

RD Sharma Solutions for Class 8 Chapter 1 Rational Numbers

1. Add the following rational numbers:

(i) $-\frac{5}{7}$ and $\frac{3}{7}$

(ii) $-\frac{15}{4}$ and $\frac{7}{4}$

(iii) $-\frac{8}{11}$ and $-\frac{4}{11}$

(iv) $\frac{6}{13}$ and $-\frac{9}{13}$

Solution:

Since the denominators are of same positive numbers we can add them directly

(i) $-\frac{5}{7} + \frac{3}{7} = \frac{-5+3}{7} = -\frac{2}{7}$

(ii) $-\frac{15}{4} + \frac{7}{4} = \frac{-15+7}{4} = -\frac{8}{4}$

Further dividing by 4 we get,

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

(iii) $-\frac{8}{11} + -\frac{4}{11} = \frac{-8 + (-4)}{11} = \frac{-8-4}{11} = -\frac{12}{11}$

(iv) $\frac{6}{13} + -\frac{9}{13} = \frac{6 + (-9)}{13} = \frac{6-9}{13} = -\frac{3}{13}$

2. Add the following rational numbers:

(i) $\frac{3}{4}$ and $-\frac{5}{8}$

Solution: The denominators are 4 and 8

By taking LCM for 4 and 8 is 8

We rewrite the given fraction in order to get the same denominator

$$\frac{3}{4} = \frac{(3 \times 2)}{(4 \times 2)} = \frac{6}{8} \text{ and}$$

$$-\frac{5}{8} = \frac{(-5 \times 1)}{(8 \times 1)} = -\frac{5}{8}$$

Since the denominators are same we can add them directly

$$\frac{6}{8} + -\frac{5}{8} = \frac{6 + (-5)}{8} = \frac{6-5}{8} = \frac{1}{8}$$

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

Solution: Firstly we need to convert the denominators to positive numbers.

$$\frac{5}{-9} = \frac{(5 \times -1)}{(-9 \times -1)} = -\frac{5}{9}$$

The denominators are 9 and 3

By taking LCM for 9 and 3 is 9

We rewrite the given fraction in order to get the same denominator

$$-\frac{5}{9} = \frac{(-5 \times 1)}{(9 \times 1)} = -\frac{5}{9} \text{ and}$$

$$7/3 = (7 \times 3) / (3 \times 3) = 21/9$$

Since the denominators are same we can add them directly

$$-5/9 + 21/9 = (-5+21)/9 = 16/9$$

(iii) -3 and 3/5

Solution: The denominators are 1 and 5

By taking LCM for 1 and 5 is 5

We rewrite the given fraction in order to get the same denominator

$$-3/1 = (-3 \times 5) / (1 \times 5) = -15/5 \text{ and}$$

$$3/5 = (3 \times 1) / (5 \times 1) = 3/5$$

Now, the denominators are same we can add them directly

$$-15/5 + 3/5 = (-15+3)/5 = -12/5$$

(iv) -7/27 and 11/18

Solution: The denominators are 27 and 18

By taking LCM for 27 and 18 is 54

We rewrite the given fraction in order to get the same denominator

$$-7/27 = (-7 \times 2) / (27 \times 2) = -14/54 \text{ and}$$

$$11/18 = (11 \times 3) / (18 \times 3) = 33/54$$

Now, the denominators are same we can add them directly

$$-14/54 + 33/54 = (-14+33)/54 = 19/54$$

(v) 31/-4 and -5/8

Solution: Firstly we need to convert the denominators to positive numbers.

$$31/-4 = (31 \times -1) / (-4 \times -1) = -31/4$$

The denominators are 4 and 8

By taking LCM for 4 and 8 is 8

We rewrite the given fraction in order to get the same denominator

$$-31/4 = (-31 \times 2) / (4 \times 2) = -62/8 \text{ and}$$

$$-5/8 = (-5 \times 1) / (8 \times 1) = -5/8$$

Since the denominators are same we can add them directly

$$-62/8 + (-5)/8 = (-62 + (-5))/8 = (-62-5)/8 = -67/8$$

(vi) 5/36 and -7/12

Solution: The denominators are 36 and 12

By taking LCM for 36 and 12 is 36

We rewrite the given fraction in order to get the same denominator

$$5/36 = (5 \times 1) / (36 \times 1) = 5/36 \text{ and}$$

$$-7/12 = (-7 \times 3) / (12 \times 3) = -21/36$$

Now, the denominators are same we can add them directly

$$5/36 + -21/36 = (5 + (-21))/36 = 5-21/36 = -16/36 = -4/9$$

(vii) -5/16 and 7/24

Solution: The denominators are 16 and 24

By taking LCM for 16 and 24 is 48

We rewrite the given fraction in order to get the same denominator

$$-5/16 = (-5 \times 3) / (16 \times 3) = -15/48 \text{ and}$$

$$7/24 = (7 \times 2) / (24 \times 2) = 14/48$$

Now, the denominators are same we can add them directly

$$-15/48 + 14/48 = (-15 + 14)/48 = -1/48$$

(viii) 7/-18 and 8/27

Solution: Firstly we need to convert the denominators to positive numbers.

$$7/-18 = (7 \times -1) / (-18 \times -1) = -7/18$$

The denominators are 18 and 27

By taking LCM for 18 and 27 is 54

We rewrite the given fraction in order to get the same denominator

$$-7/18 = (-7 \times 3) / (18 \times 3) = -21/54 \text{ and}$$

$$8/27 = (8 \times 2) / (27 \times 2) = 16/54$$

Since the denominators are same we can add them directly

$$-21/54 + 16/54 = (-21 + 16)/54 = -5/54$$

3.Simplify:

(i) 8/9 + -11/6

Solution: let us take the LCM for 9 and 6 which is 18

$$(8 \times 2) / (9 \times 2) + (-11 \times 3) / (6 \times 3)$$

$$16/18 + -33/18$$

Since the denominators are same we can add them directly

$$(16-33)/18 = -17/18$$

(ii) 3 + 5/-7

Solution: Firstly convert the denominator to positive number

$$5/-7 = (5 \times -1) / (-7 \times -1) = -5/7$$

$$3/1 + -5/7$$

Now let us take the LCM for 1 and 7 which is 7

$$(3 \times 7)/(1 \times 7) + (-5 \times 1)/(7 \times 1)$$

$$21/7 + -5/7$$

Since the denominators are same we can add them directly

$$(21-5)/7 = 16/7$$

(iii) $1/-12 + 2/-15$

Solution: Firstly convert the denominator to positive number

$$1/-12 = (1 \times -1)/(-12 \times -1) = -1/12$$

$$2/-15 = (2 \times -1)/(-15 \times -1) = -2/15$$

$$-1/12 + -2/15$$

Now let us take the LCM for 12 and 15 which is 60

$$(-1 \times 5)/(12 \times 5) + (-2 \times 4)/(15 \times 4)$$

$$-5/60 + -8/60$$

Since the denominators are same we can add them directly

$$(-5-8)/60 = -13/60$$

(iv) $-8/19 + -4/57$

Solution: let us take the LCM for 19 and 57 which is 57

$$(-8 \times 3)/(19 \times 3) + (-4 \times 1)/(57 \times 1)$$

$$-24/57 + -4/57$$

Since the denominators are same we can add them directly

$$(-24-4)/57 = -28/57$$

(v) $7/9 + 3/-4$

Solution: Firstly convert the denominator to positive number

$$3/-4 = (3 \times -1)/(-4 \times -1) = -3/4$$

$$7/9 + -3/4$$

Now let us take the LCM for 9 and 4 which is 36

$$(7 \times 4)/(9 \times 4) + (-3 \times 9)/(4 \times 9)$$

$$28/36 + -27/36$$

Since the denominators are same we can add them directly

$$(28-27)/36 = 1/36$$

(vi) $5/26 + 11/-39$

Solution: Firstly convert the denominator to positive number

$$11/-39 = (11 \times -1)/(-39 \times -1) = -11/39$$

$$5/26 + -11/39$$

Now let us take the LCM for 26 and 39 which is 78

$$(5 \times 3)/(26 \times 3) + (-11 \times 2)/(39 \times 2)$$

$$15/78 + -22/78$$

Since the denominators are same we can add them directly

$$(15-22)/78 = -7/78$$

(vii) $-16/9 + -5/12$

Solution: let us take the LCM for 9 and 12 which is 36

$$(-16 \times 4)/(9 \times 4) + (-5 \times 3)/(12 \times 3)$$

$$-64/36 + -15/36$$

Since the denominators are same we can add them directly

$$(-64-15)/36 = -79/36$$

Further divide the fraction by 3 we get,

$$-79/36 = -79/36$$

(viii) $-13/8 + 5/36$

Solution: let us take the LCM for 8 and 36 which is 72

$$(-13 \times 9)/(8 \times 9) + (5 \times 2)/(36 \times 2)$$

$$-117/72 + 10/72$$

Since the denominators are same we can add them directly

$$(-117+10)/72 = -107/72$$

(ix) $0 + -3/5$

Solution: We know that anything added to 0 results in the same.

$$0 + -3/5 = -3/5$$

(x) $1 + -4/5$

Solution: let us take the LCM for 1 and 5 which is 5

$$(1 \times 5)/(1 \times 5) + (-4 \times 1)/(5 \times 1)$$

$$5/5 + -4/5$$

Since the denominators are same we can add them directly

$$(5-4)/5 = 1/5$$

4. Add and express the sum as a mixed fraction:

(i) $-12/5$ and $43/10$

Solution: let us add the given fraction

$$-12/5 + 43/10$$

let us take the LCM for 5 and 10 which is 10

$$(-12 \times 2)/(5 \times 2) + (43 \times 1)/(10 \times 1)$$

$$-24/10 + 43/10$$

Since the denominators are same we can add them directly

$$(-24+43)/10 = 19/10$$

19/10 can be written as $(1\frac{9}{10})$ in mixed fraction.

(ii) 24/7 and -11/4

Solution: let us add the given fraction

$$24/7 + -11/4$$

let us take the LCM for 7 and 4 which is 28

$$(24 \times 4)/(7 \times 4) + (-11 \times 7)/(4 \times 7)$$

$$96/28 + -77/28$$

Since the denominators are same we can add them directly

$$(96-77)/28 = 19/28$$

(iii) -31/6 and -27/8

Solution: let us add the given fraction

$$-31/6 + -27/8$$

let us take the LCM for 6 and 8 which is 24

$$(-31 \times 4)/(6 \times 4) + (-27 \times 3)/(8 \times 3)$$

$$-124/24 + -81/24$$

Since the denominators are same we can add them directly

$$(-124-81)/24 = -205/24$$

-205/24 can be written as $(-8\frac{13}{24})$ in mixed fraction.

(iv) 101/6 and 7/8

Solution: let us add the given fraction

$$101/6 + 7/8$$

let us take the LCM for 6 and 8 which is 24

$$(101 \times 4)/(6 \times 4) + (7 \times 3)/(8 \times 3)$$

$$404/24 + 21/24$$

Since the denominators are same we can add them directly

$$(404+21)/24 = 425/24$$

425/24 can be written as $(17\frac{17}{24})$ in mixed fraction.

EXERCISE 1.2 PAGE NO: 1.14

1. Verify commutativity of addition of rational numbers for each of the following pairs of rational numbers:

(i) $-11/5$ and $4/7$

Solution: By using the commutativity law, the addition of rational numbers is commutative $\therefore a/b + c/d = c/d + a/b$

In order to verify the above property let us consider the given fraction

$-11/5$ and $4/7$ as

$-11/5 + 4/7$ and $4/7 + -11/5$

The denominators are 5 and 7

By taking LCM for 5 and 7 is 35

We rewrite the given fraction in order to get the same denominator

Now, $-11/5 = (-11 \times 7) / (5 \times 7) = -77/35$

$4/7 = (4 \times 5) / (7 \times 5) = 20/35$

Since the denominators are same we can add them directly

$-77/35 + 20/35 = (-77+20)/35 = -57/35$

$4/7 + -11/5$

The denominators are 7 and 5

By taking LCM for 7 and 5 is 35

We rewrite the given fraction in order to get the same denominator

Now, $4/7 = (4 \times 5) / (7 \times 5) = 20/35$

$-11/5 = (-11 \times 7) / (5 \times 7) = -77/35$

Since the denominators are same we can add them directly

$20/35 + -77/35 = (20 + (-77))/35 = (20-77)/35 = -57/35$

$\therefore -11/5 + 4/7 = 4/7 + -11/5$ is satisfied.

(ii) $4/9$ and $7/-12$

Solution: Firstly we need to convert the denominators to positive numbers.

$7/-12 = (7 \times -1) / (-12 \times -1) = -7/12$

By using the commutativity law, the addition of rational numbers is commutative.

$\therefore a/b + c/d = c/d + a/b$

In order to verify the above property let us consider the given fraction

$4/9$ and $-7/12$ as

$4/9 + -7/12$ and $-7/12 + 4/9$

The denominators are 9 and 12

By taking LCM for 9 and 12 is 36

We rewrite the given fraction in order to get the same denominator

$$\text{Now, } 4/9 = (4 \times 4) / (9 \times 4) = 16/36$$

$$-7/12 = (-7 \times 3) / (12 \times 3) = -21/36$$

Since the denominators are same we can add them directly

$$16/36 + (-21)/36 = (16 + (-21))/36 = (16-21)/36 = -5/36$$

$$-7/12 + 4/9$$

The denominators are 12 and 9

By taking LCM for 12 and 9 is 36

We rewrite the given fraction in order to get the same denominator

$$\text{Now, } -7/12 = (-7 \times 3) / (12 \times 3) = -21/36$$

$$4/9 = (4 \times 4) / (9 \times 4) = 16/36$$

Since the denominators are same we can add them directly

$$-21/36 + 16/36 = (-21 + 16)/36 = -5/36$$

$\therefore 4/9 + -7/12 = -7/12 + 4/9$ is satisfied.

(iii) $-3/5$ and $-2/-15$

Solution:

By using the commutativity law, the addition of rational numbers is commutative.

$$\therefore a/b + c/d = c/d + a/b$$

In order to verify the above property let us consider the given fraction

$-3/5$ and $-2/-15$ as

$$-3/5 + -2/-15 \text{ and } -2/-15 + -3/5$$

$$-2/-15 = 2/15$$

The denominators are 5 and 15

By taking LCM for 5 and 15 is 15

We rewrite the given fraction in order to get the same denominator

$$\text{Now, } -3/5 = (-3 \times 3) / (5 \times 3) = -9/15$$

$$2/15 = (2 \times 1) / (15 \times 1) = 2/15$$

Since the denominators are same we can add them directly

$$-9/15 + 2/15 = (-9 + 2)/15 = -7/15$$

$$-2/-15 + -3/5$$

$$-2/-15 = 2/15$$

The denominators are 15 and 5

By taking LCM for 15 and 5 is 15

We rewrite the given fraction in order to get the same denominator

$$\text{Now, } 2/15 = (2 \times 1) / (15 \times 1) = 2/15$$

$$-3/5 = (-3 \times 3) / (5 \times 3) = -9/15$$

Since the denominators are same we can add them directly

$$2/15 + -9/15 = (2 + (-9))/15 = (2-9)/15 = -7/15$$

$\therefore -3/5 + -2/15 = -2/15 + -3/5$ is satisfied.

(iv) 2/-7 and 12/-35

Solution: Firstly we need to convert the denominators to positive numbers.

$$2/-7 = (2 \times -1) / (-7 \times -1) = -2/7$$

$$12/-35 = (12 \times -1) / (-35 \times -1) = -12/35$$

By using the commutativity law, the addition of rational numbers is commutative.

$$\therefore a/b + c/d = c/d + a/b$$

In order to verify the above property let us consider the given fraction

$-2/7$ and $-12/35$ as

$$-2/7 + -12/35 \text{ and } -12/35 + -2/7$$

The denominators are 7 and 35

By taking LCM for 7 and 35 is 35

We rewrite the given fraction in order to get the same denominator

$$\text{Now, } -2/7 = (-2 \times 5) / (7 \times 5) = -10/35$$

$$-12/35 = (-12 \times 1) / (35 \times 1) = -12/35$$

Since the denominators are same we can add them directly

$$-10/35 + (-12)/35 = (-10 + (-12))/35 = (-10-12)/35 = -22/35$$

$$-12/35 + -2/7$$

The denominators are 35 and 7

By taking LCM for 35 and 7 is 35

We rewrite the given fraction in order to get the same denominator

$$\text{Now, } -12/35 = (-12 \times 1) / (35 \times 1) = -12/35$$

$$-2/7 = (-2 \times 5) / (7 \times 5) = -10/35$$

Since the denominators are same we can add them directly

$$-12/35 + -10/35 = (-12 + (-10))/35 = (-12-10)/35 = -22/35$$

$\therefore -2/7 + -12/35 = -12/35 + -2/7$ is satisfied.

(v) 4 and -3/5

Solution: By using the commutativity law, the addition of rational numbers is commutative.

$$\therefore a/b + c/d = c/d + a/b$$

In order to verify the above property let us consider the given fraction

4/1 and -3/5 as

$$4/1 + -3/5 \text{ and } -3/5 + 4/1$$

The denominators are 1 and 5

By taking LCM for 1 and 5 is 5

We rewrite the given fraction in order to get the same denominator

$$\text{Now, } 4/1 = (4 \times 5) / (1 \times 5) = 20/5$$

$$-3/5 = (-3 \times 1) / (5 \times 1) = -3/5$$

Since the denominators are same we can add them directly

$$20/5 + -3/5 = (20 + (-3))/5 = (20-3)/5 = 17/5$$

$$-3/5 + 4/1$$

The denominators are 5 and 1

By taking LCM for 5 and 1 is 5

We rewrite the given fraction in order to get the same denominator

$$\text{Now, } -3/5 = (-3 \times 1) / (5 \times 1) = -3/5$$

$$4/1 = (4 \times 5) / (1 \times 5) = 20/5$$

Since the denominators are same we can add them directly

$$-3/5 + 20/5 = (-3 + 20)/5 = 17/5$$

$$\therefore 4/1 + -3/5 = -3/5 + 4/1 \text{ is satisfied.}$$

(vi) -4 and 4/-7

Solution: Firstly we need to convert the denominators to positive numbers.

$$4/-7 = (4 \times -1) / (-7 \times -1) = -4/7$$

By using the commutativity law, the addition of rational numbers is commutative.

$$\therefore a/b + c/d = c/d + a/b$$

In order to verify the above property let us consider the given fraction

-4/1 and -4/7 as

$$-4/1 + -4/7 \text{ and } -4/7 + -4/1$$

The denominators are 1 and 7

By taking LCM for 1 and 7 is 7

We rewrite the given fraction in order to get the same denominator

$$\text{Now, } -4/1 = (-4 \times 7) / (1 \times 7) = -28/7$$

$$-4/7 = (-4 \times 1) / (7 \times 1) = -4/7$$

Since the denominators are same we can add them directly

$$-28/7 + -4/7 = (-28 + (-4))/7 = (-28-4)/7 = -32/7$$

$$-4/7 + -4/1$$

The denominators are 7 and 1

By taking LCM for 7 and 1 is 7

We rewrite the given fraction in order to get the same denominator

$$\text{Now, } -4/7 = (-4 \times 1) / (7 \times 1) = -4/7$$

$$-4/1 = (-4 \times 7) / (1 \times 7) = -28/7$$

Since the denominators are same we can add them directly

$$-4/7 + -28/7 = (-4 + (-28))/7 = (-4-28)/7 = -32/7$$

$\therefore -4/1 + -4/7 = -4/7 + -4/1$ is satisfied.

2. Verify associativity of addition of rational numbers i.e., $(x + y) + z = x + (y + z)$, when:

(i) $x = 1/2, y = 2/3, z = -1/5$

Solution: As the property states $(x + y) + z = x + (y + z)$

Use the values as such,

$$(1/2 + 2/3) + (-1/5) = 1/2 + (2/3 + (-1/5))$$

Let us consider LHS $(1/2 + 2/3) + (-1/5)$

Taking LCM for 2 and 3 is 6

$$(1 \times 3)/(2 \times 3) + (2 \times 2)/(3 \times 2)$$

$$3/6 + 4/6$$

Since the denominators are same we can add them directly,

$$3/6 + 4/6 = 7/6$$

$$7/6 + (-1/5)$$

Taking LCM for 6 and 5 is 30

$$(7 \times 5)/(6 \times 5) + (-1 \times 6)/(5 \times 6)$$

$$35/30 + (-6)/30$$

Since the denominators are same we can add them directly,

$$(35 + (-6))/30 = (35-6)/30 = 29/30$$

Let us consider RHS $1/2 + (2/3 + (-1/5))$

Taking LCM for 3 and 5 is 15

$$(2/3 + (-1/5)) = (2 \times 5)/(3 \times 5) + (-1 \times 3)/(5 \times 3)$$

$$= 10/15 + (-3)/15$$

Since the denominators are same we can add them directly,

$$10/15 + (-3)/15 = (10-3)/15 = 7/15$$

$$1/2 + 7/15$$

Taking LCM for 2 and 15 is 30

$$1/2 + 7/15 = (1 \times 15)/(2 \times 15) + (7 \times 2)/(15 \times 2)$$

$$= 15/30 + 14/30$$

Since the denominators are same we can add them directly,

$$= (15 + 14)/30 = 29/30$$

\therefore LHS = RHS associativity of addition of rational numbers is verified.

(ii) $x = -2/5, y = 4/3, z = -7/10$

Solution: As the property states $(x + y) + z = x + (y + z)$

Use the values as such,

$$(-2/5 + 4/3) + (-7/10) = -2/5 + (4/3 + (-7/10))$$

Let us consider LHS $(-2/5 + 4/3) + (-7/10)$

Taking LCM for 5 and 3 is 15

$$(-2 \times 3)/(5 \times 3) + (4 \times 5)/(3 \times 5)$$

$$-6/15 + 20/15$$

Since the denominators are same we can add them directly,

$$-6/15 + 20/15 = (-6+20)/15 = 14/15$$

$$14/15 + (-7/10)$$

Taking LCM for 15 and 10 is 30

$$(14 \times 2)/(15 \times 2) + (-7 \times 3)/(10 \times 3)$$

$$28/30 + (-21)/30$$

Since the denominators are same we can add them directly,

$$(28+(-21))/30 = (28-21)/30 = 7/30$$

Let us consider RHS $-2/5 + (4/3 + (-7/10))$

Taking LCM for 3 and 10 is 30

$$(4/3 + (-7/10)) = (4 \times 10)/(3 \times 10) + (-7 \times 3)/(10 \times 3)$$

$$= 40/30 + (-21)/30$$

Since the denominators are same we can add them directly,

$$40/30 + (-21)/30 = (40-21)/30 = 19/30$$

$$-2/5 + 19/30$$

Taking LCM for 5 and 30 is 30

$$\begin{aligned} -2/5 + 19/30 &= (-2 \times 6)/(5 \times 6) + (19 \times 1)/(30 \times 1) \\ &= -12/30 + 19/30 \end{aligned}$$

Since the denominators are same we can add them directly,

$$= (-12 + 19)/30 = 7/30$$

∴ LHS = RHS associativity of addition of rational numbers is verified.

(iii) $x = -7/11$, $y = 2/-5$, $z = -3/22$

Solution: Firstly convert the denominators to positive numbers

$$2/-5 = (2 \times -1)/(-5 \times -1) = -2/5$$

As the property states **$(x + y) + z = x + (y + z)$**

Use the values as such,

$$(-7/11 + -2/5) + (-3/22) = -7/11 + (-2/5 + (-3/22))$$

Let us consider LHS $(-7/11 + -2/5) + (-3/22)$

Taking LCM for 11 and 5 is 55

$$\begin{aligned} (-7 \times 5)/(11 \times 5) + (-2 \times 11)/(5 \times 11) \\ -35/55 + -22/55 \end{aligned}$$

Since the denominators are same we can add them directly,

$$\begin{aligned} -35/55 + -22/55 &= (-35-22)/55 = -57/55 \\ -57/55 + (-3/22) \end{aligned}$$

Taking LCM for 55 and 22 is 110

$$\begin{aligned} (-57 \times 2)/(55 \times 2) + (-3 \times 5)/(22 \times 5) \\ -114/110 + (-15)/110 \end{aligned}$$

Since the denominators are same we can add them directly,

$$(-114+(-15))/110 = (-114-15)/110 = -129/110$$

Let us consider RHS $-7/11 + (-2/5 + (-3/22))$

Taking LCM for 5 and 22 is 110

$$\begin{aligned} (-2/5 + (-3/22)) &= (-2 \times 22)/(5 \times 22) + (-3 \times 5)/(22 \times 5) \\ &= -44/110 + (-15)/110 \end{aligned}$$

Since the denominators are same we can add them directly,

$$\begin{aligned} -44/110 + (-15)/110 &= (-44-15)/110 = -59/110 \\ -7/11 + -59/110 \end{aligned}$$

Taking LCM for 11 and 110 is 110

$$-7/11 + -59/110 = (-7 \times 10)/(11 \times 10) + (-59 \times 1)/(110 \times 1)$$

$$= -70/110 + -59/110$$

Since the denominators are same we can add them directly,

$$= (-70 -59)/110 = -129/110$$

∴ LHS = RHS associativity of addition of rational numbers is verified.

(iv) $x = -2, y = 3/5, z = -4/3$

Solution: As the property states $(x + y) + z = x + (y + z)$

Use the values as such,

$$(-2/1 + 3/5) + (-4/3) = -2/1 + (3/5 + (-4/3))$$

Let us consider LHS $(-2/1 + 3/5) + (-4/3)$

Taking LCM for 1 and 5 is 5

$$(-2 \times 5)/(1 \times 5) + (3 \times 1)/(5 \times 1)$$

$$-10/5 + 3/5$$

Since the denominators are same we can add them directly,

$$-10/5 + 3/5 = (-10+3)/5 = -7/5$$

$$-7/5 + (-4/3)$$

Taking LCM for 5 and 3 is 15

$$(-7 \times 3)/(5 \times 3) + (-4 \times 5)/(3 \times 5)$$

$$-21/15 + (-20)/15$$

Since the denominators are same we can add them directly,

$$(-21+(-20))/15 = (-21-20)/15 = -41/15$$

Let us consider RHS $-2/1 + (3/5 + (-4/3))$

Taking LCM for 5 and 3 is 15

$$(3/5 + (-4/3)) = (3 \times 3)/(5 \times 3) + (-4 \times 5)/(3 \times 5)$$

$$= 9/15 + (-20)/15$$

Since the denominators are same we can add them directly,

$$9/15 + (-20)/15 = (9-20)/15 = -11/15$$

$$-2/1 + -11/15$$

Taking LCM for 1 and 15 is 15

$$-2/1 + -11/15 = (-2 \times 15)/(1 \times 15) + (-11 \times 1)/(15 \times 1)$$

$$= -30/15 + -11/15$$

Since the denominators are same we can add them directly,

$$= (-30 -11)/15 = -41/15$$

∴ LHS = RHS associativity of addition of rational numbers is verified.

3. Write the additive of each of the following rational numbers:

(i) $-2/17$

(ii) $3/-11$

(iii) $-17/5$

(iv) $-11/-25$

Solution:

(i) The additive inverse of $-2/17$ is $2/17$

(ii) The additive inverse of $3/-11$ is $3/11$

(iii) The additive inverse of $-17/5$ is $17/5$

(iv) The additive inverse of $-11/-25$ is $-11/25$

4. Write the negative(additive) inverse of each of the following:

(i) $-2/5$

(ii) $7/-9$

(iii) $-16/13$

(iv) $-5/1$

(v) 0

(vi) 1

(vii) -1

Solution:

(i) The negative (additive) inverse of $-2/5$ is $2/5$

(ii) The negative (additive) inverse of $7/-9$ is $7/9$

(iii) The negative (additive) inverse of $-16/13$ is $16/13$

(iv) The negative (additive) inverse of $-5/1$ is 5

(v) The negative (additive) inverse of 0 is 0

(vi) The negative (additive) inverse of 1 is -1

(vii) The negative (additive) inverse of -1 is 1

5. Using commutativity and associativity of addition of rational numbers, express each of the following as a rational number:

(i) $2/5 + 7/3 + -4/5 + -1/3$

Solution: Firstly group the rational numbers with same denominators

$$2/5 + -4/5 + 7/3 + -1/3$$

Now the denominators which are same can be added directly.

$$(2+(-4))/5 + (7+(-1))/3$$

$$(2-4)/5 + (7-1)/3$$

$$-2/5 + 6/3$$

By taking LCM for 5 and 3 we get, 15

$$(-2 \times 3)/(5 \times 3) + (6 \times 5)/(3 \times 5)$$

$$-6/15 + 30/15$$

Since the denominators are same can be added directly

$$(-6+30)/15 = 24/15$$

Further can be divided by 3 we get,

$$24/15 = 8/5$$

(ii) $3/7 + -4/9 + -11/7 + 7/9$

Solution: Firstly group the rational numbers with same denominators

$$3/7 + -11/7 + -4/9 + 7/9$$

Now the denominators which are same can be added directly.

$$(3 + (-11))/7 + (-4 + 7)/9$$

$$(3-11)/7 + (-4+7)/9$$

$$-8/7 + 3/9$$

$$-8/7 + 1/3$$

By taking LCM for 7 and 3 we get, 21

$$(-8 \times 3)/(7 \times 3) + (1 \times 7)/(3 \times 7)$$

$$-24/21 + 7/21$$

Since the denominators are same can be added directly

$$(-24+7)/21 = -17/21$$

(iii) $2/5 + 8/3 + -11/15 + 4/5 + -2/3$

Solution: Firstly group the rational numbers with same denominators

$$2/5 + 4/5 + 8/3 + -2/3 + -11/15$$

Now the denominators which are same can be added directly.

$$(2 + 4)/5 + (8 + (-2))/3 + -11/15$$

$$6/5 + (8-2)/3 + -11/15$$

$$6/5 + 6/3 + -11/15$$

$$6/5 + 2/1 + -11/15$$

By taking LCM for 5, 1 and 15 we get, 15

$$(6 \times 3)/(5 \times 3) + (2 \times 15)/(1 \times 15) + (-11 \times 1)/(15 \times 1)$$

$$18/15 + 30/15 + -11/15$$

Since the denominators are same can be added directly

$$(18+30+(-11))/15 = (18+30-11)/15 = 37/15$$

(iv) $4/7 + 0 + -8/9 + -13/7 + 17/21$

Solution: Firstly group the rational numbers with same denominators

$$4/7 + -13/7 + -8/9 + 17/21$$

Now the denominators which are same can be added directly.

$$(4 + (-13))/7 + -8/9 + 17/21$$

$$(4-13)/7 + -8/9 + 17/21$$

$$-9/7 + -8/9 + 17/21$$

By taking LCM for 7, 9 and 21 we get, 63

$$(-9 \times 9)/(7 \times 9) + (-8 \times 7)/(9 \times 7) + (17 \times 3)/(21 \times 3)$$

$$-81/63 + -56/63 + 51/63$$

Since the denominators are same can be added directly

$$(-81+(-56)+51)/63 = (-81-56+51)/63 = -86/63$$

6. Re-arrange suitably and find the sum in each of the following:

(i) $11/12 + -17/3 + 11/2 + -25/2$

Solution: Firstly group the rational numbers with same denominators

$$11/12 + -17/3 + (11-25)/2$$

$$11/12 + -17/3 + -14/2$$

By taking LCM for 12, 3 and 2 we get, 12

$$(11 \times 1)/(12 \times 1) + (-17 \times 4)/(3 \times 4) + (-14 \times 6)/(2 \times 6)$$

$$11/12 + -68/12 + -84/12$$

Since the denominators are same can be added directly

$$(11-68-84)/12 = -141/12$$

(ii) $-6/7 + -5/6 + -4/9 + -15/7$

Solution: Firstly group the rational numbers with same denominators

$$-6/7 + -15/7 + -5/6 + -4/9$$

$$(-6-15)/7 + -5/6 + -4/9$$

$$-21/7 + -5/6 + -4/9$$

$$-3/1 + -5/6 + -4/9$$

By taking LCM for 1, 6 and 9 we get, 18

$$(-3 \times 18)/(1 \times 18) + (-5 \times 3)/(6 \times 3) + (-4 \times 2)/(9 \times 2)$$

$$-54/18 + -15/18 + -8/18$$

Since the denominators are same can be added directly

$$(-54-15-8)/18 = -77/18$$

(iii) $3/5 + 7/3 + 9/5 + -13/15 + -7/3$

Solution: Firstly group the rational numbers with same denominators

$$3/5 + 9/5 + 7/3 + -7/3 + -13/15$$

$$(3+9)/5 + -13/15$$

$$12/5 + -13/15$$

By taking LCM for 5 and 15 we get, 15

$$(12 \times 3)/(5 \times 3) + (-13 \times 1)/(15 \times 1)$$

$$36/15 + -13/15$$

Since the denominators are same can be added directly

$$(36-13)/15 = 23/15$$

(iv) $4/13 + -5/8 + -8/13 + 9/13$

Solution: Firstly group the rational numbers with same denominators

$$4/13 + -8/13 + 9/13 + -5/8$$

$$(4-8+9)/13 + -5/8$$

$$5/13 + -5/8$$

By taking LCM for 13 and 8 we get, 104

$$(5 \times 8)/(13 \times 8) + (-5 \times 13)/(8 \times 13)$$

$$40/104 + -65/104$$

Since the denominators are same can be added directly

$$(40-65)/104 = -25/104$$

(v) $2/3 + -4/5 + 1/3 + 2/5$

Solution: Firstly group the rational numbers with same denominators

$$2/3 + 1/3 + -4/5 + 2/5$$

$$(2+1)/3 + (-4+2)/5$$

$$3/3 + -2/5$$

$$1/1 + -2/5$$

By taking LCM for 1 and 5 we get, 5

$$(1 \times 5)/(1 \times 5) + (-2 \times 1)/(5 \times 1)$$

$$5/5 + -2/5$$

Since the denominators are same can be added directly

$$(5-2)/5 = 3/5$$

(vi) $\frac{1}{8} + \frac{5}{12} + \frac{2}{7} + \frac{7}{12} + \frac{9}{7} + -\frac{5}{16}$

Solution: Firstly group the rational numbers with same denominators

$$\frac{1}{8} + \frac{5}{12} + \frac{7}{12} + \frac{2}{7} + \frac{9}{7} + -\frac{5}{16}$$

$$\frac{1}{8} + \frac{(5+7)}{12} + \frac{(2+9)}{7} + -\frac{5}{16}$$

$$\frac{1}{8} + \frac{12}{12} + \frac{11}{7} + -\frac{5}{16}$$

$$\frac{1}{8} + \frac{1}{1} + \frac{11}{7} + -\frac{5}{16}$$

By taking LCM for 8, 1, 7 and 16 we get, 112

$$\frac{(1 \times 14)}{(8 \times 14)} + \frac{(1 \times 112)}{(1 \times 112)} + \frac{(11 \times 16)}{(7 \times 16)} + \frac{(-5 \times 7)}{(16 \times 7)}$$

$$\frac{14}{112} + \frac{112}{112} + \frac{176}{112} + -\frac{35}{112}$$

Since the denominators are same can be added directly

$$(14+112+176-35)/112 = 267/112$$

EXERCISE 1.3 PAGE NO: 1.18

1. Subtract the first rational number from the second in each of the following:

(i) $\frac{3}{8}, \frac{5}{8}$

(ii) $-\frac{7}{9}, \frac{4}{9}$

(iii) $-\frac{2}{11}, -\frac{9}{11}$

(iv) $\frac{11}{13}, -\frac{4}{13}$

(v) $\frac{1}{4}, -\frac{3}{8}$

(vi) $-\frac{2}{3}, \frac{5}{6}$

(vii) $-\frac{6}{7}, -\frac{13}{14}$

(viii) $-\frac{8}{33}, -\frac{7}{22}$

Solution:

(i) let us subtract

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

Since the denominators are same we can subtract directly

$$\frac{(5-3)}{8} = \frac{2}{8}$$

Further we can divide by 2 we get,

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

(ii) let us subtract

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

Since the denominators are same we can subtract directly

$$(4+7)/9 = 11/9$$

(iii) let us subtract

$$-9/11 - -2/11$$

Since the denominators are same we can subtract directly

$$(-9+2)/11 = -7/11$$

(iv) let us subtract

$$-4/13 - 11/13$$

Since the denominators are same we can subtract directly

$$(-4-11)/13 = -15/13$$

(v) let us subtract

$$-3/8 - 1/4$$

By taking LCM for 8 and 4 which is 8

$$-3/8 - 1/4 = (-3 \times 1)/(8 \times 1) - (1 \times 2)/(4 \times 2) = -3/8 - 2/8$$

Since the denominators are same we can subtract directly

$$(-3-2)/8 = -5/8$$

(vi) let us subtract

$$5/6 - -2/3$$

By taking LCM for 6 and 3 which is 6

$$5/6 - -2/3 = (5 \times 1)/(6 \times 1) - (-2 \times 2)/(3 \times 2) = 5/6 - -4/6$$

Since the denominators are same we can subtract directly

$$(5+4)/6 = 9/6$$

Further we can divide by 3 we get,

$$9/6 = 3/2$$

(vii) let us subtract

$$-13/14 - -6/7$$

By taking LCM for 14 and 7 which is 14

$$-13/14 - -6/7 = (-13 \times 1)/(14 \times 1) - (-6 \times 2)/(7 \times 2) = -13/14 - -12/14$$

Since the denominators are same we can subtract directly

$$(-13+12)/14 = -1/14$$

(viii) let us subtract

$$-7/22 - -8/33$$

By taking LCM for 22 and 33 which is 66

$$-7/22 - -8/33 = (-7 \times 3)/(22 \times 3) - (-8 \times 2)/(33 \times 2) = -21/66 - -16/66$$

Since the denominators are same we can subtract directly

$$(-21+16)/66 = -5/66$$

2. Evaluate each of the following:

(i) $2/3 - 3/5$

Solution: By taking LCM for 3 and 5 which is 15

$$\begin{aligned} 2/3 - 3/5 &= (2 \times 5 - 3 \times 3)/15 \\ &= 1/15 \end{aligned}$$

(ii) $-4/7 - 2/-3$

Solution: convert the denominator to positive number by multiplying by -1

$$2/-3 = -2/3$$

$$-4/7 - -2/3$$

By taking LCM for 7 and 3 which is 21

$$\begin{aligned} -4/7 - -2/3 &= (-4 \times 3 - -2 \times 7)/21 \\ &= (-12+14)/21 \\ &= 2/21 \end{aligned}$$

(iii) $4/7 - -5/-7$

Solution: convert the denominator to positive number by multiplying by -1

$$-5/-7 = 5/7$$

$$4/7 - 5/7$$

Since the denominators are same we can subtract directly

$$(4-5)/7 = -1/7$$

(iv) $-2 - 5/9$

Solution: By taking LCM for 1 and 9 which is 9

$$\begin{aligned} -2/1 - 5/9 &= (-2 \times 9 - 5 \times 1)/9 \\ &= (-18 - 5)/9 \\ &= -23/9 \end{aligned}$$

(v) $-3/-8 - -2/7$

Solution: convert the denominator to positive number by multiplying by -1

$$-3/-8 = 3/8$$

$$3/8 - -2/7$$

By taking LCM for 8 and 7 which is 56

$$\begin{aligned} 3/8 - -2/7 &= (3 \times 7 - -2 \times 8)/56 \\ &= (21 + 16)/56 \end{aligned}$$

$$= 37/56$$

(vi) $-4/13 - -5/26$

Solution: By taking LCM for 13 and 26 which is 26

$$-4/13 - -5/26 = (-4 \times 2 - -5 \times 1)/26$$

$$= (-8 + 5)/26$$

$$= -3/26$$

(vii) $-5/14 - -2/7$

Solution: By taking LCM for 14 and 7 which is 14

$$-5/14 - -2/7 = (-5 \times 1 - -2 \times 2)/14$$

$$= (-5 + 4)/14$$

$$= -1/14$$

(viii) $13/15 - 12/25$

Solution: By taking LCM for 15 and 25 which is 75

$$13/15 - 12/25 = (13 \times 5 - 12 \times 3)/75$$

$$= (65 - 36)/75$$

$$= 29/75$$

(ix) $-6/13 - -7/13$

Solution: Since the denominators are same we can subtract directly

$$-6/13 - -7/13 = (-6+7)/13$$

$$= 1/13$$

(x) $7/24 - 19/36$

Solution: By taking LCM for 24 and 36 which is 72

$$7/24 - 19/36 = (7 \times 3 - 19 \times 2)/72$$

$$= (21 - 38)/72$$

$$= -17/72$$

(xi) $5/63 - -8/21$

Solution: By taking LCM for 63 and 21 which is 63

$$5/63 - -8/21 = (5 \times 1 - -8 \times 3)/63$$

$$= (5 + 24)/63$$

$$= 29/63$$

3. The sum of the two numbers is $5/9$. If one of the numbers is $1/3$, find the other.

Solution: Let us note down the given details

$$\text{Sum of two numbers} = 5/9$$

One of the number = $1/3$

By using the formula,

Other number = sum of number – given number

$$= 5/9 - 1/3$$

By taking LCM for 9 and 3 which is 9

$$5/9 - 1/3 = (5 \times 1 - 1 \times 3)/9$$

$$= (5 - 3)/9$$

$$= 2/9$$

∴ the other number is $2/9$

4. The sum of the two numbers is $-1/3$. If one of the numbers is $-12/3$, find the other.

Solution: Let us note down the given details

Sum of two numbers = $-1/3$

One of the number = $-12/3$

By using the formula,

Other number = sum of number – given number

$$= -1/3 - -12/3$$

Since the denominators are same we can subtract directly

$$= (-1+12)/3 = 11/3$$

∴ the other number is $11/3$

5. The sum of the two numbers is $-4/3$. If one of the numbers is -5 , find the other.

Solution: Let us note down the given details

Sum of two numbers = $-4/3$

One of the number = $-5/1$

By using the formula,

Other number = sum of number – given number

$$= -4/3 - -5/1$$

By taking LCM for 3 and 1 which is 3

$$-4/3 - -5/1 = (-4 \times 1 - -5 \times 3)/3$$

$$= (-4 + 15)/3$$

$$= 11/3$$

∴ the other number is $11/3$

6. The sum of the two rational numbers is -8 . If one of the numbers is $-15/7$, find the other.

Solution: Let us note down the given details

Sum of two rational numbers = $-8/1$

One of the number = $-15/7$

Let us consider the other number as x

$$x + -15/7 = -8$$

$$(7x - 15)/7 = -8$$

$$7x - 15 = -8 \times 7$$

$$7x - 15 = -56$$

$$7x = -56 + 15$$

$$x = -41/7$$

\therefore the other number is $-41/7$

7. What should be added to $-7/8$ so as to get $5/9$?

Solution: Let us consider a number as x to be added to $-7/8$ to get $5/9$

$$\text{So, } -7/8 + x = 5/9$$

$$(-7 + 8x)/8 = 5/9$$

$$(-7 + 8x) \times 9 = 5 \times 8$$

$$-63 + 72x = 40$$

$$72x = 40 + 63$$

$$x = 103/72$$

\therefore the required number is $103/72$

8. What number should be added to $-5/11$ so as to get $26/33$?

Solution: Let us consider a number as x to be added to $-5/11$ to get $26/33$

$$\text{So, } -5/11 + x = 26/33$$

$$x = 26/33 + 5/11$$

let us take LCM for 33 and 11 which is 33

$$x = (26 \times 1 + 5 \times 3)/33$$

$$= (26 + 15)/33$$

$$= 41/33$$

\therefore the required number is $41/33$

9. What number should be added to $-5/7$ to get $-2/3$?

Solution: Let us consider a number as x to be added to $-5/7$ to get $-2/3$

$$\text{So, } -5/7 + x = -2/3$$

$$x = -2/3 + 5/7$$

let us take LCM for 3 and 7 which is 21

$$\begin{aligned}x &= (-2 \times 7 + 5 \times 3) / 21 \\ &= (-14 + 15) / 21 \\ &= 1 / 21\end{aligned}$$

∴ the required number is $1/21$

10. What number should be subtracted from $-5/3$ to get $5/6$?

Solution: Let us consider a number as x to be subtracted from $-5/3$ to get $5/6$

$$\text{So, } -5/3 - x = 5/6$$

$$x = -5/3 - 5/6$$

let us take LCM for 3 and 6 which is 6

$$x = (-5 \times 2 - 5 \times 1) / 6$$

$$= (-10 - 5) / 6$$

$$= -15/6$$

Further we can divide by 3 we get,

$$-15/6 = -5/2$$

∴ the required number is $-5/2$

11. What number should be subtracted from $3/7$ to get $5/4$?

Solution: Let us consider a number as x to be subtracted from $3/7$ to get $5/4$

$$\text{So, } 3/7 - x = 5/4$$

$$x = 3/7 - 5/4$$

let us take LCM for 7 and 4 which is 28

$$x = (3 \times 4 - 5 \times 7) / 28$$

$$= (12 - 35) / 28$$

$$= -23/28$$

∴ the required number is $-23/28$

12. What should be added to $(2/3 + 3/5)$ to get $-2/15$?

Solution: Let us consider a number as x to be added to $(2/3 + 3/5)$ to get $-2/15$

$$x + (2/3 + 3/5) = -2/15$$

By taking LCM of 3 and 5 which is 15 we get,

$$(15x + 2 \times 5 + 3 \times 3) / 15 = -2/15$$

$$15x + 10 + 9 = -2$$

$$15x = -2 - 19$$

$$x = -21/15$$

Further we can divide by 3 we get,

$$-21/15 = -7/5$$

∴ the required number is $-7/5$

13. What should be added to $(1/2 + 1/3 + 1/5)$ to get 3?

Solution: Let us consider a number as x to be added to $(1/2 + 1/3 + 1/5)$ to get 3

$$x + (1/2 + 1/3 + 1/5) = 3$$

By taking LCM of 2, 3 and 5 which is 30 we get,

$$(30x + 1 \times 15 + 1 \times 10 + 1 \times 6) / 30 = 3$$

$$30x + 15 + 10 + 6 = 3 \times 30$$

$$30x + 31 = 90$$

$$30x = 90 - 31$$

$$x = 59/30$$

∴ the required number is $59/30$

14. What number should be subtracted from $(3/4 - 2/3)$ to get $-1/6$?

Solution: Let us consider a number as x to be subtracted from $(3/4 - 2/3)$ to get $-1/6$

$$\text{So, } (3/4 - 2/3) - x = -1/6$$

$$x = 3/4 - 2/3 + 1/6$$

Let us take LCM for 4 and 3 which is 12

$$x = (3 \times 3 - 2 \times 4) / 12 + 1/6$$

$$= (9 - 8) / 12 + 1/6$$

$$= 1/12 + 1/6$$

Let us take LCM for 12 and 6 which is 12

$$= (1 \times 1 + 1 \times 2) / 12$$

$$= 3/12$$

Further we can divide by 3 we get,

$$3/12 = 1/4 \quad \therefore \text{the required number is } 1/4$$

15. Fill in the blanks:

(i) $-4/13 - 3/26 = \dots$

Solution:

$$-4/13 - 3/26$$

Let us take LCM for 13 and 26 which is 26

$$(-4 \times 2 + 3 \times 1) / 26$$

$$(-8 + 3) / 26 = -5/26$$

(ii) $-9/14 + \dots = -1$

Solution:

Let us consider the number to be added as x

$$-9/14 + x = -1$$

$$x = -1 + 9/14$$

By taking LCM as 14 we get,

$$x = (-1 \times 14 + 9)/14$$

$$= (-14 + 9)/14$$

$$= -5/14$$

(iii) $-7/9 + \dots = 3$

Solution:

Let us consider the number to be added as x

$$-7/9 + x = 3$$

$$x = 3 + 7/9$$

By taking LCM as 9 we get,

$$x = (3 \times 9 + 7)/9$$

$$= (27 + 7)/9$$

$$= 34/9$$

(iv) $\dots + 15/23 = 4$

Solution:

Let us consider the number to be added as x

$$x + 15/23 = 4$$

$$x = 4 - 15/23$$

By taking LCM as 23 we get,

$$x = (4 \times 23 - 15)/23$$

$$= (92 - 15)/23$$

$$= 77/23$$

EXERCISE 1.4 PAGE NO: 1.22

1. Simplify each of the following and write as a rational number of the form p/q:

(i) $3/4 + 5/6 + -7/8$

Solution:

$$3/4 + 5/6 - 7/8$$

By taking LCM for 4, 6 and 8 which is 24

$$((3 \times 6) + (5 \times 4) - (7 \times 3))/24$$

$$(18 + 20 - 21)/24$$

$$(38 - 21)/24$$

$$17/24$$

(ii) $2/3 + -5/6 + -7/9$

Solution:

$$2/3 + -5/6 + -7/9$$

By taking LCM for 3, 6 and 9 which is 18

$$((2 \times 6) + (-5 \times 3) + (-7 \times 2))/18$$

$$(12 - 15 - 14)/18$$

$$-17/18$$

(iii) $-11/2 + 7/6 + -5/8$

Solution:

$$-11/2 + 7/6 + -5/8$$

By taking LCM for 2, 6 and 8 which is 24

$$((-11 \times 12) + (7 \times 4) + (-5 \times 3))/24$$

$$(-132 + 28 - 15)/24$$

$$-119/24$$

(iv) $-4/5 + -7/10 + -8/15$

Solution:

$$-4/5 + -7/10 + -8/15$$

By taking LCM for 5, 10 and 15 which is 30

$$((-4 \times 6) + (-7 \times 3) + (-8 \times 2))/30$$

$$(-24 - 21 - 16)/30$$

$$-61/30$$

(v) $-9/10 + 22/15 + 13/-20$

Solution:

$$-9/10 + 22/15 + 13/-20$$

By taking LCM for 10, 15 and 20 which is 60

$$((-9 \times 6) + (22 \times 4) + (-13 \times 3))/60$$

$$(-54 + 88 - 39)/60$$

$$-5/60 = -1/12$$

(vi) $\frac{5}{3} + \frac{3}{-2} + \frac{-7}{3} + 3$

Solution:

$$\frac{5}{3} + \frac{3}{-2} + \frac{-7}{3} + 3$$

By taking LCM for 3, 2, 3 and 1 which is 6

$$((5 \times 2) + (-3 \times 3) + (-7 \times 2) + (3 \times 6))/6$$

$$(10 - 9 - 14 + 18)/6$$

$$\frac{5}{6}$$

2. Express each of the following as a rational number of the form p/q:

(i) $-\frac{8}{3} + \frac{-1}{4} + \frac{-11}{6} + \frac{3}{8} - 3$

Solution:

$$-\frac{8}{3} + \frac{-1}{4} + \frac{-11}{6} + \frac{3}{8} - 3$$

By taking LCM for 3, 4, 6, 8 and 1 which is 24

$$((-8 \times 8) + (-1 \times 6) + (-11 \times 4) + (3 \times 3) - (3 \times 24))/24$$

$$(-64 - 6 - 44 + 9 - 72)/24$$

$$-177/24$$

Further divide by 3 we get,

$$-177/24 = -59/8$$

(ii) $\frac{6}{7} + 1 + \frac{-7}{9} + \frac{19}{21} + \frac{-12}{7}$

Solution:

$$\frac{6}{7} + 1 + \frac{-7}{9} + \frac{19}{21} + \frac{-12}{7}$$

By taking LCM for 7, 1, 9, 21 and 7 which is 63

$$((6 \times 9) + (1 \times 63) + (-7 \times 7) + (19 \times 3) + (-12 \times 9))/63$$

$$(54 + 63 - 49 + 57 - 108)/63$$

$$\frac{17}{63}$$

(iii) $\frac{15}{2} + \frac{9}{8} + \frac{-11}{3} + 6 + \frac{-7}{6}$

Solution:

$$\frac{15}{2} + \frac{9}{8} + \frac{-11}{3} + 6 + \frac{-7}{6}$$

By taking LCM for 2, 8, 3, 1 and 6 which is 24

$$((15 \times 12) + (9 \times 3) + (-11 \times 8) + (6 \times 24) + (-7 \times 4))/24$$

$$(180 + 27 - 88 + 144 - 28)/24$$

$$\frac{235}{24}$$

(iv) $-\frac{7}{4} + 0 + \frac{-9}{5} + \frac{19}{10} + \frac{11}{14}$

Solution:

$$-7/4 + 0 + -9/5 + 19/10 + 11/14$$

By taking LCM for 4, 5, 10 and 14 which is 140

$$((-7 \times 35) + (-9 \times 28) + (19 \times 14) + (11 \times 10))/140$$

$$(-245 - 252 + 266 + 110)/140$$

$$-121/140$$

$$(v) -7/4 + 5/3 + -1/2 + -5/6 + 2$$

Solution:

$$-7/4 + 5/3 + -1/2 + -5/6 + 2$$

By taking LCM for 4, 3, 2, 6 and 1 which is 12

$$((-7 \times 3) + (5 \times 4) + (-1 \times 6) + (-5 \times 2) + (2 \times 12))/12$$

$$(-21 + 20 - 6 - 10 + 24)/12$$

$$7/12$$

3. Simplify:

$$(i) -3/2 + 5/4 - 7/4$$

Solution:

$$-3/2 + 5/4 - 7/4$$

By taking LCM for 2 and 4 which is 4

$$((-3 \times 2) + (5 \times 1) - (7 \times 1))/4$$

$$(-6 + 5 - 7)/4$$

$$-8/4$$

Further divide by 2 we get,

$$-8/2 = -2$$

$$(ii) 5/3 - 7/6 + -2/3$$

Solution:

$$5/3 - 7/6 + -2/3$$

By taking LCM for 3 and 6 which is 6

$$((5 \times 2) - (7 \times 1) + (-2 \times 2))/6$$

$$(10 - 7 - 4)/6$$

$$-1/6$$

$$(iii) 5/4 - 7/6 - -2/3$$

Solution:

$$5/4 - 7/6 - -2/3$$

By taking LCM for 4, 6 and 3 which is 12

$$((5 \times 3) - (7 \times 2) - (-2 \times 4))/12$$

$$(15 - 14 + 8)/12$$

$$9/12$$

Further can divide by 3 we get,

$$9/12 = 3/4$$

(iv) $-2/5 - 3/10 - 4/7$

Solution:

$$-2/5 - 3/10 - 4/7$$

By taking LCM for 5, 10 and 7 which is 70

$$((-2 \times 14) - (-3 \times 7) - (-4 \times 10))/70$$

$$(-28 + 21 + 40)/70$$

$$33/70$$

(v) $5/6 + -2/5 - 2/15$

Solution:

$$5/6 + -2/5 - 2/15$$

By taking LCM for 6, 5 and 15 which is 30

$$((5 \times 5) + (-2 \times 6) - (-2 \times 2))/30$$

$$(25 - 12 + 4)/30$$

$$17/30$$

(vi) $3/8 - 2/9 + 5/36$

Solution:

$$3/8 - 2/9 + 5/36$$

By taking LCM for 8, 9 and 36 which is 72

$$((3 \times 9) - (-2 \times 8) + (-5 \times 2))/72$$

$$(27 + 16 - 10)/72$$

$$33/72$$

Further can divide by 3 we get,

$$33/72 = 11/24$$

EXERCISE 1.5 PAGE NO: 1.25

1. Multiply:

(i) $7/11$ by $5/4$

Solution:

$7/11$ by $5/4$

$$\begin{aligned}(7/11) \times (5/4) &= (7 \times 5)/(11 \times 4) \\ &= 35/44\end{aligned}$$

(ii) $5/7$ by $-3/4$

Solution:

$5/7$ by $-3/4$

$$\begin{aligned}(5/7) \times (-3/4) &= (5 \times -3)/(7 \times 4) \\ &= -15/28\end{aligned}$$

(iii) $-2/9$ by $5/11$

Solution:

$-2/9$ by $5/11$

$$\begin{aligned}(-2/9) \times (5/11) &= (-2 \times 5)/(9 \times 11) \\ &= -10/99\end{aligned}$$

(iv) $-3/17$ by $-5/4$

Solution:

$-3/17$ by $-5/4$

$$\begin{aligned}(-3/17) \times (-5/4) &= (-3 \times -5)/(17 \times 4) \\ &= 15/68 \\ &= -15/68\end{aligned}$$

(v) $9/7$ by $36/11$

Solution:

$9/7$ by $36/11$

$$\begin{aligned}(9/7) \times (36/11) &= (9 \times 36)/(7 \times 11) \\ &= 324/77\end{aligned}$$

(vi) $-11/13$ by $-21/7$

Solution:

$-11/13$ by $-21/7$

$$\begin{aligned}(-11/13) \times (-21/7) &= (-11 \times -21)/(13 \times 7) \\ &= 231/91 = 33/13\end{aligned}$$

(vii) $-3/5$ by $-4/7$

Solution:

$-3/5$ by $-4/7$

$$\begin{aligned}(-3/5) \times (-4/7) &= (-3 \times -4)/(5 \times 7) \\ &= 12/35\end{aligned}$$

(viii) -15/11 by 7

Solution:

-15/11 by 7

$$\begin{aligned}(-15/11) \times 7 &= (-15 \times 7)/11 \\ &= -105/11\end{aligned}$$

2. Multiply:

(i) -5/17 by 51/-60

Solution:

-5/17 by 51/-60

$$\begin{aligned}(-5/17) \times (51/-60) &= (-5 \times 51)/(17 \times -60) \\ &= -255/-1020\end{aligned}$$

Further can divide by 255 we get,

$$-255/-1020 = 1/4$$

(ii) -6/11 by -55/36

Solution:

-6/11 by -55/36

$$\begin{aligned}(-6/11) \times (-55/36) &= (-6 \times -55)/(11 \times 36) \\ &= 330/396\end{aligned}$$

Further can divide by 66 we get,

$$330/396 = 5/6$$

(iii) -8/25 by -5/16

Solution:

-8/25 by -5/16

$$\begin{aligned}(-8/25) \times (-5/16) &= (-8 \times -5)/(25 \times 16) \\ &= 40/400\end{aligned}$$

Further can divide by 40 we get,

$$40/400 = 1/10$$

(iv) 6/7 by -49/36

Solution:

6/7 by -49/36

$$(6/7) \times (-49/36) = (6 \times -49)/(7 \times 36)$$

$$= 294/252$$

Further can divide by 42 we get,

$$294/252 = -7/6$$

(v) $8/-9$ by $-7/-16$

Solution:

$8/-9$ by $-7/-16$

$$(8/-9) \times (-7/-16) = (8 \times -7)/(-9 \times -16)$$

$$= -56/144$$

Further can divide by 8 we get,

$$-56/144 = -7/18$$

(vi) $-8/9$ by $3/64$

Solution:

$-8/9$ by $3/64$

$$(-8/9) \times (3/64) = (-8 \times 3)/(9 \times 64)$$

$$= -24/576$$

Further can divide by 24 we get,

$$-24/576 = -1/24$$

3. Simplify each of the following and express the result as a rational number in standard form:

(i) $(-16/21) \times (14/5)$

Solution:

$$(-16/21) \times (14/5) = (-16/3) \times (2/5) \text{ (divisible by 7)}$$

$$= (-16 \times 2)/(3 \times 5)$$

$$= -32/15$$

(ii) $(7/6) \times (-3/28)$

Solution:

$$(7/6) \times (-3/28) = (1/2) \times (-1/4) \text{ (divisible by 7 and 3)}$$

$$= -1/8$$

(iii) $(-19/36) \times 16$

Solution:

$$-19/36 \times 16 = (-19/9) \times 4 \text{ (divisible by 4)}$$

$$= (-19 \times 4)/9 = -76/9$$

(iv) $(-13/9) \times (27/-26)$

Solution:

$$\begin{aligned}(-13/9) \times (27/-26) &= (-1/1) \times (3/-2) \text{ (divisible by 13 and 9)} \\ &= -3/-2 = 3/2\end{aligned}$$

(v) $(-9/16) \times (-64/-27)$

Solution:

$$\begin{aligned}(-9/16) \times (-64/-27) &= (-1/1) \times (-4/-3) \text{ (divisible by 9 and 16)} \\ &= 4/-3 = -4/3\end{aligned}$$

(vi) $(-50/7) \times (14/3)$

Solution:

$$\begin{aligned}(-50/7) \times (14/3) &= (-50/1) \times (2/3) \text{ (divisible by 7)} \\ &= (-50 \times 2)/(1 \times 3) \\ &= -100/3\end{aligned}$$

(vii) $(-11/9) \times (-81/-88)$

Solution:

$$\begin{aligned}(-11/9) \times (-81/-88) &= (-1/1) \times (-9/-8) \text{ (divisible by 11 and 9)} \\ &= (-1 \times -9)/(1 \times -8) \\ &= 9/-8 = -9/8\end{aligned}$$

(viii) $(-5/9) \times (72/-25)$

Solution:

$$\begin{aligned}(-5/9) \times (72/-25) &= (-1/1) \times (8/-5) \text{ (divisible by 5 and 9)} \\ &= (-1 \times 8)/(1 \times -5) \\ &= -8/-5 = 8/5\end{aligned}$$

4. Simplify:

(i) $((25/8) \times (2/5)) - ((3/5) \times (-10/9))$

Solution:

$$\begin{aligned}((25/8) \times (2/5)) - ((3/5) \times (-10/9)) &= (25 \times 2)/(8 \times 5) - (3 \times -10)/(5 \times 9) \\ &= 50/40 - -30/45 \\ &= 5/4 + 2/3 \text{ (divisible by 5 and 3)}\end{aligned}$$

By taking LCM for 4 and 3 which is 12

$$\begin{aligned}&= ((5 \times 3) + (2 \times 4))/12 \\ &= (15+8)/12 \\ &= 23/12\end{aligned}$$

(ii) $((1/2) \times (1/4)) + ((1/2) \times 6)$

Solution:

$$\left(\frac{1}{2} \times \frac{1}{4}\right) + \left(\frac{1}{2} \times 6\right) = \frac{(1 \times 1)}{(2 \times 4)} + (1 \times 3) \text{ (divisible by 2)}$$
$$= \frac{1}{8} + 3$$

By taking LCM for 8 and 1 which is 8

$$= \frac{(1 \times 1) + (3 \times 8)}{8}$$
$$= \frac{(1 + 24)}{8}$$
$$= \frac{25}{8}$$

(iii) $(-5 \times \frac{2}{15}) - (-6 \times \frac{2}{9})$

Solution:

$$(-5 \times \frac{2}{15}) - (-6 \times \frac{2}{9}) = (-1 \times \frac{2}{3}) - (-2 \times \frac{2}{3}) \text{ (divisible by 5 and 3)}$$
$$= (-\frac{2}{3}) + (\frac{4}{3})$$

Since the denominators are same we can add directly

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

(iv) $(-\frac{9}{4} \times \frac{5}{3}) + (\frac{13}{2} \times \frac{5}{6})$

Solution:

$$\left(-\frac{9}{4} \times \frac{5}{3}\right) + \left(\frac{13}{2} \times \frac{5}{6}\right) = \frac{-9 \times 5}{4 \times 3} + \frac{13 \times 5}{2 \times 6}$$
$$= -\frac{45}{12} + \frac{65}{12}$$

Since the denominators are same we can add directly

$$= \frac{-45 + 65}{12}$$
$$= \frac{20}{12} \text{ (divisible by 2)}$$
$$= \frac{10}{6} \text{ (divisible by 2)}$$
$$= \frac{5}{3}$$

(v) $(-\frac{4}{3} \times \frac{12}{-5}) + (\frac{3}{7} \times \frac{21}{15})$

Solution:

$$\left(-\frac{4}{3} \times \frac{12}{-5}\right) + \left(\frac{3}{7} \times \frac{21}{15}\right) = \left(-\frac{4}{1} \times \frac{4}{-5}\right) + \left(\frac{1}{1} \times \frac{3}{5}\right) \text{ (divisible by 3, 7)}$$
$$= \frac{-4 \times 4}{1 \times -5} + \frac{1 \times 3}{1 \times 5}$$
$$= -\frac{16}{-5} + \frac{3}{5}$$

Since the denominators are same we can add directly

$$= \frac{(16 + 3)}{5}$$
$$= \frac{19}{5}$$

(vi) $(\frac{13}{5} \times \frac{8}{3}) - (-\frac{5}{2} \times \frac{11}{3})$

Solution:

$$\left(\frac{13}{5} \times \frac{8}{3}\right) - \left(\frac{-5}{2} \times \frac{11}{3}\right) = \frac{(13 \times 8)}{(5 \times 3)} - \frac{(-5 \times 11)}{(2 \times 3)}$$

$$= 104/15 + 55/6$$

By taking LCM for 15 and 6 which is 30

$$= \frac{((104 \times 2) + (55 \times 5))}{30}$$

$$= \frac{(208 + 275)}{30}$$

$$= 483/30$$

(vii) $\left(\frac{13}{7} \times \frac{11}{26}\right) - \left(\frac{-4}{3} \times \frac{5}{6}\right)$

Solution:

$$\left(\frac{13}{7} \times \frac{11}{26}\right) - \left(\frac{-4}{3} \times \frac{5}{6}\right) = \left(\frac{1}{7} \times \frac{11}{2}\right) - \left(\frac{-2}{3} \times \frac{5}{3}\right) \text{ (divisible by 13, 2)}$$

$$= \frac{(1 \times 11)}{(7 \times 2)} - \frac{(-2 \times 5)}{(3 \times 3)}$$

$$= 11/14 + 10/9$$

By taking LCM for 14 and 9 which is 126

$$= \frac{((11 \times 9) + (10 \times 14))}{126}$$

$$= \frac{(99 + 140)}{126}$$

$$= 239/126$$

(viii) $\left(\frac{8}{5} \times \frac{-3}{2}\right) + \left(\frac{-3}{10} \times \frac{11}{16}\right)$

Solution:

$$\left(\frac{8}{5} \times \frac{-3}{2}\right) + \left(\frac{-3}{10} \times \frac{11}{16}\right) = \left(\frac{4}{5} \times \frac{-3}{1}\right) + \left(\frac{-3}{10} \times \frac{11}{16}\right) \text{ (divisible by 2)}$$

$$= \frac{(4 \times -3)}{(5 \times 1)} + \frac{(-3 \times 11)}{(10 \times 16)}$$

$$= -12/5 - 33/160$$

By taking LCM for 5 and 160 which is 160

$$= \frac{((-12 \times 32) - (33 \times 1))}{160}$$

$$= \frac{(-384 - 33)}{160}$$

$$= -417/160$$

5. Simplify:

(i) $\left(\frac{3}{2} \times \frac{1}{6}\right) + \left(\frac{5}{3} \times \frac{7}{2}\right) - \left(\frac{13}{8} \times \frac{4}{3}\right)$

Solution:

$$\left(\frac{3}{2} \times \frac{1}{6}\right) + \left(\frac{5}{3} \times \frac{7}{2}\right) - \left(\frac{13}{8} \times \frac{4}{3}\right) =$$

$$\left(\frac{1}{2} \times \frac{1}{2}\right) + \left(\frac{5}{3} \times \frac{7}{2}\right) - \left(\frac{13}{2} \times \frac{1}{3}\right)$$

$$\frac{(1 \times 1)}{(2 \times 2)} + \frac{(5 \times 7)}{(3 \times 2)} - \frac{(13 \times 1)}{(2 \times 3)}$$

$$1/4 + 35/6 - 13/6$$

By taking LCM for 4 and 6 which is 24

$$\frac{((1 \times 6) + (35 \times 4) - (13 \times 4))}{24}$$

$$(6 + 140 - 52)/24$$

$$94/24$$

Further divide by 2 we get, $94/24 = 47/12$

$$(ii) ((1/4) \times (2/7)) - ((5/14) \times (-2/3) + (3/7) \times (9/2))$$

Solution:

$$((1/4) \times (2/7)) - ((5/14) \times (-2/3) + (3/7) \times (9/2)) =$$

$$((1/2) \times (1/7)) - ((5/7) \times (-1/3) + (3/7) \times (9/2))$$

$$(1 \times 1)/(2 \times 7) - (5 \times -1)/(7 \times 3) + (3 \times 9)/(7 \times 2)$$

$$1/14 + 5/21 + 27/14$$

By taking LCM for 14 and 21 which is 42

$$((1 \times 3) + (5 \times 2) + (27 \times 3))/42$$

$$(3 + 10 + 81)/42$$

$$94/42$$

Further divide by 2 we get, $94/42 = 47/21$

$$(iii) ((13/9) \times (-15/2)) + ((7/3) \times (8/5) + (3/5) \times (1/2))$$

Solution:

$$((13/9) \times (-15/2)) + ((7/3) \times (8/5) + (3/5) \times (1/2)) =$$

$$(13 \times -5)/(3 \times 2) + (7 \times 8)/(3 \times 5) + (3 \times 1)/(5 \times 2)$$

$$-65/6 + 56/15 + 3/10$$

By taking LCM for 6, 15 and 10 which is 30

$$((-65 \times 5) + (56 \times 2) + (3 \times 3))/30$$

$$(-325 + 112 + 9)/30$$

$$-204/30$$

Further divide by 2 we get, $-204/30 = -102/15$

$$(iv) ((3/11) \times (5/6)) - ((9/12) \times (4/3) + (5/13) \times (6/15))$$

Solution:

$$((3/11) \times (5/6)) - ((9/12) \times (4/3) + (5/13) \times (6/15)) =$$

$$((1/11) \times (5/2)) - ((1/1) \times (1/1) + (1/13) \times (2/1))$$

$$(1 \times 5)/(11 \times 2) - 1/1 + (1 \times 2)/(13 \times 1)$$

$$5/22 - 1/1 + 2/13$$

By taking LCM for 22, 1 and 13 which is 286

$$((5 \times 13) - (1 \times 286) + (2 \times 22))/286$$

$$(65 - 286 + 44)/286$$

EXERCISE 1.6 PAGE NO: 1.31

1. Verify the property: $x \times y = y \times x$ by taking:

(i) $x = -1/3, y = 2/7$

Solution:

By using the property

$$x \times y = y \times x$$

$$-1/3 \times 2/7 = 2/7 \times -1/3$$

$$(-1 \times 2)/(3 \times 7) = (2 \times -1)/(7 \times 3)$$

$$-2/21 = -2/21$$

Hence, the property is satisfied.

(ii) $x = -3/5, y = -11/13$

Solution:

By using the property

$$x \times y = y \times x$$

$$-3/5 \times -11/13 = -11/13 \times -3/5$$

$$(-3 \times -11)/(5 \times 13) = (-11 \times -3)/(13 \times 5)$$

$$33/65 = 33/65$$

Hence, the property is satisfied.

(iii) $x = 2, y = 7/-8$

Solution:

By using the property

$$x \times y = y \times x$$

$$2 \times 7/-8 = 7/-8 \times 2$$

$$(2 \times 7)/-8 = (7 \times 2)/-8$$

$$14/-8 = 14/-8$$

$$-14/8 = -14/8$$

Hence, the property is satisfied.

(iv) $x = 0, y = -15/8$

Solution:

By using the property

$$x \times y = y \times x$$

$$0 \times -15/8 = -15/8 \times 0$$

$$0 = 0$$

Hence, the property is satisfied.

2. Verify the property: $x \times (y \times z) = (x \times y) \times z$ by taking:

(i) $x = -7/3, y = 12/5, z = 4/9$

Solution:

By using the property

$$x \times (y \times z) = (x \times y) \times z$$

$$-7/3 \times (12/5 \times 4/9) = (-7/3 \times 12/5) \times 4/9$$

$$(-7 \times 12 \times 4) / (3 \times 5 \times 9) = (-7 \times 12 \times 4) / (3 \times 5 \times 9)$$

$$-336/135 = -336/135$$

Hence, the property is satisfied.

(ii) $x = 0, y = -3/5, z = -9/4$

Solution:

By using the property

$$x \times (y \times z) = (x \times y) \times z$$

$$0 \times (-3/5 \times -9/4) = (0 \times -3/5) \times -9/4$$

$$0 = 0$$

Hence, the property is satisfied.

(iii) $x = 1/2, y = 5/-4, z = -7/5$

Solution:

By using the property

$$x \times (y \times z) = (x \times y) \times z$$

$$1/2 \times (5/-4 \times -7/5) = (1/2 \times 5/-4) \times -7/5$$

$$(1 \times 5 \times -7) / (2 \times -4 \times 5) = (1 \times 5 \times -7) / (2 \times -4 \times 5)$$

$$-35/-40 = -35/-40$$

$$35/40 = 35/40$$

Hence, the property is satisfied.

(iv) $x = 5/7, y = -12/13, z = -7/18$

Solution:

By using the property

$$x \times (y \times z) = (x \times y) \times z$$

$$5/7 \times (-12/13 \times -7/18) = (5/7 \times -12/13) \times -7/18$$

$$(5 \times -12 \times -7) / (7 \times 13 \times 18) = (5 \times -12 \times -7) / (7 \times 13 \times 18)$$

$$420/1638 = 420/1638$$

Hence, the property is satisfied.

3. Verify the property: $x \times (y + z) = x \times y + x \times z$ by taking:

(i) $x = -3/7$, $y = 12/13$, $z = -5/6$

Solution:

By using the property

$$x \times (y + z) = x \times y + x \times z$$

$$-3/7 \times (12/13 + -5/6) = -3/7 \times 12/13 + -3/7 \times -5/6$$

$$-3/7 \times ((12 \times 6) + (-5 \times 13)) / 78 = (-3 \times 12) / (7 \times 13) + (-3 \times -5) / (7 \times 6)$$

$$-3/7 \times (72 - 65) / 78 = -36/91 + 15/42$$

$$-3/7 \times 7/78 = (-36 \times 6 + 15 \times 13) / 546$$

$$-1/26 = (196 - 216) / 546$$

$$= -21/546$$

$$= -1/26$$

Hence, the property is verified.

(ii) $x = -12/5$, $y = -15/4$, $z = 8/3$

Solution:

By using the property

$$x \times (y + z) = x \times y + x \times z$$

$$-12/5 \times (-15/4 + 8/3) = -12/5 \times -15/4 + -12/5 \times 8/3$$

$$-12/5 \times ((-15 \times 3) + (8 \times 4)) / 12 = (-12 \times -15) / (5 \times 4) + (-12 \times 8) / (5 \times 3)$$

$$-12/5 \times (-45 + 32) / 12 = 180/20 - 96/15$$

$$-12/5 \times -13/12 = 9 - 32/5$$

$$13/5 = (9 \times 5 - 32 \times 1) / 5$$

$$= (45 - 32) / 5$$

$$= 13/5$$

Hence, the property is verified.

(iii) $x = -8/3$, $y = 5/6$, $z = -13/12$

Solution:

By using the property

$$x \times (y + z) = x \times y + x \times z$$

$$\begin{aligned}
& -8/3 \times (5/6 + -13/12) = -8/3 \times 5/6 + -8/3 \times -13/12 \\
& -8/3 \times ((5 \times 2) - (13 \times 1))/12 = (-8 \times 5)/(3 \times 6) + (-8 \times -13)/(3 \times 12) \\
& -8/3 \times (10 - 13)/12 = -40/18 + 104/36 \\
& -8/3 \times -3/12 = (-40 \times 2 + 104 \times 1)/36 \\
& 2/3 = (-80 + 104)/36 \\
& = 24/36 \\
& = 2/3
\end{aligned}$$

Hence, the property is verified.

(iv) $x = -3/4, y = -5/2, z = 7/6$

Solution:

By using the property

$$\begin{aligned}
& x \times (y + z) = x \times y + x \times z \\
& -3/4 \times (-5/2 + 7/6) = -3/4 \times -5/2 + -3/4 \times 7/6 \\
& -3/4 \times ((-5 \times 3) + (7 \times 1))/6 = (-3 \times -5)/(4 \times 2) + (-3 \times 7)/(4 \times 6) \\
& -3/4 \times (-15 + 7)/6 = 15/8 - 21/24 \\
& -3/4 \times -8/6 = (15 \times 3 - 21 \times 1)/24 \\
& -3/4 \times -4/3 = (45 - 21)/24 \\
& 1 = 24/24 \\
& = 1
\end{aligned}$$

Hence, the property is verified.

4. Use the distributivity of multiplication of rational numbers over their addition to simplify:

(i) $3/5 \times ((35/24) + (10/1))$

Solution:

$$\begin{aligned}
& 3/5 \times 35/24 + 3/5 \times 10 \\
& 1/1 \times 7/8 + 6/1
\end{aligned}$$

By taking LCM for 8 and 1 which is 8

$$\begin{aligned}
& 7/8 + 6 = (7 \times 1 + 6 \times 8)/8 \\
& = (7 + 48)/8 \\
& = 55/8
\end{aligned}$$

(ii) $-5/4 \times ((8/5) + (16/5))$

Solution:

$$\begin{aligned}
& -5/4 \times 8/5 + -5/4 \times 16/5 \\
& -1/1 \times 2/1 + -1/1 \times 4/1
\end{aligned}$$

$$-2 + -4$$

$$-2 - 4$$

$$-6$$

$$\text{(iii) } 2/7 \times ((7/16) - (21/4))$$

Solution:

$$2/7 \times 7/16 - 2/7 \times 21/4$$

$$1/1 \times 1/8 - 1/1 \times 3/2$$

$$1/8 - 3/2$$

By taking LCM for 8 and 2 which is 8

$$1/8 - 3/2 = (1 \times 1 - 3 \times 4)/8$$

$$= (1 - 12)/8$$

$$= -11/8$$

$$\text{(iv) } 3/4 \times ((8/9) - 40)$$

Solution:

$$3/4 \times 8/9 - 3/4 \times 40$$

$$1/1 \times 2/3 - 3/1 \times 10$$

$$2/3 - 30/1$$

By taking LCM for 3 and 1 which is 3

$$2/3 - 30/1 = (2 \times 1 - 30 \times 3)/3$$

$$= (2 - 90)/3$$

$$= -88/3$$

5. Find the multiplicative inverse (reciprocal) of each of the following rational numbers:

(i) 9

(ii) -7

(iii) 12/5

(iv) -7/9

(v) -3/-5

(vi) 2/3 \times 9/4

(vii) -5/8 \times 16/15

(viii) -2 \times -3/5

(ix) -1

(x) 0/3

(xi) 1

Solution:

(i) The reciprocal of 9 is $1/9$

(ii) The reciprocal of -7 is $-1/7$

(iii) The reciprocal of $12/5$ is $5/12$

(iv) The reciprocal of $-7/9$ is $9/-7$

(v) The reciprocal of $-3/-5$ is $5/3$

(vi) The reciprocal of $2/3 \times 9/4$ is

Firstly solve for $2/3 \times 9/4 = 1/1 \times 3/2 = 3/2$

\therefore The reciprocal of $3/2$ is $2/3$

(vii) The reciprocal of $-5/8 \times 16/15$

Firstly solve for $-5/8 \times 16/15 = -1/1 \times 2/3 = -2/3$

\therefore The reciprocal of $-2/3$ is $3/-2$

(viii) The reciprocal of $-2 \times -3/5$

Firstly solve for $-2 \times -3/5 = 6/5$

\therefore The reciprocal of $6/5$ is $5/6$

(ix) The reciprocal of -1 is -1

(x) The reciprocal of $0/3$ does not exist

(xi) The reciprocal of 1 is 1

6. Name the property of multiplication of rational numbers illustrated by the following statements:

(i) $-5/16 \times 8/15 = 8/15 \times -5/16$

(ii) $-17/5 \times 9 = 9 \times -17/5$

(iii) $7/4 \times (-8/3 + -13/12) = 7/4 \times -8/3 + 7/4 \times -13/12$

(iv) $-5/9 \times (4/15 \times -9/8) = (-5/9 \times 4/15) \times -9/8$

(v) $13/-17 \times 1 = 13/-17 = 1 \times 13/-17$

(vi) $-11/16 \times 16/-11 = 1$

(vii) $2/13 \times 0 = 0 = 0 \times 2/13$

(viii) $-3/2 \times 5/4 + -3/2 \times -7/6 = -3/2 \times (5/4 + -7/6)$

Solution:

(i) $-5/16 \times 8/15 = 8/15 \times -5/16$

According to commutative law, $a/b \times c/d = c/d \times a/b$

The above rational number satisfies commutative property.

(ii) $-17/5 \times 9 = 9 \times -17/5$

According to commutative law, $a/b \times c/d = c/d \times a/b$

The above rational number satisfies commutative property.

$$(iii) 7/4 \times (-8/3 + -13/12) = 7/4 \times -8/3 + 7/4 \times -13/12$$

According to given rational number, $a/b \times (c/d + e/f) = (a/b \times c/d) + (a/b \times e/f)$

Distributivity of multiplication over addition satisfies.

$$(iv) -5/9 \times (4/15 \times -9/8) = (-5/9 \times 4/15) \times -9/8$$

According to associative law, $a/b \times (c/d \times e/f) = (a/b \times c/d) \times e/f$

The above rational number satisfies associativity of multiplication.

$$(v) 13/-17 \times 1 = 13/-17 = 1 \times 13/-17$$

Existence of identity for multiplication satisfies for the given rational number.

$$(vi) -11/16 \times 16/-11 = 1$$

Existence of multiplication inverse satisfies for the given rational number.

$$(vii) 2/13 \times 0 = 0 = 0 \times 2/13$$

By using $a/b \times 0 = 0 \times a/b$

Multiplication of zero satisfies for the given rational number.

$$(viii) -3/2 \times 5/4 + -3/2 \times -7/6 = -3/2 \times (5/4 + -7/6)$$

According to distributive law, $(a/b \times c/d) + (a/b \times e/f) = a/b \times (c/d + e/f)$

The above rational number satisfies distributive law.

7. Fill in the blanks:

- (i) The product of two positive rational numbers is always...
- (ii) The product of a positive rational number and a negative rational number is always....
- (iii) The product of two negative rational numbers is always...
- (iv) The reciprocal of a positive rational numbers is...
- (v) The reciprocal of a negative rational numbers is...
- (vi) Zero has Reciprocal.
- (vii) The product of a rational number and its reciprocal is...
- (viii) The numbers ... and ... are their own reciprocals.
- (ix) If a is reciprocal of b, then the reciprocal of b is.
- (x) The number 0 is ... the reciprocal of any number.
- (xi) reciprocal of $1/a$, $a \neq 0$ is ...
- (xii) $(17 \times 12)^{-1} = 17^{-1} \times \dots$

Solution:

- (i) The product of two positive rational numbers is always positive.

- (ii) The product of a positive rational number and a negative rational number is always negative.
- (iii) The product of two negative rational numbers is always positive.
- (iv) The reciprocal of a positive rational numbers is positive.
- (v) The reciprocal of a negative rational numbers is negative.
- (vi) Zero has no Reciprocal.
- (vii) The product of a rational number and its reciprocal is 1.
- (viii) The numbers 1 and -1 are their own reciprocals.
- (ix) If a is reciprocal of b, then the reciprocal of b is a.
- (x) The number 0 is not the reciprocal of any number.
- (xi) reciprocal of $1/a$, $a \neq 0$ is a.
- (xii) $(17 \times 12)^{-1} = 17^{-1} \times 12^{-1}$

8. Fill in the blanks:

(i) $-4 \times 7/9 = 7/9 \times \dots$

Solution:

$$-4 \times 7/9 = 7/9 \times -4$$

By using commutative property.

(ii) $5/11 \times -3/8 = -3/8 \times \dots$

Solution:

$$5/11 \times -3/8 = -3/8 \times 5/11$$

By using commutative property.

(iii) $1/2 \times (3/4 + -5/12) = 1/2 \times \dots + \dots \times -5/12$

Solution:

$$1/2 \times (3/4 + -5/12) = 1/2 \times 3/4 + 1/2 \times -5/12$$

By using distributive property.

(iv) $-4/5 \times (5/7 + -8/9) = (-4/5 \times \dots) + -4/5 \times -8/9$

Solution:

$$-4/5 \times (5/7 + -8/9) = (-4/5 \times 5/7) + -4/5 \times -8/9$$

By using distributive property.

EXERCISE 1.7 PAGE NO: 1.35

1. Divide:

(i) 1 by $1/2$

Solution:

$$1/1/2 = 1 \times 2/1 = 2$$

(ii) 5 by -5/7

Solution:

$$5/-5/7 = 5 \times 7/-5 = -7$$

(iii) -3/4 by 9/-16

Solution:

$$(-3/4) / (9/-16)$$

$$(-3/4) \times -16/9 = 4/3$$

(iv) -7/8 by -21/16

Solution:

$$(-7/8) / (-21/16)$$

$$(-7/8) \times 16/-21 = 2/3$$

(v) 7/-4 by 63/64

Solution:

$$(7/-4) / (63/64)$$

$$(7/-4) \times 64/63 = -16/9$$

(vi) 0 by -7/5

Solution:

$$0 / (7/5) = 0$$

(vii) -3/4 by -6

Solution:

$$(-3/4) / -6$$

$$(-3/4) \times 1/-6 = 1/8$$

(viii) 2/3 by -7/12

Solution:

$$(2/3) / (-7/12)$$

$$(2/3) \times 12/-7 = -8/7$$

(ix) -4 by -3/5

Solution:

$$-4 / (-3/5)$$

$$-4 \times 5/-3 = 20/3$$

(x) -3/13 by -4/65

Solution:

$$(-3/13) / (-4/65)$$

$$(-3/13) \times (65/-4) = 15/4$$

2. Find the value and express as a rational number in standard form:

(i) $2/5 \div 26/15$

Solution:

$$(2/5) / (26/15)$$

$$(2/5) \times (15/26)$$

$$(2/1) \times (3/26) = (2 \times 3) / (1 \times 26) = 6/26 = 3/13$$

(ii) $10/3 \div -35/12$

Solution:

$$(10/3) / (-35/12)$$

$$(10/3) \times (12/-35)$$

$$(10/1) \times (4/-35) = (10 \times 4) / (1 \times -35) = -40/35 = -8/7$$

(iii) $-6 \div -8/17$

Solution:

$$-6 / (-8/17)$$

$$-6 \times (17/-8)$$

$$-3 \times (17/-4) = (-3 \times 17) / (1 \times -4) = 51/4$$

(iv) $-40/99 \div -20$

Solution:

$$(-40/99) / -20$$

$$(-40/99) \times (1/-20)$$

$$(-2/99) \times (1/-1) = (-2 \times 1) / (99 \times -1) = 2/99$$

(v) $-22/27 \div -110/18$

Solution:

$$(-22/27) / (-110/18)$$

$$(-22/27) \times (18/-110)$$

$$(-1/9) \times (6/-5)$$

$$(-1/3) \times (2/-5) = (-1 \times 2) / (3 \times -5) = 2/15$$

(vi) $-36/125 \div -3/75$

Solution:

$$(-36/125) / (-3/75)$$

$$(-36/125) \times (75/-3)$$

$$(-12/25) \times (15/-1)$$

$$(-12/5) \times (3/-1) = (-12 \times 3) / (5 \times -1) = 36/5$$

3. The product of two rational numbers is 15. If one of the numbers is -10, find the other.

Solution:

We know that the product of two rational numbers = 15

One of the number = -10

\therefore other number can be obtained by dividing the product by the given number.

Other number = $15/-10$

$$= -3/2$$

4. The product of two rational numbers is -8/9. If one of the numbers is -4/15, find the other.

Solution:

We know that the product of two rational numbers = -8/9

One of the number = -4/15

\therefore other number is obtained by dividing the product by the given number.

Other number = $(-8/9)/(-4/15)$

$$= (-8/9) \times (15/-4)$$

$$= (-2/3) \times (5/-1)$$

$$= (-2 \times 5) / (3 \times -1)$$

$$= -10/-3$$

$$= 10/3$$

5. By what number should we multiply -1/6 so that the product may be -23/9?

Solution:

Let us consider a number = x

$$\text{So, } x \times -1/6 = -23/9$$

$$x = (-23/9)/(-1/6)$$

$$x = (-23/9) \times (6/-1)$$

$$= (-23/3) \times (2 \times -1)$$

$$= (-23 \times -2)/(3 \times 1)$$

$$= 46/3$$

6. By what number should we multiply -15/28 so that the product may be -5/7?

Solution:

Let us consider a number = x

$$\text{So, } x \times -15/28 = -5/7$$

$$x = (-5/7)/(-15/28)$$

$$x = (-5/7) \times (28/-15)$$

$$= (-1/1) \times (4 \times -3)$$

$$= 4/3$$

7. By what number should we multiply $-8/13$ so that the product may be 24?

Solution:

Let us consider a number = x

$$\text{So, } x \times -8/13 = 24$$

$$x = (24)/(-8/13)$$

$$x = (24) \times (13/-8)$$

$$= (3) \times (13 \times -1)$$

$$= -39$$

8. By what number should $-3/4$ be multiplied in order to produce $2/3$?

Solution:

Let us consider a number = x

$$\text{So, } x \times -3/4 = 2/3$$

$$x = (2/3)/(-3/4)$$

$$x = (2/3) \times (4/-3)$$

$$= -8/9$$

9. Find $(x+y) \div (x-y)$, if

(i) $x = 2/3, y = 3/2$

Solution:

$$(x+y) \div (x-y)$$

$$(2/3 + 3/2) / (2/3 - 3/2)$$

$$((2 \times 2 + 3 \times 3)/6) / ((2 \times 2 - 3 \times 3)/6)$$

$$((4+9)/6) / ((4-9)/6)$$

$$(13/6) / (-5/6)$$

$$(13/6) \times (6/-5)$$

$$-13/5$$

(ii) $x = 2/5, y = 1/2$

Solution:

$$(x+y) \div (x-y)$$

$$(2/5 + 1/2) / (2/5 - 1/2)$$

$$((2 \times 2 + 1 \times 5)/10) / ((2 \times 2 - 1 \times 5)/10)$$

$$((4+5)/10) / ((4-5)/10)$$

$$(9/10) / (-1/10)$$

$$(9/10) \times (10/-1)$$

-9

(iii) $x = 5/4, y = -1/3$

Solution:

$$(x+y) \div (x-y)$$

$$(5/4 - 1/3) / (5/4 + 1/3)$$

$$((5 \times 3 - 1 \times 4)/12) / ((5 \times 3 + 1 \times 4)/12)$$

$$((15-4)/12) / ((15+4)/12)$$

$$(11/12) / (19/12)$$

$$(11/12) \times (12/19)$$

11/19

(iv) $x = 2/7, y = 4/3$

Solution:

$$(x+y) \div (x-y)$$

$$(2/7 + 4/3) / (2/7 - 4/3)$$

$$((2 \times 3 + 4 \times 7)/21) / ((2 \times 3 - 4 \times 7)/21)$$

$$((6+28)/21) / ((6-28)/21)$$

$$(34/21) / (-22/21)$$

$$(34/21) \times (21/-22)$$

-34/22

-17/11

(v) $x = 1/4, y = 3/2$

Solution:

$$(x+y) \div (x-y)$$

$$(1/4 + 3/2) / (1/4 - 3/2)$$

$$((1 \times 1 + 3 \times 2)/4) / ((1 \times 1 - 3 \times 2)/4)$$

$$((1+6)/4) / ((1-6)/4)$$

$$(7/4) / (-5/4)$$

$$(7/4) \times (4/-5) = -7/5$$

10. The cost of $2\frac{3}{4}$ meters of rope is Rs $51\frac{1}{4}$. Find the cost per meter.

Solution:

We know that $2\frac{3}{4}$ meters of rope = Rs $51\frac{1}{4}$

Let us consider a number = x

$$\text{So, } x \times 2\frac{3}{4} = 51\frac{1}{4}$$

$$x = (51\frac{1}{4}) / (2\frac{3}{4})$$

$$x = (51\frac{1}{4}) \times (4/23)$$

$$= (51 \times 4) / (4 \times 23)$$

$$= 153/23$$

$$= 6\frac{15}{23}$$

\therefore cost per meter is Rs $6\frac{15}{23}$

11. The cost of $7\frac{3}{4}$ meters of cloth is Rs $301\frac{1}{4}$. Find the cost of cloth per meter.

Solution:

We know that $7\frac{3}{4}$ meters of cloth = Rs $301\frac{1}{4}$

Let us consider a number = x

$$\text{So, } x \times 7\frac{3}{4} = 301\frac{1}{4}$$

$$x = (301\frac{1}{4}) / (7\frac{3}{4})$$

$$x = (301\frac{1}{4}) \times (4/31)$$

$$= (301 \times 4) / (4 \times 31)$$

$$= (301 \times 1) / (31 \times 1)$$

$$= 9.71$$

$$= 9.71$$

\therefore cost of cloth per meter is Rs 9.71

12. By what number should $-33/16$ be divided to get $-11/4$?

Solution:

Let us consider a number = x

$$\text{So, } (-33/16) / x = -11/4$$

$$-33/16 = x \times -11/4$$

$$x = (-33/16) / (-11/4)$$

$$= (-33/16) \times (4/-11)$$

$$= (-33 \times 4) / (16 \times -11)$$

$$= (-3 \times 1) / (4 \times -1)$$

$$= 3/4$$

13. Divide the sum of $-13/5$ and $12/7$ by the product of $-31/7$ and $-1/2$.

Solution:

sum of $-13/5$ and $12/7$

$$-13/5 + 12/7$$

$$((-13 \times 7) + (12 \times 5))/35$$

$$(-91+60)/35$$

$$-31/35$$

Product of $-31/7$ and $-1/2$

$$-31/7 \times -1/2$$

$$(-31 \times -1)/(7 \times 2)$$

$$31/14$$

\therefore by dividing the sum and the product we get,

$$(-31/35) / (31/14)$$

$$(-31/35) \times (14/31)$$

$$(-31 \times 14)/(35 \times 31)$$

$$-14/35$$

$$-2/5$$

14. Divide the sum of $65/12$ and $12/7$ by their difference.

Solution:

The sum is $65/12 + 12/7$

The difference is $65/12 - 12/7$

When we divide, $(65/12 + 12/7) / (65/12 - 12/7)$

$$((65 \times 7 + 12 \times 12)/84) / ((65 \times 7 - 12 \times 12)/84)$$

$$((455+144)/84) / ((455 - 144)/84)$$

$$(599/84) / (311/84)$$

$$599/84 \times 84/311$$

$$599/311$$

15. If 24 trousers of equal size can be prepared in 54 meters of cloth, what length of cloth is required for each trouser?

Solution:

We know that total number trousers = 24

Total length of the cloth = 54

Length of the cloth required for each trouser = total length of the cloth/number of trousers

$$= 54/24$$

$$= 9/4$$

∴ 9/4 meters is required for each trouser.

EXERCISE 1.8 PAGE NO: 1.43

1. Find a rational number between -3 and 1.

Solution:

Let us consider two rational numbers x and y

We know that between two rational numbers x and y where $x < y$ there is a rational number $(x+y)/2$

$$x < (x+y)/2 < y$$

$$(-3+1)/2 = -2/2 = -1$$

So, the rational number between -3 and 1 is -1

$$\therefore -3 < -1 < 1$$

2. Find any five rational numbers less than 2.

Solution:

Five rational numbers less than 2 are 0, 1/5, 2/5, 3/5, 4/5

3. Find two rational numbers between -2/9 and 5/9

Solution:

The rational numbers between -2/9 and 5/9 is

$$(-2/9 + 5/9)/2$$

$$(1/3)/2$$

$$1/6$$

The rational numbers between -2/9 and 1/6 is

$$(-2/9 + 1/6)/2$$

$$((-2 \times 2 + 1 \times 3)/18)/2$$

$$(-4+3)/36$$

$$-1/36$$

∴ the rational numbers between -2/9 and 5/9 are -1/36, 1/6

4. Find two rational numbers between 1/5 and 1/2

Solution:

The rational numbers between 1/5 and 1/2 is

$$(1/5 + 1/2)/2$$

$$((1 \times 2 + 1 \times 5)/10)/2$$

$$(2+5)/20 = 7/20$$

The rational numbers between $1/5$ and $7/20$ is

$$(1/5 + 7/20)/2$$

$$((1 \times 4 + 7 \times 1)/20)/2$$

$$(4+7)/40$$

$$11/40$$

\therefore the rational numbers between $1/5$ and $1/2$ are $7/20, 11/40$

5. Find ten rational numbers between $1/4$ and $1/2$.

Solution:

Firstly convert the given rational numbers into equivalent rational numbers with same denominators.

The LCM for 4 and 2 is 4.

$$1/4 = 1/4$$

$$1/2 = (1 \times 2)/4 = 2/4$$

$$1/4 = (1 \times 20 / 4 \times 20) = 20/80$$

$$1/2 = (2 \times 20 / 4 \times 20) = 40/80$$

So, we now know that 21, 22, 23, ... 39 are integers between numerators 20 and 40.

\therefore the rational numbers between $1/4$ and $1/2$ are $21/80, 22/80, 23/80, \dots, 39/80$

6. Find ten rational numbers between $-2/5$ and $1/2$.

Solution:

Firstly convert the given rational numbers into equivalent rational numbers with same denominators.

The LCM for 5 and 2 is 10.

$$-2/5 = (-2 \times 2)/10 = -4/10$$

$$1/2 = (1 \times 5)/10 = 5/10$$

$$-2/5 = (-4 \times 2 / 10 \times 2) = -8/20$$

$$1/2 = (5 \times 2 / 10 \times 2) = 10/20$$

So, we now know that -7, -6, -5, ... 10 are integers between numerators -8 and 10.

\therefore the rational numbers between $-2/5$ and $1/2$ are $-7/20, -6/20, -5/20, \dots, 9/20$

7. Find ten rational numbers between $3/5$ and $3/4$.

Solution:

Firstly convert the given rational numbers into equivalent rational numbers with same denominators.

The LCM for 5 and 4 is 20.

$$3/5 = 3 \times 20 / 5 \times 20 = 60/100$$

$$\frac{3}{4} = \frac{3 \times 25}{4 \times 25} = \frac{75}{100}$$

So, we now know that 61, 62, 63, ... 74 are integers between numerators 60 and 75.

\therefore the rational numbers between $\frac{3}{5}$ and $\frac{3}{4}$ are $\frac{61}{100}$, $\frac{62}{100}$, $\frac{63}{100}$, ..., $\frac{74}{100}$

Aakash Institute