

Rational Numbers

Ex 1D

Q1.

Answer :

(i)

$$\begin{aligned}\frac{3}{5} \times \frac{-7}{8} \\ &= \frac{3 \times (-7)}{5 \times 8} \\ &= -\frac{21}{40}\end{aligned}$$

(ii)

$$\begin{aligned}\frac{-9}{2} \times \frac{5}{4} \\ &= \frac{(-9) \times 5}{2 \times 4} \\ &= \frac{-45}{8}\end{aligned}$$

(iii)

$$\begin{aligned}\frac{-6}{11} \times \frac{-5}{3} \\ &= \frac{(-6) \times (-5)}{11 \times 3} \\ &= \frac{30}{33}\end{aligned}$$

Simplifying the above rational number, we get:

$$\frac{30}{33} = \frac{30 \div 3}{33 \div 3} = \frac{10}{11}$$

(iv)

$$\begin{aligned} & \frac{-2}{3} \times \frac{6}{7} \\ &= \frac{(-2) \times 6}{3 \times 7} \\ &= \frac{-12}{21} \end{aligned}$$

Simplifying the above rational number, we get:

$$\frac{-12}{21} = \frac{-12 \div 3}{21 \div 3} = \frac{-4}{7}$$

(v)

$$\begin{aligned} & \frac{-12}{5} \times \frac{10}{-3} \\ &= \frac{(-12) \times 10}{5 \times (-3)} \\ &= \frac{-120}{-15} \\ &= \frac{120}{15} \end{aligned}$$

Simplifying the above rational number, we get:

$$\frac{120}{15} = \frac{120 \div 3}{15 \div 3} = \frac{40}{5} = 8$$

(vi)

$$\begin{aligned} & \frac{25}{-9} \times \frac{3}{-10} \\ &= \frac{25 \times 3}{(-9) \times (-10)} \\ &= \frac{75}{90} \end{aligned}$$

Simplifying the above rational number, we get:

$$\frac{75}{90} = \frac{75 \div 15}{90 \div 15} = \frac{5}{6}$$

(vii)

$$\begin{aligned} & \frac{5}{-18} \times \frac{-9}{20} \\ &= \frac{5 \times (-9)}{-18 \times 20} \\ &= \frac{-45}{-360} \\ &= \frac{45}{360} \end{aligned}$$

Simplifying the above rational number, we get:

$$\frac{45}{360} = \frac{45 \div 45}{360 \div 45} = \frac{1}{8}$$

(viii)

$$\begin{aligned} \frac{-13}{15} \times \frac{-25}{26} \\ &= \frac{(-13) \times (-25)}{15 \times 26} \\ &= \frac{325}{390} \end{aligned}$$

Simplifying the above rational number, we get:

$$\frac{325}{390} = \frac{325 \div 5}{390 \div 5} = \frac{65}{78} = \frac{65 \div 13}{78 \div 13} = \frac{5}{6}$$

(ix)

$$\begin{aligned} \frac{16}{-21} \times \frac{14}{5} \\ &= \frac{16 \times 14}{(-21) \times 5} \\ &= \frac{224}{-105} \end{aligned}$$

Simplifying the above rational number, we get:

$$\frac{224}{-105} = \frac{224 \div 7}{(-105) \div 7} = \frac{32}{-15} = \frac{32 \times -1}{-15 \times -1} = \frac{-32}{15}$$

(x)

$$\begin{aligned} \frac{-7}{6} \times 24 \\ &= \frac{(-7) \times 24}{6} \\ &= \frac{-168}{6} \end{aligned}$$

Simplifying the above rational number, we get:

$$\frac{-168}{6} = \frac{(-168) \div 2}{6 \div 2} = \frac{84}{3} = \frac{-84 \div 3}{3 \div 3} = -28$$

(xi)

$$\begin{aligned} \frac{7}{24} \times (-48) \\ &= \frac{7 \times (-48)}{24} = -\frac{336}{24} \end{aligned}$$

Simplifying the above rational number, we get:

$$\frac{-336}{24} = \frac{-336 \div 24}{24 \div 24} = -14$$

(xii)

$$\begin{aligned} \frac{-13}{5} \times (-10) \\ &= \frac{(-13) \times (-10)}{5} \\ &= \frac{130}{5} \end{aligned}$$

Simplifying the above rational number, we get:

$$\frac{130}{5} = \frac{130 \div 5}{5 \div 5} = 26$$

Q2.

Answer :

(i)

$$\frac{3}{7} \times \frac{-5}{9} = \frac{-5}{9} \times \frac{3}{7}$$

$$\begin{aligned} \text{LHS} &= \frac{3 \times (-5)}{7 \times 9} \\ &= -\frac{15}{63} \end{aligned}$$

Simplifying, we get:

$$\begin{aligned} -\frac{15}{63} &= -\frac{15 \div 3}{63 \div 3} \\ &= -\frac{5}{21} \end{aligned}$$

$$\begin{aligned} \text{RHS} &= \frac{-5}{9} \times \frac{3}{7} \\ &= \frac{(-5) \times 3}{9 \times 7} \\ &= \frac{-15}{63} \end{aligned}$$

Simplifying, we get:

$$\begin{aligned} &= \frac{-15 \div 3}{63 \div 3} \\ &= -\frac{5}{21} \end{aligned}$$

LHS = RHS

(ii)

$$\frac{-8}{7} \times \frac{13}{9} = \frac{13}{9} \times \frac{-8}{7}$$

$$\text{LHS} = \frac{-8}{7} \times \frac{13}{9} = \frac{(-8) \times 13}{7 \times 9} = -\frac{104}{63} \quad \text{RHS} = \frac{13}{9} \times \frac{-8}{7} = \frac{13 \times (-8)}{9 \times 7} = -\frac{104}{63} \quad \text{LHS} = \text{RHS}$$

(iii)

$$\frac{-12}{5} \times \frac{7}{-36} = \frac{7}{-36} \times \frac{-12}{5}$$

$$\begin{aligned} \text{LHS} &= \frac{-12}{5} \times \frac{7}{-36} \\ &= \frac{(-12) \times 7}{5 \times (-36)} \\ &= \frac{84}{180} \end{aligned}$$

Simplifying, we get:

$$\begin{aligned} &= \frac{84 \div 12}{180 \div 12} \\ &= \frac{7}{15} \end{aligned}$$

$$\begin{aligned} \text{RHS} &= \frac{7}{-36} \times \frac{-12}{5} \\ &= \frac{7 \times (-12)}{(-36) \times 5} \\ &= \frac{84}{180} \end{aligned}$$

Simplifying, we get:

$$\begin{aligned} &= \frac{84 \div 12}{180 \div 12} \\ &= \frac{7}{15} \end{aligned}$$

LHS = RHS

(iv)

$$-8 \times \frac{-13}{12} = \frac{-13}{12} \times (-8)$$

$$\begin{aligned} \text{LHS} &= -8 \times \frac{-13}{12} \\ &= \frac{(-8) \times (-13)}{12} \\ &= \frac{104}{12} \end{aligned}$$

Simplifying, we get:

$$\begin{aligned} &= \frac{104 \div 4}{12 \div 4} \\ &= \frac{26}{3} \end{aligned}$$

$$\begin{aligned} \text{RHS} &= \frac{-13}{12} \times (-8) \\ &= \frac{(-13) \times (-8)}{12} \\ &= \frac{104}{12} \end{aligned}$$

Simplifying, we get:

$$\begin{aligned} &= \frac{104 \div 4}{12 \div 4} \\ &= \frac{26}{3} \end{aligned}$$

LHS = RHS

Q3.

Answer :

(i)

$$\left(\frac{5}{7} \times \frac{12}{13}\right) \times \frac{7}{18} = \frac{5}{7} \times \left(\frac{12}{13} \times \frac{7}{18}\right)$$

$$\begin{aligned} \text{LHS} &= \left(\frac{5}{7} \times \frac{12}{13}\right) \times \frac{7}{18} \\ &= \frac{5 \times 12}{7 \times 13} \times \frac{7}{18} \\ &= \frac{60}{91} \times \frac{7}{18} \\ &= \frac{420}{1638} \\ &= \frac{10}{39} \end{aligned}$$

$$\begin{aligned} \text{RHS} &= \frac{5}{7} \times \left(\frac{12}{13} \times \frac{7}{18}\right) \\ &= \frac{5}{7} \times \frac{12 \times 7}{13 \times 18} \\ &= \frac{5}{7} \times \frac{84}{234} \\ &= \frac{420}{1638} \\ &= \frac{10}{39} \end{aligned}$$

$$\therefore \left(\frac{5}{7} \times \frac{12}{13}\right) \times \frac{7}{18} = \frac{5}{7} \times \left(\frac{12}{13} \times \frac{7}{18}\right)$$

(ii)

$$\frac{-13}{24} \times \left(\frac{-12}{5} \times \frac{35}{36}\right) = \left(\frac{-13}{24} \times \frac{-12}{5}\right) \times \frac{35}{36}$$

$$\begin{aligned}\text{LHS} &= \frac{-13}{24} \times \left(\frac{-12}{5} \times \frac{35}{36}\right) \\ &= \frac{-13}{24} \times \frac{(-12) \times 35}{5 \times 36} \\ &= \frac{-13}{24} \times \frac{-420}{180} \\ &= \frac{5460}{4320} \\ &= \frac{91}{72}\end{aligned}$$

$$\begin{aligned}\text{RHS} &= \left(\frac{-13}{24} \times \frac{-12}{5}\right) \times \frac{35}{36} \\ &= \frac{(-13) \times (-12)}{24 \times 5} \times \frac{35}{36} \\ &= \frac{156}{120} \times \frac{35}{36} \\ &= \frac{156 \times 35}{120 \times 36} \\ &= \frac{5460}{4320} \\ &= \frac{91}{72}\end{aligned}$$

$$\therefore \frac{-13}{24} \times \left(\frac{-12}{5} \times \frac{35}{36}\right) = \left(\frac{-13}{24} \times \frac{-12}{5}\right) \times \frac{35}{36}$$

(iii)

$$\left(\frac{-9}{5} \times \frac{-10}{3}\right) \times \frac{21}{-4} = \frac{-9}{5} \times \left(\frac{-10}{3} \times \frac{21}{-4}\right)$$

$$\begin{aligned}\text{LHS} &= \left(\frac{-9}{5} \times \frac{-10}{3}\right) \times \frac{21}{-4} \\ &= \frac{(-9) \times (-10)}{5 \times 3} \times \frac{21}{-4} \\ &= \frac{90}{15} \times \frac{21}{-4} \\ &= \frac{90 \times 21}{15 \times (-4)} \\ &= -\frac{1890}{60} \\ &= -\frac{63}{2}\end{aligned}$$

$$\begin{aligned}\text{RHS} &= \frac{-9}{5} \times \left(\frac{-10}{3} \times \frac{21}{-4}\right) \\ &= \frac{-9}{5} \times \frac{(-10) \times 21}{3 \times (-4)} \\ &= \frac{-9}{5} \times \frac{210}{12} \\ &= \frac{(-9) \times 210}{5 \times 12} \\ &= -\frac{1890}{60} \\ &= -\frac{63}{2}\end{aligned}$$

$$\therefore \left(\frac{-9}{5} \times \frac{-10}{3}\right) \times \frac{21}{-4} = \frac{-9}{5} \times \left(\frac{-10}{3} \times \frac{21}{-4}\right)$$

Q4.

Answer :

(i)

$$\frac{-23}{17} \times \frac{18}{35} = \frac{18}{35} \times \boxed{\frac{-23}{17}} \quad (\because a \times b = b \times a)$$

(ii)

$$-38 \times \frac{-7}{9} = \frac{-7}{9} \times \boxed{-38} \quad (\because a \times b = b \times a)$$

(iii)

$$\left(\frac{15}{7} \times \frac{-21}{10}\right) \times \frac{-5}{6} = \boxed{\frac{15}{7}} \times \left(\frac{-21}{10} \times \frac{-5}{6}\right) \quad [\because a \times (b \times c) = (a \times b) \times c]$$

(iv)

$$\frac{-12}{5} \times \left(\frac{4}{15} \times \frac{25}{-16}\right) = \left(\frac{-12}{5} \times \frac{4}{15}\right) \times \boxed{\frac{25}{-16}} \quad [\because a \times (b \times c) = (a \times b) \times c]$$

Q5.

Answer :

(i)

Reciprocal of $\frac{13}{25}$ is $\frac{25}{13}$.

(ii)

Reciprocal of $\frac{-17}{12}$ is $\frac{12}{-17}$, that is, $\frac{-12}{17}$.

(iii)

Reciprocal of $\frac{-7}{24}$ is $\frac{24}{-7}$, that is, $\frac{-24}{7}$.

(iv)

Reciprocal of 18 is $\frac{1}{18}$.

(v)

Reciprocal of -16 is $\frac{1}{-16}$, that is, $\frac{-1}{16}$.

(vi)

Reciprocal of $\frac{-3}{-5}$ is $\frac{-5}{-3}$, that is, $\frac{5}{3}$.

(vii)

Reciprocal of -1 is -1.

(viii)

Reciprocal of $\frac{0}{2}$ does not exist as $\frac{2}{0} = \infty$.

(ix)

Reciprocal of $\frac{2}{-5}$ is $\frac{-5}{2}$.

(x)

Reciprocal of $\frac{-1}{8}$ is -8.

Q6.

Answer :

We know that $a^{-1} = \frac{1}{a}$ or $a^{-1} \times a = 1$

(i)

$$\left(\frac{5}{8}\right)^{-1} = \frac{8}{5}$$

$$\therefore \frac{5}{8} \times \left(\frac{5}{8}\right)^{-1} = 1$$

(ii)

$$\left(\frac{-4}{9}\right)^{-1} = \frac{9}{-4} = \frac{-9}{4}$$

$$\therefore \frac{-4}{9} \times \left(\frac{-4}{9}\right)^{-1} = 1$$

(iii)

$$\left(-7\right)^{-1} = \frac{1}{-7} = \frac{-1}{7}$$

$$\therefore -7 \times \left(-7\right)^{-1} = 1$$

(iv) $\left(-3\right)^{-1}$

$$\left(-3\right)^{-1} = \frac{1}{-3} = \frac{-1}{3}$$

$$\therefore \left(-3\right)^{-1} \times (-3) = 1$$

Q7.

Answer :

(i)

$$\text{LHS} = \frac{3}{7} \times \left(\frac{5}{6} + \frac{12}{13}\right)$$

$$= \frac{3}{7} \times \left(\frac{65+72}{78}\right)$$

$$= \frac{3}{7} \times \frac{137}{78}$$

$$= \frac{137}{182}$$

$$\text{RHS} = \left(\frac{3}{7} \times \frac{5}{6}\right) + \left(\frac{12}{13} \times \frac{3}{7}\right)$$

$$= \frac{3 \times 5}{7 \times 6} + \frac{12 \times 3}{13 \times 7}$$

$$= \frac{15}{42} + \frac{36}{91}$$

$$= \frac{195+216}{546}$$

$$= \frac{411}{546}$$

$$= \frac{137}{182}$$

$$\therefore \frac{3}{7} \times \left(\frac{5}{6} + \frac{12}{13}\right) = \left(\frac{3}{7} \times \frac{5}{6}\right) + \left(\frac{3}{7} \times \frac{12}{13}\right)$$

(ii)

$$\begin{aligned}\text{LHS} &= \frac{-15}{4} \times \left(\frac{3}{7} + \frac{-12}{5} \right) \\ &= \frac{-15}{4} \times \left(\frac{15-84}{35} \right) \\ &= \frac{-15}{4} \times \frac{-69}{35} \\ &= \frac{(-15) \times (-69)}{140} \\ &= \frac{1035}{140} \\ &= \frac{207}{28} \\ \text{RHS} &= \left(\frac{-15}{4} \times \frac{3}{7} \right) + \left(\frac{-15}{4} \times \frac{-12}{5} \right) \\ &= \frac{(-15) \times 3}{4 \times 7} + \frac{(-15) \times (-12)}{4 \times 5} \\ &= \frac{-45}{28} + \frac{180}{20} \\ &= \frac{-225+1260}{140} \\ &= \frac{1035}{140} \\ &= \frac{207}{28}\end{aligned}$$

$$\therefore \frac{-15}{4} \times \left(\frac{3}{7} + \frac{-12}{5} \right) = \left(\frac{-15}{4} \times \frac{3}{7} \right) + \left(\frac{-15}{4} \times \frac{-12}{5} \right)$$

(iii)

$$\begin{aligned}\left(\frac{-8}{3} + \frac{-13}{12} \right) \times \frac{5}{6} &= \left(\frac{-8}{3} \times \frac{5}{6} \right) + \left(\frac{-13}{12} \times \frac{5}{6} \right) \\ \text{LHS} &= \left(\frac{-8}{3} + \frac{-13}{12} \right) \times \frac{5}{6} \\ &= \frac{-32-13}{12} \times \frac{5}{6} \\ &= \frac{-45}{12} \times \frac{5}{6} \\ &= \frac{-45 \times 5}{12 \times 6} \\ &= \frac{-225}{72} \\ &= \frac{-225 \div 9}{72 \div 9} \\ &= -\frac{25}{8} \\ \text{RHS} &= \left(\frac{-8}{3} \times \frac{5}{6} \right) + \left(\frac{-13}{12} \times \frac{5}{6} \right) \\ &= \frac{-8 \times 5}{3 \times 6} + \frac{(-13) \times 5}{12 \times 6} \\ &= \frac{-40}{18} + \frac{-65}{72} \\ &= \frac{-160-65}{72} \\ &= \frac{-225}{72} \\ &= \frac{-225 \div 9}{72 \div 9} \\ &= -\frac{25}{8} \\ \therefore \left(\frac{-8}{3} + \frac{-13}{12} \right) \times \frac{5}{6} &= \left(\frac{-8}{3} \times \frac{5}{6} \right) + \left(\frac{-13}{12} \times \frac{5}{6} \right)\end{aligned}$$

(iv)

$$\begin{aligned}\frac{-16}{7} \times \left(\frac{-8}{9} + \frac{-7}{6} \right) &= \left(\frac{-16}{7} \times \frac{-8}{9} \right) + \left(\frac{-16}{7} \times \frac{-7}{6} \right) \\ \text{LHS} &= \frac{-16}{7} \times \left(\frac{-8}{9} + \frac{-7}{6} \right) \\ &= \frac{-16}{7} \times \left(\frac{-16-21}{18} \right) \\ &= \frac{-16}{7} \times \frac{-37}{18} \\ &= \frac{592}{126} \\ &= \frac{296}{63} \\ \text{RHS} &= \left(\frac{-16}{7} \times \frac{-8}{9} \right) + \left(\frac{-16}{7} \times \frac{-7}{6} \right) \\ &= \frac{128}{63} + \frac{112}{42} \\ &= \frac{256+336}{126}\end{aligned}$$

$$= \frac{592}{126}$$
$$= \frac{296}{63}$$

$$\therefore \frac{-16}{7} \times \left(\frac{-8}{9} + \frac{-7}{6} \right) = \left(\frac{-16}{7} \times \frac{-8}{9} \right) + \left(\frac{-16}{7} \times \frac{-7}{6} \right)$$

Q8.

Answer :

Commutative property

Associative property

Distributive property

Property of multiplicative identity

Property of multiplicative inverse

Multiplicative property of 0

Q9.

Answer :

(i) 1

(ii) no

(iii) 1; -1

(iv) not

(v) 1a

(vi) a

(vii) positive

(viii) negative