Exercise 1.4

Q.1 Simplify each of the following and write as a rational number of the form $\frac{p}{q}$:

(i) $\frac{3}{4}+\frac{5}{6}+\frac{-7}{8}$ (ii) $\frac{2}{3}+\frac{-5}{6}+\frac{-7}{9}$

(iii) $-\frac{11}{2}+\frac{7}{6}+\frac{-5}{8}$ (iv) $-\frac{4}{5}+\frac{-7}{10}+\frac{-8}{15}$

(v) $-\frac{9}{10}+\frac{22}{15}+\frac{13}{-20}$ (vi) $\frac{5}{3}+\frac{3}{-2}+\frac{-7}{3}+3$

Solution: (i) $\frac{3}{4}+\frac{5}{6}+\frac{-7}{8}$

$\because$ LCM $(4,6,8) = 24$

$$\Rightarrow \frac{(3\times6)+(5\times4)-(7\times3)}{24} = \frac{18+20-21}{24} = \frac{17}{24}$$

(ii) $\frac{2}{3}+\frac{-5}{6}+\frac{-7}{9}$

LCM $(3,6,9) = 18$

$$= \frac{(2\times6)-(5\times3)+(-7\times2)}{18} = \frac{12-15-14}{18}$$

$$= \frac{-17}{18}$$

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(iii) $\frac{-11}{2} + \frac{7}{6} + \frac{-5}{8}$

$\because$ LCM $(2, 6, 8) = 24$

$= \frac{-132 + 28 - 15}{24} = \frac{-119}{24}$

(iv) $-\frac{4}{5} + \frac{-7}{10} + \frac{-8}{15}$

$\because$ LCM $(5, 10, 15) = 30$

$= \frac{(-4 \times 6) + (-7 \times 3) + (-8 \times 2)}{30} = \frac{-24 - 21 - 16}{30}$

$= \frac{-61}{30}$

(v) $\frac{-9}{10} + \frac{22}{15} + \frac{13}{-20}$

LCM $(10, 15, 20) = 60$

$= \frac{(-9 \times 6) + (22 \times 4) + (-13 \times 3)}{60} = \frac{-54 + 88 - 39}{60}$

$= \frac{-4}{60} = \frac{-1}{15}$

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

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

$= \frac{10 - 9 - 14 + 18}{6} = \frac{5}{6}$

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Q.2 Express each of the following as a rational number of the form $\frac{p}{q}$:

(i) $\frac{-8}{3} + \frac{-1}{4} + \frac{-11}{6} + \frac{3}{8} - 3$ (ii) $\frac{6}{7} + 1 + \frac{-7}{9} + \frac{19}{21} + \frac{-12}{7}$

(iii) $\frac{15}{2} + \frac{9}{8} + \frac{-11}{3} + 6 + \frac{-7}{6}$ (iv) $\frac{-7}{4} + 0 + \frac{-9}{5} + \frac{19}{10} + \frac{11}{14}$

(v) $-\frac{7}{4} + \frac{5}{3} + \frac{-1}{2} + \frac{-5}{6} + 2$

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

$\because$ LCM $(3, 4, 6, 8, 1) = 24$

$$= \frac{(-8\times8) + (-1\times6) + (-11\times4) + (3\times3) - (3\times24)}{24}$$

$$= \frac{-64 - 6 - 44 + 9 - 72}{24} = \frac{-177}{24}$$

$$= -\frac{59}{8}$$

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

$\because$ LCM $(7, 1, 9, 21, 7) = 63$

$$\frac{(6\times9) + (1\times63) - (7\times7) + (19\times3) - (12\times9)}{63}$$

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$$= \frac{54 + 63 - 49 + 57 - 108}{63}$$

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

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

$\because$ LCM $(2, 8, 3, 1, 6) = 24$

$$= \frac{(15 \times 12) + (9 \times 3) - (11 \times 8) + (6 \times 24) - (7 \times 4)}{24}$$

$$= \frac{180 + 27 - 88 + 144 - 28}{24}$$

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

(iv) $\frac{-7}{4} + 0 + \frac{-9}{5} + \frac{19}{10} + \frac{11}{14}$ $\quad \because$ LCM $(4, 5, 10, 14) = 140$

$$= \frac{(-7 \times 35) + (-9 \times 28) + (10 \times 14) + (11 \times 10)}{140}$$

$$= \frac{-175 - 252 + 140 + 110}{140} = \frac{-121}{140}.$$

(v) $\frac{-7}{4} + \frac{5}{3} + \frac{-1}{2} + \frac{-5}{6} + 2$

$\because$ LCM $(4, 3, 2, 6, 2) = 12$

$$= \frac{-7 \times 3 + 5 \times 4 - 2 \times 6 - 5 \times 2 + 2 \times 12}{12}$$

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$$\frac{-21+20-12-10+24}{12}$$

$$= \frac{-43+44}{12} = \frac{1}{12}$$

Q3 Simplify (i) $-\frac{3}{2}+\frac{5}{4}-\frac{7}{4}$ (ii) $\frac{5}{3}-\frac{7}{6}+\frac{-2}{3}$

(iii) $\frac{5}{4}-\frac{7}{6}-\frac{-2}{3}$ (iv) $-\frac{2}{5}-\frac{-3}{10}-\frac{-4}{7}$

(v) $\frac{5}{6}+\frac{-2}{5}-\frac{-2}{15}$ (vi) $\frac{3}{8}-\frac{-2}{9}+\frac{-5}{36}$

Solution: (i) $-\frac{3}{2}+\frac{5}{4}-\frac{7}{4} = \frac{(-3\times2)+5-7}{4}$

$$= \frac{-6+5-7}{4} = \frac{-8}{4} = -2$$

(ii) $\frac{5}{3}-\frac{7}{6}+\frac{-2}{3}$

$\because$ LCM $(3,6,3) = 6$

$$\Rightarrow \frac{(5\times2)-(7\times1)+(-2\times2)}{6} = \frac{10-7-4}{6} = \frac{10-11}{6} = \frac{-1}{6}$$

(iii) $\frac{5}{4}-\frac{7}{6}-\frac{-2}{3} = \frac{5}{4}-\frac{7}{6}+\frac{2}{3}$

$$= \frac{5\times3-7\times2+2\times4}{12} = \frac{15-14+8}{12}$$

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

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(iv) $-\frac{2}{5} - \frac{-3}{10} - \frac{-4}{7}$

$\because$ LCM $(5, 10, 7) = 70$

$$\Rightarrow \frac{-2\times14 + 3\times7 + 4\times10}{70} = \frac{-28+21+40}{70}$$

$$= \frac{33}{70}$$

(v) $\frac{5}{6} + \frac{-2}{5} - \frac{-2}{15} = \frac{(5\times5)+(-2\times6)+(2\times2)}{30}$

$$= \frac{25-12+4}{30} = \frac{17}{30}$$

(vi) $\frac{3}{8} - \frac{-2}{9} + \frac{-5}{36}$

$\because$ LCM $(8, 9, 36) = 72$

$$= \frac{(3\times9)+(2\times8)-(5\times2)}{72} = \frac{27+16-10}{72}$$

$$= \frac{43-10}{72} = \frac{33}{72} = \frac{11}{24}$$

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