2. Write two rational numbers which are their own reciprocals.

3. Which rational number is the multiplicative identity for rational numbers ?

4. Express $\dfrac{2}{-3}$ as a rational number with denominator :

   (i) -15 (ii) 18

5. Express $\dfrac{24}{-30}$ as rational number with numerator :

   (i) -8 (ii) -12

6. If $x = \dfrac{7}{12}$, $y = \dfrac{0}{12}$ and $z = \dfrac{-5}{12}$, write, whether $x > y$, $y = z$ or $z > x$.

7. Find the reciprocal of the following rational numbers :

   (i) $\dfrac{-6}{7}$ (ii) $\dfrac{3}{-5}$

8. Subtract the sum of $\dfrac{-3}{10}$ and $\dfrac{5}{8}$ from the sum of $\dfrac{4}{15}$ and $\dfrac{2}{-5}$.

9. Subtract the sum of $\dfrac{-11}{5}$ and $\dfrac{-2}{3}$ from the sum of $\dfrac{3}{5}$ and $\dfrac{7}{3}$.

10. If $x = \dfrac{5}{9}$ and $y = \dfrac{9}{11}$, prove that $|x \times y| = |x| \times |y|$.

11. Simplify :

   (i) $-\left(\dfrac{3}{11} \times \dfrac{-5}{6}\right) - \left(\dfrac{9}{12} \div \dfrac{3}{4}\right) - \left(\dfrac{5}{13} \times \dfrac{-6}{15}\right)$ (ii) $\left(-\dfrac{13}{9} \div \dfrac{2}{15}\right) \times \left(\dfrac{7}{3} \div \dfrac{5}{8}\right) + \left(\dfrac{3}{5} \times \dfrac{1}{2}\right)$

   (iii) $-\dfrac{2}{5} - \dfrac{-3}{10} - \dfrac{-4}{7}$ (iv) $\left(\dfrac{1}{2} \times \dfrac{1}{4}\right) - \left(1 \times \dfrac{1}{4}\right) + \left(\dfrac{-7}{18} \div \dfrac{7}{-15}\right)$

12. The product of two rational numbers is $\dfrac{5}{18}$. If one of them is $\dfrac{-3}{20}$, find the other.

13. The product of two rational numbers is -1. If one of the rational numbers is $\dfrac{-17}{8}$, find the other.

14. Divide the sum of $\dfrac{-13}{5}$ and $\dfrac{12}{7}$ by the product of $\dfrac{-31}{7}$ and $\dfrac{-1}{2}$.

15. Verify $x \times (y + z) = x \times y + x \times z$ by taking $x = \dfrac{3}{13}$, $y = \dfrac{-2}{7}$ and $z = \dfrac{-1}{2}$.

16. Verify $x \times (y + z) = x \times y + x \times z$ for :

   (i) $x = \dfrac{3}{5}$, $y = -\dfrac{2}{5}$, $z = -\dfrac{7}{5}$ (ii) $x = -\dfrac{5}{12}$, $y = \dfrac{7}{8}$, $z = \dfrac{-12}{3}$

SOLUTION : (i) Express $\dfrac{11}{3}$ in the form of the mixed fraction.

i.e.
$$\dfrac{11}{3} = 3\dfrac{2}{3} = 3 + \dfrac{2}{3}$$

On the right of origin, divide the unit part next to 3 in three equal parts.

The 2nd part on right side of 3 represents $\dfrac{11}{3}$ as shown.
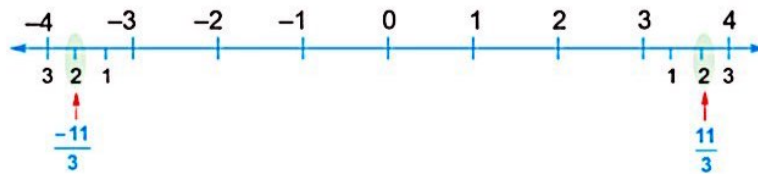
(ii) Express $\dfrac{-11}{3}$ in the form of the mixed fraction.

i.e.
$$\dfrac{-11}{3} = -\left(3\dfrac{2}{3}\right) = -\left(3 + \dfrac{2}{3}\right)$$

On the left of origin, divide the unit part next to – 3 in three equal parts.

The 2nd part on left of – 3 represents $\dfrac{-11}{3}$ as shown in the above figure.

EXAMPLE 24 : *In the number line as shown at right, the point 'P' represents*

Multiple Choice Question

(a) – 5   (b) $\dfrac{-4}{7}$ (c) – 4   (d) $\dfrac{-5}{7}$

SOLUTION : From the figure, it is obvious that the unit part (– 1) is divided in 7 equal parts, where point 'P' represents 4th part. Hence, the point 'P' represents $-\dfrac{4}{7}$ as a rational number.

So, the option **(b)** is correct, which is the required answer, i.e. <u>answer **(b)**</u>.

Assignment 1.2

1. **Multiple Choice Questions (MCQ)**   Choose the correct option.
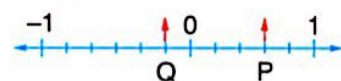
(i) In the number line given at right, the point 'P' represents

(a) $\dfrac{4}{5}$ (b) $\dfrac{3}{5}$ (c) $\dfrac{-2}{5}$ (d) $-\dfrac{1}{5}$

(ii) In the number line of (i), the point Q represents

(a) $\dfrac{-5}{6}$ (b) $\dfrac{5}{6}$ (c) $\dfrac{1}{6}$ (d) $\dfrac{-1}{6}$

2. Represent the following rational numbers on number line :

(i) $-\dfrac{7}{8}$ (ii) $\dfrac{3}{7}$ (iii) $-\dfrac{4}{5}$ (iv) $\dfrac{2}{9}$

3. Represent the following rational numbers on number line :

(i) $\dfrac{13}{3}$ (ii) $-\dfrac{7}{5}$ (iii) $\dfrac{15}{4}$ (iv) $-\dfrac{23}{7}$

2. Insert 5 rational numbers between :

   (i) $-\dfrac{3}{11}$ and $\dfrac{-1}{13}$ (ii) $\dfrac{3}{8}$ and $\dfrac{-1}{2}$ (iii) $\dfrac{2}{3}$ and $\dfrac{3}{13}$

3. Insert 6 rational numbers between :

   (i) $\dfrac{7}{13}$ and $\dfrac{-4}{13}$ (ii) $\dfrac{7}{11}$ and $\dfrac{8}{11}$ (iii) $\dfrac{-10}{17}$ and $\dfrac{-11}{17}$

4. Insert 10 rational numbers between :

   (i) $-\dfrac{3}{11}$ and $-\dfrac{2}{11}$ (ii) $\dfrac{10}{13}$ and $\dfrac{12}{13}$

1.5 WORD PROBLEMS ON RATIONAL NUMBERS

We come across many word problems on rational numbers.

Read the given problems carefully and try to find which operation of rational numbers is needed according to question and apply the operation carefully.

EXAMPLE 27 : *Price of 6 books is ₹ $\dfrac{3000}{7}$ and price of 10 pens is ₹ $\dfrac{1200}{11}$. The*

Multiple Choice Question

price of 2 books and 3 pens is

   (a) ₹ $\dfrac{13520}{77}$ (b) ₹ $\dfrac{1352}{77}$ (c) ₹ 13520   (d) ₹ $\dfrac{135200}{77}$

SOLUTION :

$\because$ Price of 6 books $= ₹ \dfrac{3000}{7}$

$\therefore$ Price of 1 book $= ₹ \dfrac{3000^{500}}{7 \times \cancel{6}} = ₹ \dfrac{500}{7}$

$\therefore$ Price of 2 books $= ₹ \dfrac{500}{7} \times 2 = ₹ \dfrac{1000}{7}$

$\because$ Price of 10 pens $= ₹ \dfrac{1200}{11}$

$\therefore$ Price of 1 pen $= ₹ \dfrac{1200^{120}}{11 \times \cancel{10}} = ₹ \dfrac{120}{11}$

$\therefore$ Price of 3 pens $= ₹ \dfrac{120}{11} \times 3 = ₹ \dfrac{360}{11}$

Now, price of 2 books and 3 pens $= ₹ \left(\dfrac{1000}{7} + \dfrac{360}{11} \right)$

$$= ₹ \dfrac{11000 + 2520}{77} = ₹ \dfrac{13520}{77}$$

So, the option (**a**) is correct, which is the required answer, *i.e.* <u>answer</u> (**a**).

2.

Column A	Column B
(a)	(p) $\dfrac{12}{5}$
(b)	(q) $\dfrac{3}{5}$
(c)	(r) $3\dfrac{2}{3}$
(d)	(s) $\dfrac{2}{7}$

Section B

SHORT AND LONG ANSWER TYPE QUESTIONS

1. Find three rational numbers between -2 and -3.

2. How many rational numbers can be found between two distinct rational numbers 'a' and 'b' ?

3. Verify the following :

(i) $\dfrac{5}{7} \times \dfrac{-12}{5} = \dfrac{-12}{5} \times \dfrac{5}{7}$

(ii) $\dfrac{-3}{4} \times \dfrac{17}{8} \times \dfrac{-1}{2} = \dfrac{-1}{2} \times \dfrac{-3}{4} \times \dfrac{17}{8}$

(iii) $\dfrac{5}{-7} + \dfrac{7}{5} + \dfrac{-3}{2} = \dfrac{7}{5} + \dfrac{-3}{2} + \dfrac{5}{-7}$

(iv) $\dfrac{3}{4} + \dfrac{-4}{3} + \dfrac{5}{6} = \dfrac{-4}{3} + \dfrac{5}{6} + \dfrac{3}{4}$

(v) $\dfrac{2}{-9} + \dfrac{-3}{5} + \dfrac{1}{3} = \dfrac{-3}{5} + \dfrac{2}{-9} + \dfrac{1}{3}$

4. The sum of two rational numbers is $\dfrac{-13}{33}$. If one of them is $\dfrac{-7}{11}$, find the other.

5. What number should be added to $\dfrac{8}{14}$ to get $\dfrac{-2}{7}$?

6. What number should be subtracted from $\dfrac{-5}{4}$ to get 0 ?

7. If $x = -\dfrac{1}{3}$ and $y = -\dfrac{2}{5}$, prove that :

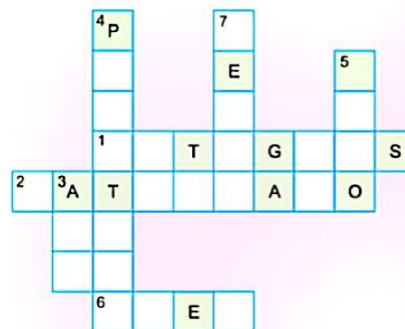(i) $|x + y| = |x| + |y|$ (ii) $|x \times y| = |x| \times |y|$

8. What should be added to $\dfrac{3}{4}$ so that the sum may be zero ?

PUZZLES

1. Read the given clues and then fill in the boxes :

Across : →
1. Smallest set of numbers which is closed under subtraction.
2. A number of the form $\dfrac{p}{q}$ where, p, q are integers and $q \ne 0$.
6. A number divisible by 2.

Down : ↓
3. Related to an operation on rational numbers which gives same result even when the numbers change places.
4. Opposite of the word negative.
5. Additive identity for rational numbers.
7. A prime number which is sum of an even number and a prime number.

ASSIGNMENT 1.4

1. **Multiple Choice Questions (MCQ)**   Choose the correct option.

   (i) The price of 100 pens is ₹ $500\frac{3}{5}$ and price of 50 pencils is ₹ $100\frac{1}{5}$. The price of 3 pens and 5 pencils, is
      (a) ₹ 2504   (b) ₹ 25.04   (c) ₹ 25.4   (d) ₹ 25

   (ii) If the price of 12 shirts is ₹ $3600\frac{2}{5}$ and price of 6 pants is ₹ $3000\frac{3}{4}$, the price of 4 shirts and 4 pants is
      (a) ₹ 320   (b) ₹ 3200   (c) ₹ 32000   (d) ₹ 3200.63

   (iii) The speed of a bus is $40\frac{1}{4}$ km/h. The time (in minutes) to travel $\frac{1000}{3}$ km by the bus is
      (a) 496 min   (b) 497 min   (c) 496.6 min   (d) 498 min

   (iv) The speed of a train is $60\frac{1}{2}$ km/h. How much distance the train will travel in $10\frac{1}{2}$ hours $\frac{45}{2}$ minutes ?
      (a) 657.94 km   (b) 657 km   (c) 65.79 km   (d) 657.98 km

2. A train travels a distance of 1000 km 400 m in $15\frac{1}{2}$ hours 30 minutes. What is the average speed of the train ?

3. A car is travelling with a speed of $50\frac{2}{5}$ km/h. How much time will it take to travel the distance of 200 km 100 m ?

4. A boy has a cardboard of length $\frac{10}{7}$ m and breadth $\frac{5}{4}$ m. He wants to make 5 pieces from the cardboard by cutting and pasting. Find the area of 3 such pieces.

5. One seller quoted the price of 5 pens and 7 pencils as ₹ $55\frac{1}{3}$ and ₹ $14\frac{2}{3}$ respectively. Second seller quoted the price of 7 pens and 5 pencils as ₹ $78\frac{2}{5}$ and ₹ $10\frac{3}{4}$ respectively. From where should we buy ?

6. The length and breadth of a cardboard are $2\frac{1}{5}$ m and $1\frac{1}{5}$ m respectively. The length and breadth of a second cardboard are $3\frac{1}{5}$ m and $2\frac{2}{5}$ m respectively. Both cardboards are divided into 10 equal small pieces. What is the total area of a cardboard, if it is made using 5 smaller pieces from the first cardboard and 3 smaller pieces from the second cardboard ?

CHAPTER-END EXERCISES

Section A

I. MULTIPLE CHOICE QUESTIONS (MCQ)

For each question, there are four Options, out of which one is correct. Choose the correct one :

1. If $x = \dfrac{1}{2}$ and $y = \dfrac{-1}{2}$, then

    (a) $x + y > 0$ (b) $x - y < 0$ (c) $x - y = 1$ (d) $x + y = 1$

2. Which of the following rational numbers is in the standard form ?

    (a) $\dfrac{-9}{16}$ (b) $\dfrac{-49}{91}$ (c) $\dfrac{-12}{26}$ (d) $\dfrac{28}{-105}$

3. The reciprocal of a negative rational number
    (a) is a positive rational number.
    (b) is a negative rational number.
    (c) does not exist.
    (d) can be either a positive or a negative rational number.

4. The value of $\left(-\dfrac{9}{16} \times \dfrac{24}{27}\right)$ is

    (a) $\dfrac{-1}{3}$ (b) $\dfrac{-3}{7}$ (c) $\dfrac{-5}{12}$ (d) $\dfrac{-1}{2}$

5. If $x = \dfrac{-3}{5}$ and $y = \dfrac{2}{7}$, then which of the following is correct ?

    (a) $|x \times y| = |x| \times |y|$ (b) $|x \times y| < |x| \times |y|$
    (c) $|x \times y| > |x| \times |y|$ (d) None of these

6. If the price of 10 pens is ₹ $158\dfrac{1}{2}$, then the price of such 1000 pens is

    (a) ₹ 12580   (b) ₹ 15580   (c) ₹ 15850   (d) ₹ 15650

7. The sum of two rational numbers is -3. If one of the numbers is $-\dfrac{10}{3}$, the other number is

    (a) $\dfrac{11}{3}$ (b) $\dfrac{-17}{3}$ (c) $\dfrac{-1}{3}$ (d) $\dfrac{1}{3}$

8. What number should be subtracted from $-\dfrac{3}{5}$ to get -3 ?

    (a) $\dfrac{-7}{5}$ (b) $\dfrac{12}{5}$ (c) $\dfrac{7}{5}$ (d) $\dfrac{-13}{5}$

9. If -1 is obtained on doubling a rational number, then the rational number is

    (a) 2 (b) $\dfrac{-1}{4}$ (c) $\dfrac{1}{2}$ (d) $\dfrac{-1}{2}$

10. The multiplicative inverse of 0 is

    (a) 0 (b) 1 (c) $\dfrac{0}{1}$ (d) not existing

9. The product of two rational numbers is $-\dfrac{12}{35}$. If one of them is $\dfrac{3}{5}$, find the absolute value of the difference of two rational numbers.

10. Simplify and write as a rational number of the form $\dfrac{p}{q}$:

   (i) $\dfrac{15}{2} + \dfrac{-11}{3} + 6 + \dfrac{-7}{6} + \dfrac{9}{8}$ (ii) $\dfrac{6}{7} + 1 + \dfrac{-7}{9} + \dfrac{-12}{7} + \dfrac{19}{21}$

II. MENTAL MATHEMATICS

1. Which rational number has no reciprocal ?

2. Which rational number is its own opposite ?

3. By what number should we multiply $\dfrac{-1}{6}$ so that the product may be $\dfrac{-23}{9}$?

4. Find six rational numbers between $\dfrac{3}{8}$ and $\dfrac{-1}{2}$.

HOTS *Higher Order Thinking Skills*

1. How many rational numbers exist between any two distinct rational numbers ?

2. Is $(4 \div 2) = (2 \div 4)$? What does it show ?

3. Is 0.3 the multiplicative inverse of $3\dfrac{1}{3}$? Why or why not ?

4. Using appropriate properties find :
   $$\dfrac{-2}{3} \times \dfrac{3}{5} + \dfrac{5}{2} - \dfrac{3}{5} \times \dfrac{1}{6}$$

5. For any two rational numbers x and y, which of the following statements is (are) correct ?
   (i) $x > y$ (ii) $x = y$ (iii) $x < y$
   (a) Only (i) is correct.   (b) Only (iii) is correct.
   (c) (ii) and (iii) are correct.   (d) All the three are correct.

VALUE-BASED QUESTIONS

1. How many pieces of rope of each $5\dfrac{1}{6}$ metres long can be cut from a rope of $77\dfrac{1}{2}$ metres long ?

2. If area of a rectangle is $\dfrac{120}{49}$ cm^2 and one of its sides is $\dfrac{10}{7}$ cm, find the length of other side.