}\right)$$
$$= \frac{-5}{4}$$

95. What should be added to –1/2 to obtain the nearest natural number?

Solution:

As we know that nearest number of $\frac{-1}{2}$ is 1.

Let y be added $\frac{-1}{2}$ to obtain 1.

So,

$$\frac{-1}{2} + y = 1$$
$$y = 1 + \frac{1}{2}$$
$$y = \frac{2+1}{2}$$
$$y = \frac{3}{2}$$

96. What should be subtracted from –2/3 to obtain the nearest integer?

Solution:

As we know that nearest number of $\frac{-2}{3}$ is -1.

Let y be subtracted from $\frac{-2}{3}$ to obtain -1.

So,

$$\frac{-2}{3} - y = -1$$
$$y = \frac{-2}{3} + 1$$
$$y = \frac{-2+3}{3}$$
$$y = \frac{1}{3}$$

97. What should be multiplied with –5/8 to obtain the nearest integer?

Solution:

As we know that nearest number of $\frac{-5}{8}$ is -1

Let y be the number,
We have,

$$\frac{-5}{8} \times y = -1$$

$$y = \frac{8}{5}$$

98. What should be divided by 1/2 to obtain the greatest negative integer?

Solution:

As we know that greatest negative number is -1.

Let y be the number.
We have,

$$\frac{1}{2} \div y = -1$$

$$\frac{1}{2} \times \frac{1}{y} = -1$$

$$y = \frac{-1}{2}$$

99. From a rope 68 m long, pieces of equal size are cut. If length of one piece is 4(1/4) m, find the number of such pieces.

Solution:

Given, length of the rope is 68 meters.

Length of small pieces = $4\frac{1}{4} m$

$$= \frac{17}{4} m$$

Hence,

Number of pieces = $\frac{68}{\frac{17}{4}}$

$$= \frac{68}{1} \times \frac{4}{17}$$
$$= 4 \times 4$$
$$= 16$$

Therefore, 16 is the number of pieces.

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

Solution:

Given,
Total size of available cloth is 27 meters
Since, 12 shirts can be made from 27 meters long cloth.

Length of cloth required for each shirt = $\frac{Total\ available\ cloth}{Number\ of\ shirt}$

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

Therefore, 2.25 meters of cloth is required for each shirt.

101. Insert 3 equivalent rational numbers between
(i) –1/2 and 1/5 (ii) 0 and –10

Solution:

$$(\text{i}) \frac{-1}{2} and \frac{1}{5}$$
$$\frac{-1}{2} = \frac{-1 \times 5}{2 \times 5}$$
$$= \frac{-5}{10}$$
$$\frac{1}{5} = \frac{1 \times 2}{5 \times 2}$$
$$= \frac{2}{10}$$

Therefore, three equivalent rational number,

$$\frac{-3}{10}, \frac{-6}{20}, \frac{-9}{30}$$

(ii) Three equivalent rational numbers between 0 and -10 are,

$-2, \frac{-10}{5}, \frac{-20}{10}$

102. Put the (√), wherever applicable

Number	Natural Number	Whole Number	Integer	Fraction	Rational Number
(a) – 114					
(b) $\frac{19}{27}$					
(c) $\frac{623}{1}$					
(d) $-19\frac{3}{4}$					
(e) $\frac{73}{71}$					
(f) 0					

Solution:

The table is :

Number	Natural number	Whole number	Integer	Fraction	Rational number
– 114			✓		✓
$\frac{19}{27}$				✓	✓
$\frac{623}{1}$	✓	✓	✓	✓	✓
$-19\frac{3}{4}$					✓
$\frac{73}{71}$				✓	✓
0		✓	✓	✓	✓

103. 'a' and 'b' are two different numbers taken from the numbers 1 – 50. What is the largest value that (a – b)/(a + b) can have? What is the largest value that (a + b)/(a – b) can have?

Solution:

Let,

a = 50

b = 1

Given, a and b are two different numbers between 1 and 50.

$$\frac{a-b}{a+b}=\frac{50-1}{50+1}$$

$$=\frac{49}{51}$$

Similarly,

Let $a = 50$ *and* $b = 49$

$$\frac{a+b}{a-b}=\frac{50+49}{50-49}$$

$$=\frac{99}{1}$$

104. 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?

Solution:

Total students in the class studying Maths, English, or both = 150

Students of Maths = 68% of 150

= 102

Students of English = 62% of 150

= 93

Total students who are studying both subject = Students of Maths + Students of English – Students of both subjects

= 93+ 102 – 150

= 45

105. A body floats 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.

Solution:

Given,

Body's Volume = $\frac{2}{9}$

Volume of body submerged = 1 - volume of body exposed

$= 1 - \frac{2}{9}$

$= \frac{7}{9}$

Hence, required ratio,

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

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

106. (a) 4/3 x 3/4 (b) -3/2 x -2/3 (c) 2 x 1/2 (d) -1/3 x 3/1

Solution:

$(a) \frac{4}{3} \times \frac{3}{4} = 1$

$(b) \frac{-3}{2} \times \frac{-2}{3} = 1$

$(c) 2 \times \frac{1}{2} = 1$

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

Option (d) is the odd one.

107. (a) 4/−9 (b) -16/36 (c) −20/-45 (d) 28/−63

Solution:

$\frac{-20}{-45}$ is the only positive rational number among all in the above-given questions. Therefore, the option (c) is the odd one.

108. (a) -4/3 (b) -7/6 (c) -10/3 (d) −8/7

Solution:

$\frac{-7}{6}$ is odd one because all other three in above-given question have odd denominator and even numerator.

109. (a) −3/7 (b) -9/15 (c) 24/20 (d) 35/25

Solution:

$\frac{-3}{7}$ is in the lowest form, while other three were have common factor in their numerator and denominator.

110. What's the Error? Chhaya simplified a rational number in this manner -25/-30 = −5/6. What error did the student make?

Solution:

If a denominator and numerator both have negative sign, then it will cancel out each other and resulting fraction will be positive rational number.

Therefore,

$$\frac{-25}{-30} = \frac{5}{6}$$

Here, Chhaya divided numerator by 5 but denominator by -5.