EXERCISE 1(A)

Question 1.

Add, each pair of rational numbers, given below, and show that their addition (sum) is also a rational number.

Solution:-

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

Solution:

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

Adding addition sign in between,

$= \frac{-5}{8} + \frac{3}{8}$ (∵ Denominators are same, LCM=8)

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

$= \frac{-2}{8} = \frac{-1}{4}$ (Cancelling numerator and denominator by 2)

Which is a rational number.

(ii) $\frac{-8}{13}$ and $\frac{-4}{13}$

Solution:

$\frac{-8}{13}$ and $\frac{-4}{13}$

Adding addition sign in between

$= \frac{-8}{13} + \left(\frac{-4}{13}\right)$ (∵ Denominators are same, LCM=13)

$\frac{-8}{13} + \left(\frac{-4}{13}\right) = \frac{-8-4}{13} = \frac{-12}{13}$

Which is a rational number.

(iii) $\frac{6}{11}$ and $\frac{-9}{11}$

Solution:

$\frac{6}{11}$ and $\frac{-9}{11}$

Adding addition sign in between

$= \frac{6}{11} + \left(\frac{-9}{11}\right) = \frac{6}{11} + \left(\frac{-9}{11}\right)$ (∵ Denominators are same, ∴LCM=11)

$= \frac{6-9}{11} = \frac{-3}{11}$

Which is a rational number.

(iv) $\frac{5}{-26}$ and $\frac{8}{39}$

Solution:

$\frac{5}{-26}$ and $\frac{8}{39}$

Adding addition sign in between

$= \frac{5}{-26} + \frac{8}{39}$

Taking L.C.M.

∴LCM of 26 and 39 = 2 × 3 × 13 = 78

$\frac{5}{-26} + \frac{8}{39} = \frac{-5\times3}{26\times3} + \frac{8\times2}{39\times2}$

$= \frac{-15+16}{78}$

$= \frac{1}{78}$

Which is a rational number.

(v) $\frac{5}{-6}$ and $\frac{2}{3}$

Solution:

$\frac{5}{-6}$ and $\frac{2}{3}$

Adding addition sign in between

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

Taking L.C.M.

2 6,3

3 3,3

1,1

∴ LCM of 6, 3=2×3=6

$\frac{-5}{6} + \frac{2}{3} = \frac{-5\times1}{6\times1} + \frac{2\times2}{3\times2}$ (∵LCM of 6 and 3=6)

$= \frac{-5+4}{6} = \frac{-1}{6}$

Which is a rational number.

(vi) -2 and $\frac{2}{5}$

Solution:

-2 and $\frac{2}{5}$

Adding addition sign in between

$= \frac{-2}{1} + \frac{2}{5} (\because LCM of 1 and 5 = 5)$

$= \frac{-2\times5}{1\times5} + \frac{2\times1}{5\times1}$

$= \frac{-10+2}{5} = \frac{-8}{5}$

Which is a rational number.

(vii) $\frac{9}{-4}$ and $\frac{-3}{8}$

Solution:

$\frac{9}{-4}$ and $\frac{-3}{8}$

Adding addition sign in between

$= \frac{-9}{4} + \left(\frac{-3}{8}\right)$

Taking L.C.M.
2 4,8
2 2,4
2 2,2
1,1
∴LCM of 4 and 8=2×2×2=8

$\frac{-9}{4} + \left(\frac{-3}{8}\right) = \frac{-9\times2}{4\times2} - \frac{3\times1}{8\times1}$

$= \frac{-18-3}{8} = \frac{-21}{8}$

Which is a rational number.

(viii) $\frac{7}{-18}$ and $\frac{8}{27}$

Solution:

$\frac{7}{-18}$ and $\frac{8}{27}$

Adding addition sign in between

$\frac{7}{-18} + \frac{8}{27}$

2 18,27
3 9,27
3 3,9
3 1,3

1,1

∴LCM of 18 and 27=2×3×3×3=54

$= \frac{-21+16}{54} = \frac{-5}{54}$ Which is a rational number.

Question 2. Evaluate:

(i) $\frac{5}{9} + \frac{-7}{6}$

Solution:

$\frac{5}{9} + \frac{-7}{6}$ Taking L.C.M.

2 9,6

3 9,3

3 3,1

1,1

∴LCM of 9 and 6=2×3×3=18

$\frac{5}{9} + \frac{-7}{6}$

$= \frac{5\times2}{9\times2} - \frac{7\times3}{6\times3}$

(∵LCM of 9 and 6=18)

$= \frac{10-21}{18} = \frac{-11}{8}$

(ii) $4 + \frac{3}{-5}$

Solution:

$4 + \frac{3}{-5}$

$4 + \frac{3}{-5} = \frac{4}{1} + \left(\frac{-3}{5}\right)$

$= \frac{4}{1} - \frac{3}{5}$

Taking L.C.M.

LCM of 1 and 5=5

$4 + \frac{3}{-5} = \frac{4\times5}{1\times5} - \frac{3\times1}{5\times1}$

$= \frac{20-3}{5} = \frac{17}{5} = 3\frac{2}{5}$ (Displaying the answer in mixed fraction)

(iii) $\frac{1}{-15} + \frac{5}{-12}$

Solution:

$\frac{1}{-15} + \frac{5}{-12}$

$= \frac{-1}{15} + \left(\frac{-5}{12}\right)$

$= \frac{-1}{15} - \frac{5}{12}$

Taking L.C.M.

2 15,2

2 15,6

3 15,3

5 5,1

1,1

∴LCM of 15 and 12=2×2×3×5=60

$= \frac{-1\times4}{15\times4} - \frac{5\times5}{12\times5}$

LCM of 15 and 12 = 60

$\frac{1}{-15} + \frac{5}{-12} = \frac{-4-25}{60} = \frac{-29}{60}$

(iv) $\frac{5}{9} + \frac{3}{-4}$

Solution:

$\frac{5}{9} + \frac{3}{-4}$

$= \frac{5}{9} - \frac{3}{4}$ (Manipulating the signs)

LCM of 9 and 4=2×2×3×3=36

$\frac{5}{9} + \frac{3}{-4} = \frac{5\times4}{9\times4} - \frac{3\times9}{4\times9}$

$= \frac{20-27}{36} = \frac{-7}{36}$

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

(v) $\frac{-8}{9} + \frac{-5}{12}$

Solution:

$\frac{-8}{9} + \frac{-5}{12}$ Taking L.C.M.

2 9,12

2 9,6

3 9,3

3 3,1

1,1

∴ LCM of 9, 12=2×2×3×3=36

$\frac{-8}{9} + \frac{-5}{12} = \frac{-8\times4}{9\times4} - \frac{5\times3}{12\times3}$

$= \frac{-32-15}{36}$

$= \frac{-47}{36}$

(vi) $0 + \frac{-2}{7}$

Solution:

$0 + \frac{-2}{7}$ LCM of 0 and 7=7

By cross multiplying

$0 + \frac{-2}{7} = \frac{0\times7}{1\times7} - \frac{2\times1}{7\times1}$

$= \frac{0-2}{7} = \frac{-2}{7}$

(vii) $\frac{5}{-11} + 0$

Solution:

$\frac{5}{-11} + 0$

LCM of 0 and 11=11

By cross multiplying

$\frac{5}{-11} + 0 = \frac{-5\times1}{11\times1} + \frac{0\times11}{1\times11}$

$= \frac{-5+0}{11} = \frac{-5}{11}$

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

Solution:

$= \frac{2}{1} - \frac{3}{5}$ LCM of 1 and 5=5

$= \frac{2\times5}{1\times5} - \frac{3\times1}{5\times1}$

$= \frac{10-3}{5} = \frac{7}{5} = 1\frac{2}{5}$

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

Solution:

$\frac{4}{-9} + 1$

LCM of 9 and 1=9

$\frac{-4}{9} + \frac{1}{1} = \frac{-4\times1}{9\times1} + \frac{1\times9}{1\times9}$

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

Question 3. Evaluate:

(i) $\frac{3}{7}+\frac{-4}{9}+\frac{-11}{7}+\frac{7}{9}$

Solution:

$$=\left(\frac{3}{7}+\frac{-11}{7}\right)+\left(\frac{-4}{9}+\frac{7}{9}\right)$$

$$=\frac{3-11}{7}+\frac{-4+7}{9}$$

$$=\frac{-8}{7}+\frac{3}{9}$$

$$=\frac{-8}{7}+\frac{1}{3}$$

Taking LCM of 7 and 3

3 7,3

7 7,7

1,1

∴LCM of 3 and 7 = 3×7 = 21

$$\frac{-8}{7}+\frac{1}{3}=\frac{-8\times3}{7\times3}+\frac{1\times7}{3\times7}$$

$$=\frac{-24+7}{21}=\frac{-17}{21}$$

(ii) $\frac{2}{3}+\frac{-4}{5}+\frac{1}{3}+\frac{2}{5}$

Solution:

$$=\left(\frac{2}{3}+\frac{1}{3}\right)+\left(\frac{-4}{5}+\frac{2}{5}\right)$$

$$=\frac{2+1}{3}+\frac{-4+2}{5}$$

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

Taking LCM,

3 3,5

5 1,5

1,1

∴LCM of 3 and 5 = 3×5 = 15

$$\frac{3}{3}+\left(\frac{-2}{5}\right)=\frac{3\times5}{3\times5}+\frac{-2\times3}{5\times3}$$

$$=\frac{15-6}{15}=\frac{9}{15}=\frac{3}{5}$$

(iii) $\frac{4}{7}+0+\frac{-8}{9}+\frac{-13}{7}+\frac{17}{9}$

Solution:

$$=\frac{4}{7}+\frac{-8}{9}+\frac{-13}{7}+\frac{17}{9}$$

$$=\left[\frac{4}{7}+\left(\frac{-13}{7}\right)\right]+\left(\frac{-8}{9}+\frac{17}{9}\right)$$

$$=\left[\frac{4}{7}-\frac{13}{7}\right]+\left[\frac{-8}{9}+\frac{17}{9}\right]$$

$$=\frac{-9}{7}+\frac{9}{9}=\frac{-9}{7}+1$$

$$=\frac{-9\times1}{7\times1}+\frac{1\times7}{1\times7}(\because LCM of 1 and 7=7)$$

$$=\frac{-9}{7}+\frac{7}{7}=\frac{-2}{7}$$

(iv) $\frac{3}{8}+\frac{-5}{12}+\frac{3}{7}+\frac{3}{12}+\frac{-5}{8}+\frac{-2}{7}$

Solution:

$$=\left(\frac{3}{8}-\frac{5}{8}\right)+\left(\frac{-5}{12}+\frac{3}{12}\right)+\left(\frac{3}{7}-\frac{2}{7}\right)$$

$$=\frac{-2}{8}-\frac{2}{12}+\frac{1}{7}$$

$$=\frac{-1}{4}-\frac{1}{6}+\frac{1}{7}$$

2 4,6,7
2 2,3,7
3 1,3,7
7 1,1,7
1,1,1
∴LCM of 4, 6 and 7 = 2×2×3×7 = 84

$$\frac{-1}{4}-\frac{1}{6}+\frac{1}{7}=\frac{-1\times21}{4\times21}-\frac{1\times14}{6\times14}+\frac{1\times12}{7\times12}$$

$$=\frac{-21-14+12}{84}$$

$$=\frac{-35+12}{84}=\frac{-23}{84}$$

Question 4.

For each pair of rational numbers, verify commutative property of addition of rational numbers:

(i) $\frac{-8}{7}$ and $\frac{5}{14}$

Solution:

To prove: $\frac{-8}{7}+\frac{5}{14}=\frac{5}{14}+\frac{-8}{7}$

LHS = $\frac{-8}{7}+\frac{5}{14}$

Taking LCM of 7 and 14

2 7,14

7 7,7

1,1

∴LCM of 2 and 7=14

$\frac{-8}{7}+\frac{5}{14}=\frac{-8\times2}{7\times2}+\frac{5\times1}{14\times1}$

$=\frac{-16+5}{14}=\frac{-11}{14}$

R H S=$\frac{5}{14}+\frac{-8}{7}$

$=\frac{5\times1}{14\times1}+\left(\frac{-8\times2}{7\times2}\right)$ (∵LCM of 2 and 7=14)

$=\frac{5-16}{14}=\frac{-11}{14}$ ∴ RHS = LHS

i.e. $\frac{-8}{7}+\frac{5}{14}=\frac{5}{14}+\frac{-8}{7}$

Hence, the commutative property for the addition of rational numbers is verified.

(ii) $\frac{5}{9}$ and $\frac{5}{-12}$

Solution:

To prove: $\frac{5}{9}+\frac{5}{-12}=\frac{5}{-12}+\frac{5}{9}$

LHS = $\frac{5}{9}+\frac{5}{-12}$ LCM of 9 and 12=2×2×3×3=36

LHS = $\frac{5\times4}{9\times4}-\frac{5\times3}{12\times3}$

$=\frac{20-15}{36}=\frac{5}{36}$

RHS = $\frac{5}{-12}+\frac{5}{9}$

$=\frac{5\times3}{-12\times3}+\frac{5\times4}{9\times4}$ (∵LCM of 9 and 12 = 36)

$=\frac{-15+20}{36}=\frac{5}{36}$ ∴ RHS = LHS

i.e. $\frac{5}{9}+\frac{5}{-12}=\frac{5}{-12}+\frac{5}{9}$

Hence, the commutative property for the addition of rational numbers is verified.

(iii) $\frac{-4}{5}$ and $\frac{-13}{-15}$

Solution:

To prove:

$\frac{-4}{5}+\frac{-13}{-15}=\frac{-13}{-15}+\left(\frac{-4}{5}\right)$

LHS = $\frac{-4}{5}+\frac{13}{15}$

Taking LCM

5 5,15

3 1,3

1,1

∴LCM of 5 and 15=5×3=15

LHS $=\frac{-4\times3}{5\times3}+\frac{13\times1}{15\times1}$

= (-12 + 13)/15 = 1/15

RHS $=\frac{13}{15}+\frac{-4}{5}$

$=\frac{13\times1}{15\times1}+\frac{-4\times3}{5\times3}$ (∵LCM of 5 and 15 = 15)

$=\frac{13-12}{15}=\frac{1}{15}$ ∴ RHS = LHS

i.e. $\frac{-4}{5}+\frac{-13}{-15}=\frac{-13}{-15}+\frac{-4}{5}$

Hence, the commutative property for the addition of rational numbers is verified.

(iv) $\frac{2}{-5}$ **and** $\frac{11}{-15}$

Solution:

To prove: $\frac{2}{-5}+\frac{11}{-15}=\frac{11}{-15}+\frac{2}{-5}$

LHS $=\frac{2}{-5}+\frac{11}{-15}$

Taking LCM

3 5,15

5 5,5

1,1

∴LCM of 5 and 15=15

LHS $=\frac{-2\times3}{5\times3}-\frac{11\times1}{15\times1}$

$=\frac{-6-11}{15}=\frac{-17}{15}$

RHS $= \frac{11}{-15} + \frac{2}{-5}$

$= \frac{-11\times1}{15\times1} - \frac{2\times3}{5\times3}$ (∵LCM of 5 and 15 = 15)

$= \frac{-11-6}{15} = \frac{-17}{15}$ ∴ RHS = LHS

i.e. $\frac{2}{-5} + \frac{11}{-15} = \frac{11}{-15} + \frac{2}{-5}$

Hence, the commutative property for the addition of rational numbers is verified.

(v) 3 and $\frac{-2}{7}$

Solution:

To prove: $\frac{3}{1} + \frac{-2}{7} = \frac{-2}{7} + \frac{3}{1}$

LHS $= \frac{3}{1} + \frac{-2}{7}$

$= \frac{3\times7}{1\times7} - \frac{2\times1}{7\times1}$ (∵LCM of 1 and 7=7)

$= \frac{21-2}{7} = \frac{19}{7}$

RHS$= \frac{-2}{7} + \frac{3}{1}$

$= \frac{-2\times1}{7\times1} + \frac{3\times7}{1\times7}$ (∵LCM of 1 and 7=7)

$= \frac{-2+21}{7} = \frac{19}{7}$ ∴ RHS = LHS

i.e. $\frac{3}{1} + \frac{-2}{7} = \frac{-2}{7} + \frac{3}{1}$

Hence, the commutative property for the addition of rational numbers is verified.

vi) -2 and $\frac{3}{-5}$

Solution:

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

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

$= \frac{-2\times5}{1\times5} + \frac{-3\times1}{5\times1}$ (∵LCM of 1 and 5=5)

$= \frac{-10-3}{5} = \frac{-13}{5}$

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

$= \frac{-3\times1}{5\times1} + \frac{-2\times5}{1\times5}$ (∵LCM of 1 and 5=5)

∴ RHS = LHS

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

Hence, the commutative property for the addition of rational numbers is verified.

Question 5.

For each set of rational numbers, given below, verify the associative property of addition of rational numbers:

(i) $\frac{1}{2}, \frac{2}{3}$ **and** $-\frac{1}{6}$

Solution:

To prove: $\frac{1}{2} + \left(\frac{2}{3} + \frac{-1}{6}\right) = \left(\frac{1}{2} + \frac{2}{3}\right) + \frac{-1}{6}$

LHS $= \frac{1}{2} + \left(\frac{2}{3} + \frac{-1}{6}\right)$ Taking LCM

2 3,6

3 3,3

1,1

∴LCM of 3 and 6=6

LHS $= \frac{1}{2} + \left(\frac{2\times2}{3\times2} + \frac{-1\times1}{6\times1}\right)$

$= \frac{1}{2} + \left(\frac{4}{6} - \frac{1}{6}\right)$

$= \frac{1}{2} + \left(\frac{4-1}{6}\right)$

$= \frac{1}{2} + \left(\frac{3}{6}\right)$

$= \frac{1\times3}{2\times3} + \frac{3\times1}{6\times1}$ (∵LCM of 2 and 6=3)

$= \frac{3+3}{6} = \frac{6}{6} = 1$

RHS $= \left(\frac{1}{2} + \frac{2}{3}\right) + \frac{-1}{6}$ Taking LCM

2 2,3

3 1,3

1,1

∴ LCM of 2 and 3=6

RHS $= \left(\frac{1\times3}{2\times3} + \frac{2\times2}{3\times2}\right) + \frac{-1}{6}$

$= \frac{3+4}{6} + \frac{-1}{6}$

$= \frac{7-1}{6} = \frac{6}{6} = 1$

∴RHS = LHS

i.e. $\frac{1}{2} + \left(\frac{2}{3} + \frac{-1}{6}\right) = \left(\frac{1}{2} + \frac{2}{3}\right) + \frac{-1}{6}$

Hence, the associative property for the addition of rational numbers is verified.

(ii) $\frac{-2}{5}, \frac{4}{15}$ and $\frac{-7}{10}$

Solution:

To prove: $\frac{-2}{5} + \left(\frac{4}{15} + \frac{-7}{10}\right) = \left(\frac{-2}{5} + \frac{4}{15}\right) + \frac{-7}{10}$

LHS $= \frac{-2}{5} + \left(\frac{4}{15} + \frac{-7}{10}\right)$

Taking LCM

2 15,10

3 15,5

5 5,5

1,1

∴LCM of 15 and $10 = 2 \times 3 \times 5 = 30$

LHS $= \frac{-2}{5} + \left(\frac{4\times2}{15\times2} + \frac{-7\times3}{10\times3}\right)$

$= \frac{-2}{5} + \left(\frac{8-21}{30}\right)$

$= \frac{-2}{5} - \frac{13}{30} = \frac{-2\times6}{5\times6} - \frac{13\times1}{30\times1}$ (∵LCM of 5 and 30=30)

$= \frac{-12-13}{30} = \frac{-25}{30} = \frac{-5}{6}$

RHS $= \left(\frac{-2}{5} + \frac{4}{15}\right) + \frac{-7}{10}$

Taking LCM

3 5,15

5 5,5

1,1

∴LCM of 5 and 15=3×5=15

$\text{RHS} = \left(\frac{-2\times3}{5\times3} + \frac{4\times1}{15\times1}\right) + \frac{-7}{10}$

$= \frac{-6+4}{15} + \frac{-7}{10}$

$= \frac{-2}{15} + \frac{-7}{10}$

$= \frac{-2\times2}{15\times2} - \frac{7\times3}{10\times3}$ (∵LCM of 15 and 10=30)

$= \frac{-4}{30} - \frac{21}{30} = \frac{-25}{30} = \frac{-5}{6}$ ∴RHS = LHS

i.e. $\frac{-2}{5} + \left(\frac{4}{15} + \frac{-7}{10}\right) = \left(\frac{-2}{5} + \frac{4}{15}\right) + \frac{-7}{10}$

Hence, the associative property for the addition of rational numbers is verified.

(iii) $\frac{-7}{9}, \frac{2}{-3}$ **and** $\frac{-5}{18}$

Solution:

To prove: $\frac{-7}{9} + \left(\frac{2}{-3} + \frac{-5}{18}\right) = \left(\frac{-7}{9} + \frac{2}{-3}\right) + \frac{-5}{18}$

$\text{LHS} = \frac{-7}{9} + \left(\frac{2}{-3} + \frac{-5}{18}\right)$

Taking LCM
2 3,18
3 3,9
5 3,3
1,1
∴LCM of 3 and 18=2×3×3=18

$\text{LHS} = \frac{-7}{9} + \left(\frac{-2\times6}{3\times6} + \frac{-5\times1}{18\times1}\right)$

$= \frac{-7}{9} + \left(\frac{-12-5}{18}\right)$

$= \frac{-7}{9} + \frac{-17}{18}$

$= \frac{-7\times2}{9\times2} - \frac{17\times1}{18\times1}$ (∵LCM of 9 and 18=18)

$\text{RHS} = \left(\frac{-7}{9} + \frac{2}{-3}\right) + \frac{-5}{18}$

Taking LCM

3 3,9
3 3,3
1,1
∴LCM of 3 and 9=3

RHS$= \left(\frac{-7\times1}{9\times1}+\frac{-2\times3}{3\times3}\right)+\frac{-5}{18}$

$=\frac{-7-6}{9}+\frac{-5}{18}$

$=\frac{-13}{9}+\frac{-5}{18}$

$=\frac{-13\times2}{9\times2}+\frac{-5\times1}{18\times1}$ (∵LCM of 9 and 18=18)

$=\frac{-26-5}{18}=\frac{-31}{18}$ ∴RHS = LHS

i.e. $\frac{-7}{9}+\left(\frac{2}{-3}+\frac{-5}{18}\right)=\left(\frac{-7}{9}+\frac{2}{-3}\right)+\frac{-5}{18}$

Hence, the associative property for the addition of rational numbers is verified.

(iv) $-1, \frac{5}{6}$ **and** $\frac{-2}{3}$

Solution:

To prove: $\frac{-1}{1}+\left(\frac{5}{6}+\frac{-2}{3}\right)=\left(\frac{-1}{1}+\frac{5}{6}\right)+\frac{-2}{3}$

LHS $=\frac{-1}{1}+\left(\frac{5}{6}+\frac{-2}{3}\right)$

Taking LCM
2 3,6
3 3,3
1,1
∴LCM of 6 and 3 = 6

LHS $=\frac{-1}{1}+\left(\frac{5\times1}{6\times1}+\frac{-2\times2}{3\times2}\right)$

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

$=\frac{-1\times6}{1\times6}+\frac{1\times1}{6\times1}$ (∵LCM of 1 and 6=6)

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

RHS $=\left(\frac{-1}{1}+\frac{5}{6}\right)+\frac{-2}{3}$

$= \left(\frac{-1\times6}{1\times6} + \frac{5\times1}{6\times1}\right) + \frac{-2}{3}$ (∵ LCM of 1 and 6 = 6)

$= \left(\frac{-6+5}{6}\right) + \frac{-2}{3} = -\frac{1}{6} + \frac{-2}{3}$

$= \frac{-1\times1}{6\times1} + \frac{-2\times2}{3\times2}$ (∵LCM of 6 and 3=6)

$= \frac{-1-4}{6} = \frac{-5}{6}$ ∴ RHS = LHS

i.e. $\frac{-1}{1} + \left(\frac{5}{6} + \frac{-2}{3}\right) = \left(\frac{-1}{1} + \frac{5}{6}\right) + \frac{-2}{3}$

Hence, the associative property for the addition of rational numbers is verified.

Question 6.

Write the additive inverse (negative) of:

(i) $\frac{-3}{8}$

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

(iii) $\frac{-7}{5}$

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

(v) 0

(vi) -2

(vii) 1

(viii) $-\frac{1}{3}$

(ix) $\frac{-3}{1}$

Solution:

(i) The additive inverse of $\frac{-3}{8} = \frac{3}{8}$

(ii) The additive inverse of $\frac{4}{-9} = \frac{4}{9}$

(iii) The additive inverse of $\frac{-7}{5} = \frac{7}{5}$

(iv) The additive inverse of $\frac{-4}{-13}$ or $\left(\frac{4}{13}\right) = -\frac{4}{13}$

(v) The additive inverse of 0=0

(vi) The additive inverse of -2=2

(vii) The additive inverse of 1=-1

(viii) The additive inverse of $-\frac{1}{3} = \frac{1}{3}$

(ix) The additive inverse of $\frac{-3}{1} = 3$

Question 7

Fill in the blanks:

(i) Additive inverse of $\frac{-5}{-12}$ =_____.

(ii) $\frac{-5}{-12}+$ its additive inverse =_____.

(iii) If $\frac{a}{b}$ is additive inverse of $\frac{-c}{d'}$ then $\frac{-c}{d}$ is additive inverse of _____.

Solution:

(i) Additive inverse of $\frac{-5}{-12} = -\frac{5}{12}$

(ii) $\frac{-5}{-12}+$ its additive inverse $= \frac{-5}{-15} + \left(-\frac{5}{15}\right) = 0$

(iii) $\frac{a}{b}$ is additive inverse of $\frac{-c}{d}$ then $\frac{-c}{d}$ is additive inverse of $\frac{a}{b}$

Question 8.

State, true or false:

(i) $\frac{7}{9} = \frac{7+5}{9+5}$

Solution: False

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

Solution: False

(iii) $\frac{7}{9} = \frac{7\times5}{9\times5}$

Solution: True

(iv) $\frac{7}{9} = \frac{7+5}{9+5}$

Solution: True

(v) $\frac{-5}{-12}$ is a negative rational number

Solution: False

(vi) $\frac{-13}{25}$ smaller than $\frac{-25}{13}$

Solution: False

EXERCISE 1(B)

Question 1.

Evaluate:

(i) $\frac{2}{3} - \frac{4}{5}$

Solution:

$\frac{2}{3} - \frac{4}{5}$

Taking LCM

3 3,5

5 1,5

1,1

∴LCM of 3 and 5=15

$\frac{2}{3} - \frac{4}{5} = \frac{2\times5}{3\times5} - \frac{4\times3}{5\times3}$

$= \frac{10-12}{15} = \frac{-2}{15}$

(ii) $\frac{-4}{9} - \frac{2}{-3}$

Solution:

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

Taking LCM

3 9,3

5 3,1

1,1

(∴LCM of 3 and 9=9)

$\frac{-4}{9} - \frac{2}{-3} = \frac{-4\times1}{9\times1} - \frac{(-2\times3)}{3\times3}$

$= \frac{-4+6}{9} = \frac{2}{9}$

(iii) $-1 - \frac{4}{9}$

Solution:

$-1 - \frac{4}{9} = \frac{-1\times9}{1\times9} - \frac{4\times1}{9\times1}$ (∵ LCM of 3 and 9=9)

$= \frac{-9-4}{9} = \frac{-13}{9}$

(iv) $\frac{-2}{7} - \frac{3}{-14}$

Solution:

$\frac{-2}{7} - \frac{3}{-14}$

Taking LCM

2 2,7

7 7,7

1,1

∴LCM of 7 and 14 = 14

$\frac{-2}{7} - \frac{3}{-14} = \frac{-2\times2}{7\times2} - \frac{(-3\times1)}{14\times1}$

$= \frac{-4+3}{14} = \frac{-1}{14}$

(v) $\frac{-5}{18} - \frac{-2}{9}$

Solution:

Taking LCM

2 18,9

3 9,9

3 3,3

1,1

∴LCM of 9 and 18=2×3×3=18

$\frac{-5}{18} - \frac{-2}{9} = \frac{-5\times1}{18\times1} - \frac{(-2\times2)}{9\times2}$

$= \frac{-5+4}{18}$

$= \frac{-1}{18}$

(vi) $\frac{5}{21} - \frac{-13}{42}$

Solution:

Taking LCM

2 21,42

3 21,21

7 7,7

1,1

∴LCM of 21, 42=2×3×7=42

$= \frac{5\times2}{21\times2} - \frac{(-13\times1)}{42\times1}$

$= \frac{10+13}{42} = \frac{23}{42}$

Question 2.

Subtract:

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

(ii) $\frac{-8}{11}$ from $\frac{4}{11}$

(iii) $\frac{4}{9}$ from $\frac{-5}{9}$

(iv) $\frac{1}{4}$ from $\frac{-3}{8}$

(v) $\frac{-5}{8}$ from $\frac{-13}{16}$

(vi) $\frac{-9}{22}$ from $\frac{5}{33}$

Solution:

(i) Subtracting $\frac{5}{8}$ from $\frac{-3}{8}$

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

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

(ii) Subtracting $\frac{-8}{11}$ from $\frac{4}{11}$

$\frac{4}{11} - \left(\frac{-8}{11}\right) = \frac{4+8}{11}$

$= \frac{12}{11} = 1\frac{1}{11}$

(iii) Subtracting $\frac{4}{9}$ from $\frac{-5}{9}$

$\frac{-5}{9} - \frac{4}{9} = \frac{-5-4}{9} = \frac{-9}{9} = -1$

(iv) Subtracting $\frac{1}{4}$ from $\frac{-3}{8}$

Taking LCM

2 4,8

2 2,4

2 1,2
1,1

∴LCM of 4,8=2×2×2=8

$$\frac{-3}{8}-\frac{1}{4}=\frac{-3\times1}{8\times1}-\frac{1\times2}{4\times2}$$

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

(v) Subtracting $\frac{-5}{8}$ from $\frac{-13}{16}$ Taking LCM
2 8,16
2 4,8
2 2,4
2 1,2
1,1

∴LCM of 8 and 16=16

$$\frac{-13}{16}-\left(\frac{-5}{8}\right)=\frac{-13\times1}{16\times1}+\frac{5\times2}{8\times2}$$

$$=\frac{-13+10}{16}=\frac{-3}{16}$$

(vi) Subtracting $\frac{-9}{22}$ from $\frac{5}{33}$

Taking LCM
2 22,33
3 11,33
11 1,11
1,1

∴LCM of 22 and 33=2×3×11=66

$$\frac{5}{33}-\left(\frac{-9}{22}\right)=\frac{5\times2}{33\times2}+\frac{9\times3}{22\times3}$$

$$=\frac{10+27}{66}=\frac{37}{66}$$

Question 3.

The sum of two rational numbers is $\frac{9}{20}$ If one of them is $\frac{2}{5}$ find the other.

Solution:

Given, the sum of two rational numbers $=\frac{9}{20}$

One of the numbers $= \frac{2}{5}$

To find the other number, we need to subtract the first number from the sum.

i.e. other rational number $= \frac{9}{20} - \frac{2}{5}$

Taking LCM
2 20,5
2 10,5
5 5,5
1,1
∴LCM of 20 and 5=20

$\frac{9}{20} - \frac{2}{5} = \frac{9\times1}{20\times1} - \frac{2\times4}{5\times4}$

$= \frac{9}{20} - \frac{8}{20}$

$= \frac{9-8}{20} = \frac{1}{20}$

Question 4.

The sum of the two rational numbers is $\frac{-2}{3}$. If one of them is $\frac{-8}{5}$. Find the other?

Solution:

Given, the sum of two rational numbers $= \frac{-2}{3}$

One of the numbers $= \frac{-8}{5}$

To find the other number, we need to subtract the first number from the sum.
i.e. other rational number $= \frac{-2}{3} - \frac{-8}{15}$

Taking LCM
3 3,15
5 1,5
1,1
∴LCM of 3 and 15=15

$\frac{-2}{3} - \frac{-8}{15} = \frac{-2\times5}{3\times5} + \frac{8\times1}{15\times1}$

$= \frac{-10+8}{15} = \frac{-2}{15}$

Question 5.

The sum of the two rational numbers is -6. If one of them is $\frac{-8}{5}$.find the other

Solution:

Given, the sum of two rational numbers =-6

One of the numbers $= \frac{-8}{5}$

To find the other number, we need to subtract the first number from the sum.

i.e. other rational number $= \frac{-6}{1} - \frac{-8}{5}$

$= \frac{-6\times5}{1\times5} + \frac{8\times1}{5\times1}$

$= \frac{-30+8}{5} = \frac{-22}{5}$

Question 6.

Which rational number should be added to $\frac{-7}{8}$ to get $\frac{5}{9}$?

Solution:

Required rational number

$= \frac{5}{9} - \left(\frac{-7}{8}\right)$

$= \frac{5}{9} + \frac{7}{8}$

Taking LCM

2 9,8

2 9,4

2 9,2

3 9,1

3 3,1

1,1

∴LCM of 9 and 8=2×2×2×3×3=72

$\frac{5}{9} + \frac{7}{8} = \frac{5\times8}{9\times8} + \frac{7\times9}{8\times9}$

$= \frac{40}{72} + \frac{63}{72}$

$= \frac{40+63}{72} = \frac{103}{72} = 1\frac{31}{72}$

Question 7

Which rational number should be added to $\frac{-5}{9}$ to get $\frac{-2}{3}$

Solution.

Required rational number

$= \frac{-2}{3} - \left(\frac{-5}{9}\right)$

$= \frac{-2}{3} + \frac{5}{9}$

LCM of 3 and 9=9

$\frac{-2}{3} + \frac{5}{9} = \frac{-2\times3}{3\times3} + \frac{5\times1}{9\times1}$

$= \frac{-6+5}{9} = \frac{-1}{9}$