

Chapter 1: Rational numbers

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Exercise 1A

Question 1.

Solution: If $\frac{a}{b}$ is a fraction and m is a non-zero integer, then $\frac{a}{b} = \frac{a \times m}{b \times m}$.

$$(i) \frac{-3}{5} = \frac{-3 \times 4}{5 \times 4} = \frac{-12}{20}$$

$$(ii) \frac{-3}{5} = \frac{-3 \times -6}{5 \times -6} = \frac{18}{-30}$$

$$(iii) \frac{-3}{5} = \frac{-3 \times 7}{5 \times 7} = \frac{-21}{35}$$

$$(iv) \frac{-3}{5} = \frac{-3 \times -8}{5 \times -8} = \frac{24}{-40}$$

Question 2.

Solution: If $\frac{a}{b}$ is a fraction and m is a common divisor of a and b , then $\frac{a}{b} = \frac{a \div m}{b \div m}$.

$$\frac{-42}{98} = \frac{-42 \div 14}{98 \div 14} = \frac{-3}{7}$$

Question 3.

Solution: If $\frac{a}{b}$ is a fraction and m is a common divisor of a and b , then $\frac{a}{b} = \frac{a \div m}{b \div m}$.

$$\frac{-48}{60} = \frac{-48 \div 12}{60 \div 12} = \frac{-4}{5}$$

Question 4.

Solution: A rational number $\frac{a}{b}$ is said to be in standard form if a and b have no common divisor other than unity and $b > 0$.

Thus,

$$(i) \frac{-12}{30} = \frac{-12 \div 6}{30 \div 6} = \frac{-2}{5}$$

$$(ii) \frac{-14}{49} = \frac{-14 \div 7}{49 \div 7} = \frac{-2}{7}$$

$$(iii) \frac{24}{-64} = \frac{24 \div 8}{-64 \div 8} = \frac{-3}{8}$$

$$(iv) \frac{-36}{-63} = \frac{36 \div 9}{63 \div 9} = \frac{4}{7}$$

Question 5.

Solution:

(i) $\frac{3}{8}$ is a positive rational number.

$$\therefore \frac{3}{8} > 0$$

(ii) $\frac{-2}{9}$ is a negative rational number.

$$\therefore \frac{-2}{9} < 0$$

(iii) $\frac{-3}{4}$ is a negative rational number.

$$\therefore \frac{-3}{4} < 0$$

Also, $\frac{1}{4}$ is a positive rational number.

$$\therefore \frac{1}{4} > 0$$

$$\therefore \frac{-3}{4} < \frac{1}{4}$$

(iv) Both have same denominators. So that we can directly compare the numerators

$$\therefore \frac{-5}{7} < \frac{-4}{7}$$

$$(v) \frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

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

$$\therefore \frac{8}{12} < \frac{9}{12}$$

$$\therefore \frac{2}{3} < \frac{3}{4}$$

$$\text{(vi)} \quad \frac{-1}{2} = \frac{-1 \times 1}{2 \times 1} = \frac{-1}{2}$$

$$\frac{-1}{1} = \frac{-1 \times 2}{1 \times 2} = \frac{-2}{2}$$

$$\therefore \frac{-1}{2} < \frac{-2}{2}$$

$$\therefore -1 < \frac{-1}{2}$$

Question 6.

Solution:

(i) L.C.M. of denominators 3 and 7 is 21.

$$\frac{-4}{3} = \frac{-4 \times 7}{3 \times 7} = \frac{-28}{21}$$

$$\frac{-8}{7} = \frac{-8 \times 3}{7 \times 3} = \frac{-24}{21}$$

$$\therefore \frac{-28}{21} < \frac{-24}{21}$$

$$\therefore \frac{-4}{3} < \frac{-8}{7}$$

(ii) L.C.M. of denominators 9 and 8 is 72.

$$\frac{-7}{9} = \frac{-7 \times 8}{9 \times 8} = \frac{-56}{72}$$

$$\frac{-5}{8} = \frac{-5 \times 9}{8 \times 9} = \frac{-45}{72}$$

$$\therefore \frac{-56}{72} < \frac{-45}{72}$$

$$\therefore \frac{-7}{9} < \frac{-5}{8}$$

(iii) L.C.M. of denominators 3 and 5 is 15.

$$\frac{-1}{3} = \frac{-1 \times 5}{3 \times 5} = \frac{-5}{15}$$

$$\frac{-4}{5} = \frac{-4 \times 3}{5 \times 3} = \frac{-12}{15}$$

$$\therefore \frac{-5}{15} > \frac{-12}{15}$$

$$\therefore \frac{-1}{3} > \frac{-4}{5}$$

(iv) L.C.M. of denominators 13 and 12 is 156.

$$\frac{-9}{13} = \frac{9 \times 12}{13 \times 12} = \frac{-108}{156}$$

$$\frac{7}{-12} = \frac{7 \times 13}{-12 \times 13} = \frac{-91}{156}$$

$$\therefore \frac{-108}{156} < \frac{-91}{156}$$

$$\therefore \frac{-9}{13} < \frac{7}{-12}$$

(v) L.C.M. of denominators 5 and 10 is 10.

$$\frac{-4}{5} = \frac{-4 \times 2}{5 \times 2} = \frac{-8}{10}$$

$$\frac{-7}{10} = \frac{-7 \times 1}{10 \times 1} = \frac{-7}{10}$$

$$\therefore \frac{-8}{10} < \frac{-7}{10}$$

$$\therefore \frac{-4}{5} < \frac{-7}{10}$$

(vi) L.C.M. of denominators 5.

$$\frac{-3}{1} = \frac{-3 \times 5}{1 \times 5} = \frac{-15}{5}$$

$$\frac{-12}{5}$$

$$\therefore \frac{-15}{5} < \frac{-12}{5}$$

$$\therefore -3 < \frac{-12}{5}$$

Question 7.

Solution:

$$(i) \frac{-3}{7} > \frac{6}{-13}$$

$$(ii) \frac{5}{-13} = \frac{-35}{91}$$

$$(iii) -2 > \frac{-13}{5}$$

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

$$(v) 0 < \frac{-3}{-5}$$

$$(vi) \frac{-8}{9} > \frac{-9}{10}$$

Question 8.

Solution:

(i) L.C.M. of 9, 12, 18 and 3 is 36.

$$\frac{-4}{9} = \frac{-4 \times 4}{9 \times 4} = \frac{-16}{36}$$

$$\frac{-5}{12} = \frac{-5 \times 3}{12 \times 3} = \frac{-15}{36}$$

$$\frac{-7}{18} = \frac{-7 \times 2}{18 \times 2} = \frac{-14}{36}$$

$$\frac{-2}{3} = \frac{-2 \times 12}{3 \times 12} = \frac{-24}{36}$$

$$\frac{-24}{36} < \frac{-16}{36} < \frac{-15}{36} < \frac{-14}{36}$$

$$\therefore \frac{-2}{3} < \frac{-4}{9} < \frac{-5}{12} < \frac{-7}{18}$$

(ii) L.C.M. of 4, 12, 16 and 24 is 48.

$$\frac{-3}{4} = \frac{-3 \times 12}{4 \times 12} = \frac{-36}{48}$$

$$\frac{-5}{12} = \frac{-5 \times 4}{12 \times 4} = \frac{-20}{48}$$

$$\frac{-7}{16} = \frac{-7 \times 3}{16 \times 3} = \frac{-21}{48}$$

$$\frac{-9}{24} = \frac{-9 \times 2}{24 \times 2} = \frac{-18}{48}$$

$$\frac{-36}{48} < \frac{-21}{48} < \frac{-20}{48} < \frac{-18}{48}$$

$$\therefore \frac{-3}{4} < \frac{-7}{16} < \frac{-5}{12} < \frac{-9}{24}$$

(iii) L.C.M. of 5, 10, 15 and 20 is 60.

$$\frac{-3}{5} = \frac{-3 \times 12}{5 \times 12} = \frac{-36}{60}$$

$$\frac{-7}{10} = \frac{-7 \times 6}{10 \times 6} = \frac{-42}{60}$$

$$\frac{-11}{15} = \frac{-11 \times 4}{15 \times 4} = \frac{-44}{60}$$

$$\frac{-13}{20} = \frac{-13 \times 3}{20 \times 3} = \frac{-39}{60}$$

$$\frac{-44}{60} < \frac{-42}{60} < \frac{-39}{60} < \frac{-36}{60}$$

$$\therefore \frac{-11}{15} < \frac{-7}{10} < \frac{-13}{20} < \frac{-3}{5}$$

(iv) L.C.M. of 7, 14, 28 and 42 is 84.

$$\frac{-4}{7} = \frac{-4 \times 12}{7 \times 12} = \frac{-12}{84}$$

$$\frac{-9}{14} = \frac{-9 \times 6}{14 \times 6} = \frac{-54}{84}$$

$$\frac{-13}{28} = \frac{-13 \times 3}{28 \times 3} = \frac{-39}{84}$$

$$\frac{-23}{42} = \frac{-23 \times 2}{42 \times 2} = \frac{-46}{84}$$

$$\frac{-54}{84} < \frac{-48}{84} < \frac{-46}{84} < \frac{-39}{84}$$

$$\therefore \frac{-9}{14} < \frac{-4}{7} < \frac{-23}{42} < \frac{-13}{28}$$

Question 9.

Solution:

(i) L.C.M. of 1, 6, 3 and 3 is 6.

$$\frac{-2}{1} = \frac{-2 \times 6}{1 \times 6} = \frac{-12}{6}$$

$$\frac{-13}{6} = \frac{-13 \times 1}{6 \times 1} = \frac{-13}{6}$$

$$\frac{-8}{3} = \frac{-8 \times 2}{3 \times 2} = \frac{-16}{6}$$

$$\frac{-1}{3} = \frac{-1 \times 2}{3 \times 2} = \frac{-2}{6}$$

$$\frac{-2}{6} > \frac{-12}{6} > \frac{-13}{6} > \frac{-16}{6}$$

$$\therefore \frac{1}{3} > -2 > \frac{-13}{6} > \frac{-8}{3}$$

(ii) L.C.M. of 10, 15, 20 and 30 is 60.

$$\frac{-3}{10} = \frac{-3 \times 6}{10 \times 6} = \frac{-18}{60}$$

$$\frac{-7}{15} = \frac{-7 \times 4}{15 \times 4} = \frac{-28}{60}$$

$$\frac{-11}{20} = \frac{-11 \times 3}{20 \times 3} = \frac{-33}{60}$$

$$\frac{-17}{30} = \frac{-17 \times 2}{30 \times 2} = \frac{-34}{60}$$

$$\frac{-18}{60} > \frac{-28}{60} > \frac{-33}{60} > \frac{-34}{60}$$

$$\therefore \frac{3}{10} > \frac{7}{15} > \frac{-11}{20} > \frac{-17}{30}$$

(iii) L.C.M. of 6, 12, 18 and 24 is 72.

$$\frac{-5}{6} = \frac{-5 \times 12}{6 \times 12} = \frac{-60}{72}$$

$$\frac{-7}{12} = \frac{-7 \times 6}{12 \times 6} = \frac{-42}{72}$$

$$\frac{-13}{18} = \frac{-13 \times 4}{18 \times 4} = \frac{-52}{72}$$

$$\frac{-23}{24} = \frac{-23 \times 3}{24 \times 3} = \frac{-69}{72}$$

$$\frac{-42}{72} > \frac{-52}{72} > \frac{-60}{72} > \frac{-69}{72}$$

$$\therefore \frac{-7}{12} > \frac{-13}{18} > \frac{-5}{6} > \frac{-23}{24}$$

(iv) L.C.M. of 11, 22, 33 and 44 is 132.

$$\frac{-10}{11} = \frac{-10 \times 12}{11 \times 12} = \frac{-120}{132}$$

$$\frac{-19}{22} = \frac{-19 \times 6}{22 \times 6} = \frac{-114}{132}$$

$$\frac{-23}{33} = \frac{-23 \times 4}{33 \times 4} = \frac{-92}{132}$$

$$\frac{-39}{44} = \frac{-39 \times 3}{44 \times 3} = \frac{-117}{132}$$

$$\frac{-92}{132} > \frac{-114}{132} > \frac{-117}{132} > \frac{-120}{132}$$

Question 10.

Solution:

- (i) Every whole number is a rational number. - T
(ii) Every integer is a rational number. - T
(iii) 0 is a whole number but it is not a rational number. - F

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Exercise 1B

Question 1.

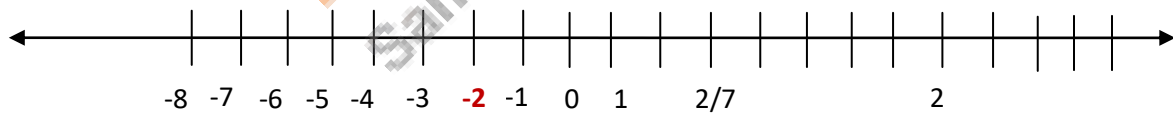
(i)

Solution:



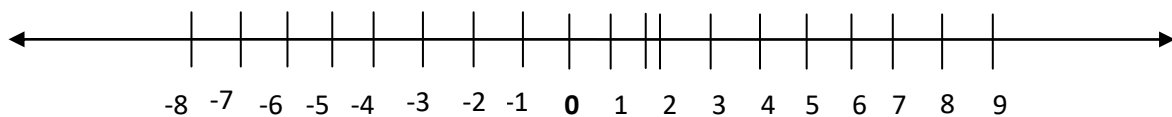
(ii)

Solution:



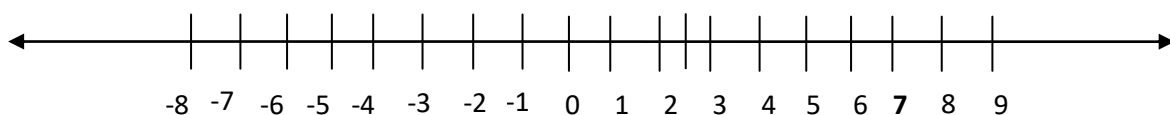
(iii)

Solution:



(iv)

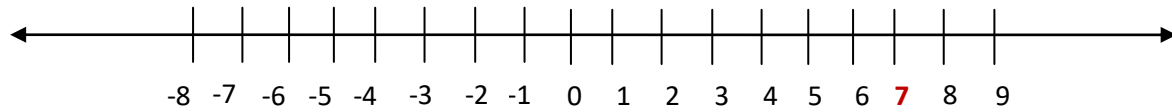
Solution:



2.4

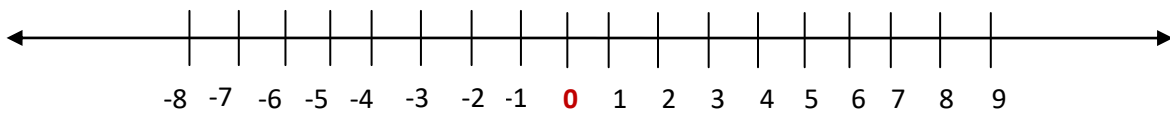
(v)

Solution:



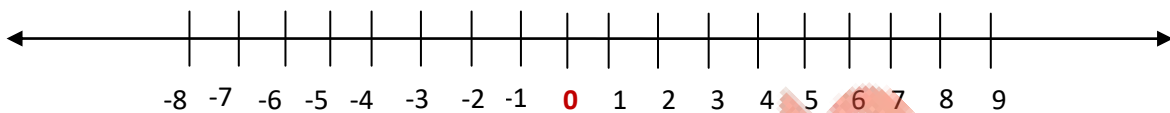
(vi)

Solution:



(vii)

Solution:



(viii)

Solution:



Question 2.

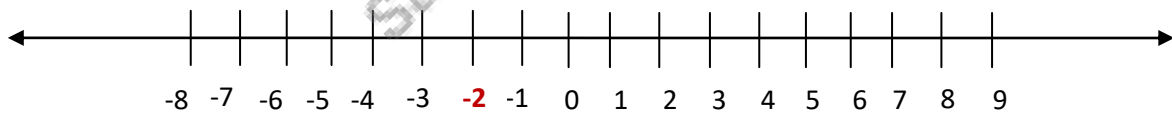
(i)

Solution:



(ii)

Solution:



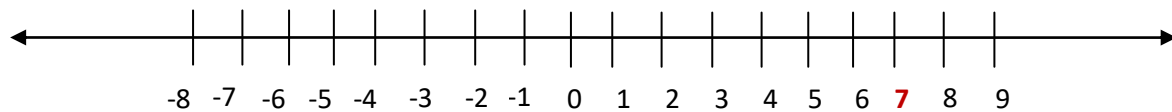
(iii)

Solution:



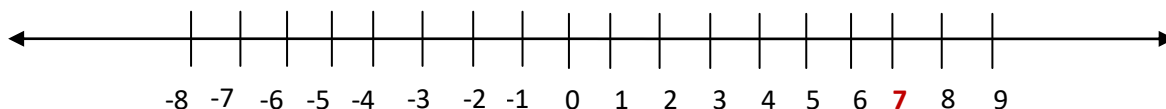
(iv)

Solution:



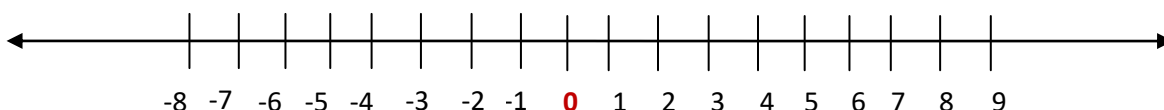
(v)

Solution:



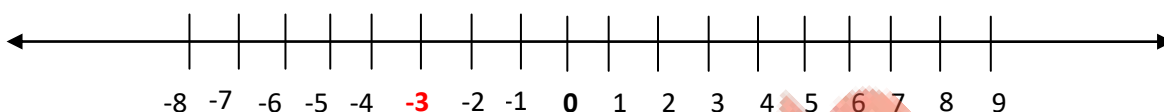
(vi)

Solution:



(vii)

Solution:



(viii)

Solution:



Question 3.

Solution:

(i) $\frac{-3}{5}$ lies to the left of 0 on the number line. – True.

(ii) $\frac{-12}{7}$ lies to the right of 0 on the number line. – False.

(iii) The rational numbers $\frac{1}{3}$ and $\frac{-5}{2}$ are on opposite sides of 0 on the number line. – False.

(iv) The rational number $\frac{-18}{-13}$ lies to the left of 0 on the number line. – True.

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Exercise 1C

Question 1.

(i)

Solution:

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

(ii)

Solution:

$$\frac{-6}{11} + \frac{-4}{11} = \frac{-10}{11}$$

(iii)

Solution:

$$\frac{-11}{8} + \frac{5}{8} = \frac{-6}{8} = \frac{-3}{4}$$

(iv)

Solution:

$$\frac{-7}{3} + \frac{1}{3} = \frac{-6}{3} = -2$$

(v)

Solution:

$$\frac{5}{6} + \frac{-1}{6} = \frac{4}{6} = \frac{2}{3}$$

(vi)

Solution:

$$\frac{-17}{15} + \frac{-1}{15} = \frac{-18}{15} = \frac{-6}{5}$$

Question 2.

(i)

Solution:

$$\frac{3}{4} + \frac{-3}{5} = \frac{15 + (-12)}{20} = \frac{3}{20}$$

(ii)

Solution:

$$\frac{5}{8} + \frac{-7}{12} = \frac{15 + (-14)}{24} = \frac{1}{24}$$

(iii)

Solution:

$$\frac{-8}{9} + \frac{11}{6} = \frac{-16+33}{18} = \frac{17}{18}$$

(iv)

Solution:

$$\frac{-5}{16} + \frac{7}{24} = \frac{-15+14}{48} = \frac{-1}{48}$$

(v)

Solution:

$$\frac{7}{-18} + \frac{8}{27} = \frac{-21+16}{54} = \frac{-5}{54}$$

(vi)

Solution:

$$\frac{1}{-12} + \frac{2}{-15} = \frac{-5+(-8)}{60} = \frac{-13}{60}$$

(vii)

Solution:

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

(viii)

Solution:

$$2 + \frac{-5}{4} = \frac{8+(-5)}{4} = \frac{3}{4}$$

(ix)

Solution:

$$0 + \frac{-2}{5} = \frac{0+(-2)}{5} = \frac{-2}{5}$$

Question 3.

(i)

Solution:

$$\frac{-12}{5} + \frac{2}{7} = \frac{2}{7} + \frac{-12}{5}$$

$$\frac{-84+10}{35} = \frac{10-84}{35}$$

$$\frac{-74}{35} = \frac{-74}{35}$$

(ii)

Solution:

$$\frac{-5}{8} + \frac{-9}{13} = \frac{-9}{13} + \frac{-5}{8}$$

$$\frac{-65+(-72)}{104} = \frac{-72-65}{104}$$

$$\frac{-137}{104} = \frac{-137}{104}$$

(iii)

Solution:

$$3 + \frac{-7}{12} = \frac{-7}{12} + 3$$

$$\frac{36+(-7)}{12} = \frac{-7+36}{12}$$

$$\frac{29}{12} = \frac{29}{12}$$

(iv)

Solution:

$$\frac{2}{-7} + \frac{12}{-35} = \frac{12}{-35} + \frac{2}{-7}$$

$$\frac{-10-12}{35} = \frac{-10-12}{35}$$

$$\frac{-22}{35} = \frac{-22}{35}$$

Question 4.

(i)

Solution:

$$\left(\frac{3}{4} + \frac{-2}{5}\right) + \frac{7}{10} = \frac{3}{4} + \left(\frac{-2}{5} + \frac{7}{10}\right)$$

$$\frac{15-8}{20} + \frac{7}{10} = \frac{3}{4} + \frac{-4-7}{10}$$

$$\frac{7}{20} + \frac{7}{10} = \frac{3}{4} + \frac{-11}{10}$$

$$\frac{7-14}{20} = \frac{15-22}{20}$$

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

(ii)

Solution:

$$\left(\frac{-7}{11} + \frac{2}{-5}\right) + \frac{-13}{22} = \frac{-7}{11} + \left(\frac{2}{-5} + \frac{-13}{22}\right)$$

$$\frac{-35-22}{55} + \frac{-13}{22} = \frac{-7}{11} + \frac{-44-65}{110}$$

$$\frac{-57}{55} + \frac{-13}{22} = \frac{-7}{11} + \frac{-109}{110}$$

$$\frac{-179}{110} = \frac{-179}{110}$$

(iii)

Solution:

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

$$\frac{-1}{1} + \frac{-8-9}{12} = \frac{-3-2}{3} + \frac{-3}{4}$$

$$\frac{-12-17}{12} = \frac{-20-9}{12}$$

$$\frac{-29}{12} = \frac{-29}{12}$$

Question 5.

Solution:

$$(i) \left(\frac{-13}{17}\right) + \left(\frac{-12}{5}\right) = \left(\frac{-12}{5}\right) + \frac{-13}{7}$$

$$(ii) -9 + \frac{-21}{8} = \frac{-21}{8} + (-9)$$

$$\text{(iii)} \left(\frac{-8}{13} + \frac{3}{7} \right) + \left(\frac{-13}{4} \right) = \frac{-8}{13} + \left(\frac{3}{7} + \frac{-13}{4} \right)$$

$$\text{(iv)} -12 + \left(\frac{7}{12} + \frac{-9}{11} \right) = \left(-12 + \frac{7}{12} \right) + \frac{-9}{11}$$

$$\text{(v)} \frac{19}{-5} + \left(\frac{-3}{11} + \frac{-7}{8} \right) = \left\{ \frac{19}{-5} + \frac{-3}{11} \right\} + \frac{-7}{8}$$

$$\text{(vi)} \frac{-16}{7} + 0 = 0 + \frac{-16}{7} = \frac{-16}{7}$$

Question 6.

(i)

$$\text{Solution: } \frac{-1}{3}$$

(ii)

$$\text{Solution: } -\frac{23}{9}$$

(iii)

$$\text{Solution: } 18$$

(iv)

$$\text{Solution: } \frac{17}{8}$$

(v)

$$\text{Solution: } \frac{15}{4}$$

(vi)

$$\text{Solution: } \frac{-16}{5}$$

(vii)

$$\text{Solution: } \frac{3}{11}$$

(viii)

$$\text{Solution: } 0$$

(ix)



Solution: $\frac{19}{6}$

(x)

Solution: $\frac{-8}{7}$

Question 7.

(i)

Solution:

$$\frac{1}{3} - \frac{3}{4} = \frac{4-9}{12} = \frac{-5}{12}$$

(ii)

Solution:

$$\frac{1}{3} - \frac{-5}{6} = \frac{2+5}{6} = \frac{7}{6}$$

(iii)

Solution:

$$\frac{-3}{5} - \frac{-8}{9} = \frac{-27+40}{45} = \frac{13}{45}$$

(iv)

Solution:

$$-1 - \frac{-9}{7} = \frac{-7+9}{7} = \frac{2}{7}$$

(v)

Solution:

$$1 - \frac{-18}{11} = \frac{11+18}{11} = \frac{29}{11}$$

(vi)

Solution:

$$0 - \frac{-13}{9} = \frac{13}{9}$$

(vii)

Solution:

$$\frac{-6}{5} - \frac{-32}{13} = \frac{-78+160}{65} = \frac{82}{65}$$

(viii)

Solution:

$$\frac{-4}{7} - -7 = \frac{-4+49}{7} = \frac{45}{7}$$

Question 8.

(i)

Solution:

$$\begin{aligned} & \frac{4}{3} + \frac{3}{5} + \frac{-2}{3} + \frac{-11}{5} \\ &= \frac{4-2}{3} + \frac{3-11}{5} \\ &= \frac{2}{3} + \frac{-8}{5} \\ &= \frac{10-24}{15} \\ &= \frac{-14}{15} \end{aligned}$$

(ii)

Solution:

$$\begin{aligned} & \frac{-8}{3} + \frac{-1}{4} + \frac{-11}{6} + \frac{3}{8} \\ &= \frac{-16-11}{6} + \frac{-2+3}{8} \\ &= \frac{-27}{6} + \frac{1}{8} \\ &= \frac{-108+3}{24} \\ &= \frac{-105}{24} \\ &= \frac{35}{8} \end{aligned}$$

(iii)

Solution:

$$\begin{aligned} & \frac{-13}{20} + \frac{11}{14} + \frac{-5}{7} + \frac{7}{10} \\ &= \frac{-13+14}{20} + \frac{11-10}{14} \\ &= \frac{1}{20} + \frac{1}{14} \\ &= \frac{7+10}{140} \\ &= \frac{17}{140} \end{aligned}$$

(iv)

Solution:

$$\begin{aligned} & \frac{-6}{7} + \frac{-5}{6} + \frac{-4}{9} + \frac{-15}{7} \\ &= \frac{-6-15}{7} + \frac{-15-8}{18} \\ &= \frac{-21}{7} + \frac{-23}{18} \\ &= \frac{-54-23}{18} \\ &= \frac{-77}{18} \end{aligned}$$

Question 9.

Solution:

$$x + \frac{-14}{5} = -2$$

$$x = -2 + \frac{14}{5}$$

$$x = \frac{-10+14}{5}$$

$$x = \frac{4}{5}$$

Question 10.

Solution:

$$x + \frac{5}{6} = \frac{-1}{2}$$

$$x = \frac{-1}{2} - \frac{5}{6}$$

$$x = \frac{-3-5}{6}$$

$$x = \frac{-8}{6}$$

$$x = \frac{-4}{3}$$

Question 11.

Solution:

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

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

$$x = \frac{-12+5}{8}$$

$$x = \frac{-7}{8}$$

Question 12.

Solution:

$$-1 + x = \frac{5}{7}$$

$$x = \frac{5}{7} + 1$$

$$x = \frac{5+7}{7}$$

$$x = \frac{12}{7}$$

Question 13.

Solution:



$$\frac{-2}{3} - x = \frac{-1}{6}$$

$$x = \frac{-2}{3} + \frac{1}{6}$$

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

$$x = \frac{-3}{6}$$

$$x = \frac{-1}{2}$$

Question 14.

Solution:

(i) Zero is a rational number that has its own additive inverse.

(ii) Yes,

Consider $ab-cd$ where b and d are not equal to 0.

$ab-cd$ implies $adbd-bcbd$ implies $ad-bcbd$.

Since, ad , bc and bd are integers since integers are closed under the operation of multiplication

and $ad-bc$ is an integer since integers are closed under the operation of subtraction, then $ad-bcbd$

Since it is in the form of one integer divided by other and denominator not equal to 0

Thus $ab-cd$ is a rational number.

(iii) Yes, rational numbers are commutative under addition. If a and b are rational numbers then law is $a+b=b+a$.

(iv) Yes, rational numbers are associative under addition. If a , b and c are rational numbers then law is $a+(b+c)=(a+b)+c$.

(v) No, subtraction is not commutative on rational numbers.

$(a-b) \neq (b-a)$

(vi) Rational numbers are not associative under subtraction.

$a-(b-c) \neq (a-b)-c$.

(vii) Negative of a negative rational number is a positive rational number.

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Exercise 1D

Question 1.

(i)

Solution:

$$\frac{3}{5} \times \frac{-7}{8} = \frac{-21}{40}$$

(ii)

Solution:

$$\frac{-9}{2} \times \frac{5}{4} = \frac{-45}{8}$$

(iii)

Solution:

$$\frac{-6}{11} \times \frac{-5}{3} = \frac{30}{33}$$

(iv)

Solution:

$$\frac{-2}{3} \times \frac{6}{7} = \frac{-12}{21} = \frac{-4}{7}$$

(v)

Solution:

$$\frac{-12}{5} \times \frac{10}{-3} = \frac{120}{15} = 8$$

(vi)

Solution:

$$\frac{25}{-9} \times \frac{3}{-10} = \frac{75}{90} = \frac{5}{6}$$

(vii)

Solution:

$$\frac{5}{-18} \times \frac{-9}{20} = \frac{45}{360} = \frac{1}{8}$$

(viii)

Solution:

$$\frac{-13}{15} \times \frac{-25}{26} = \frac{325}{390} = \frac{5}{6}$$

(ix)

Solution:

$$\frac{16}{-21} \times \frac{14}{5} = \frac{224}{-105} = \frac{-32}{15}$$

(x)

Solution:

$$\frac{-7}{6} \times 24 = \frac{-168}{6} = -28$$

(xi)

Solution:

$$\frac{7}{24} \times (-48) = \frac{-336}{24} = -14$$

(xii)

Solution:

$$\frac{-13}{5} \times (-10) = \frac{130}{5} = 26$$

Question 2.

(i)

Solution:

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

$$\frac{-5}{21} = \frac{-5}{21}$$

(ii)

Solution:

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

$$\frac{-104}{63} = \frac{-104}{63}$$

(iii)

Solution:

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

$$\frac{7}{15} = \frac{7}{15}$$

(iv)

Solution:

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

$$\frac{26}{4} = \frac{26}{4}$$

Question 3.

(i)

Solution:

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

$$\frac{60}{91} \times \frac{7}{18} = \frac{5}{7} \times \frac{84}{234}$$

$$\frac{10}{39} = \frac{10}{39}$$

(ii)

Solution:

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

$$\frac{-13}{24} \times \frac{-420}{180} = \frac{156}{120} \times \frac{35}{36}$$

$$\frac{91}{72} = \frac{91}{72}$$

(iii)

Solution:

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

$$\frac{90}{15} \times \frac{21}{-4} = \frac{-9}{5} \times \frac{210}{12}$$

$$\frac{-63}{2} = \frac{-63}{2}$$

Question 4.

Solution:

$$(i) \frac{-23}{17} \times \frac{18}{35} = \frac{18}{35} \times \frac{-23}{17}$$

$$(ii) -38 \times \frac{-7}{19} = \frac{-7}{19} \times -38$$

$$(iii) \left(\frac{15}{7} \times \frac{-21}{10}\right) \times \frac{-5}{6} = \frac{15}{7} \times \left(\frac{-21}{10} \times \frac{-5}{6}\right)$$

$$(iv) \frac{-12}{6} \times \left(\frac{4}{15} \times \frac{25}{-16}\right) = \left(\frac{-12}{6} \times \frac{4}{15}\right) \times \frac{25}{-16}$$

Question 5.

(i)

Solution: Reciprocal = $\frac{25}{13}$

(ii)

Solution: Reciprocal = $\frac{12}{-17}$

(iii)

Solution: Reciprocal = $\frac{24}{-7}$

(iv)

Solution: Reciprocal = $\frac{1}{18}$

(v)

Solution: Reciprocal = $\frac{1}{-16}$

(vi)

Solution: Reciprocal = $\frac{5}{3}$

(vii)

Solution: Reciprocal = -1

(viii)

Solution: Reciprocal = $\frac{2}{0} = \infty$

(ix)

Solution: Reciprocal = $\frac{-5}{2}$

(x)

Solution: Reciprocal = -8

Question 6.

(i)

Solution:

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

(ii)

Solution:

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

(iii)

Solution:

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

(iv)

Solution:

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

Question 7.

(i)

Solution:

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

$$\frac{3}{7} \times \frac{137}{78} = \frac{15}{42} + \frac{36}{91}$$

$$\frac{137}{182} = \frac{411}{540}$$

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

(ii)

Solution:

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

$$\frac{-15}{4} \times \frac{-69}{35} = \frac{-45}{28} + \frac{180}{20}$$

$$\frac{207}{28} = \frac{1035}{140}$$

$$\frac{207}{28} = \frac{207}{28}$$

(iii)

Solution:

$$\left(\frac{-8}{3} + \frac{-13}{12}\right) \times \frac{5}{6} = \left(\frac{-8}{3} \times \frac{5}{6}\right) + \left(\frac{-13}{12} \times \frac{5}{6}\right)$$

$$\frac{-45}{12} \times \frac{5}{6} = \frac{40}{18} + \frac{65}{72}$$

$$\frac{-225}{72} = \frac{160 - 65}{72}$$

$$\frac{-25}{8} = \frac{25}{8}$$

(iv)

Solution:

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

$$\frac{-16}{7} \times \frac{-37}{18} = \frac{123}{63} + \frac{112}{42}$$

$$\frac{592}{126} = \frac{256 + 336}{126}$$

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

Question 8.

(i)

Solution: Commutative property

(ii)

Solution: Associative property

(iii)

Solution: Distributive property

(iv)

Solution: Property of multiplicative identity

(v)

Solution: Property of multiplicative inverse

(vi)

Solution: Multiplicative property of 0.

Question 9.

Solution:

- (i) The product of a rational number and its reciprocal is 1.
- (ii) Zero has no reciprocal.
- (iii) The numbers 1 and -1 are their own reciprocals.
- (iv) Zero is not the reciprocal of any number.
- (v) The reciprocal of a , where $a \neq 0$, is $\frac{1}{a}$.

- (vi) The reciprocal of $\frac{1}{a}$, where $a \neq 0$, is a .
- (vii) The reciprocal of a positive rational number is positive.
- (viii) The reciprocal of a negative rational number is negative.

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Exercise 1E

Question 1.

(i)

Solution:

$$\frac{4}{9} \div \frac{-5}{12} = \frac{4}{9} \times \frac{12}{-5} = \frac{48}{-45} = \frac{16}{-10}$$

(ii)

Solution:

$$-8 \div \frac{-7}{16} = -8 \times \frac{16}{-7} = \frac{128}{7}$$

(iii)

Solution:

$$\frac{-12}{7} \div (-18) = \frac{-12}{7} \times \frac{1}{-18} = \frac{12}{126} = \frac{2}{21}$$

(iv)

Solution:

$$\frac{-1}{10} \div \frac{-8}{5} = \frac{-1}{10} \times \frac{5}{-8} = \frac{5}{80} = \frac{1}{16}$$

(v)

Solution:

$$\frac{-16}{35} \div \frac{-15}{4} = \frac{-16}{35} \times \frac{4}{-15} = \frac{224}{525}$$

(vi)

Solution:

$$\frac{-65}{14} \div \frac{13}{7} = \frac{-65}{14} \times \frac{7}{13} = \frac{-5}{2}$$

Question 2.**Solution:****(i) True**

$$\frac{13}{5} \div \frac{26}{10} = \frac{26}{10} \div \frac{13}{5}$$

$$\frac{13}{5} \times \frac{10}{26} = \frac{26}{10} \times \frac{5}{13}$$

$$\frac{130}{130} = \frac{130}{130}$$

$$1 = 1$$

(ii) False

$$-9 \div \frac{3}{4} = \frac{3}{4} \div (-9)$$

$$-9 \times \frac{4}{3} = \frac{3}{4} \times \frac{1}{-9}$$

$$\frac{-36}{30} \neq \frac{-1}{12}$$

(iii) False

$$\frac{-8}{9} \div \frac{-4}{3} = \frac{-4}{3} \div \frac{-8}{9}$$

$$\frac{-8}{9} \times \frac{3}{-4} = \frac{-4}{3} \times \frac{9}{-8}$$

$$\frac{2}{3} \neq \frac{3}{2}$$

(iv) False

$$\frac{-7}{24} \div \frac{3}{-16} = \frac{3}{-16} \div \frac{-7}{24}$$

$$\frac{-7}{24} \times \frac{-16}{3} = \frac{3}{-16} \times \frac{24}{-7}$$

$$\frac{112}{72} \neq \frac{72}{112}$$

Question 3.**Solution:****(i) False**

$$\left(\frac{5}{9} \div \frac{1}{3}\right) \div \frac{5}{2} = \frac{5}{9} \div \left(\frac{1}{3} \div \frac{5}{2}\right)$$

$$\frac{5}{9} \times \frac{3}{1} \times \frac{2}{5} = \frac{5}{9} \times \frac{3}{1} \times \frac{5}{2}$$

$$\frac{2}{3} \neq \frac{25}{6}$$

(ii) False

$$\left\{(-16) \div \frac{6}{5}\right\} \div \frac{-9}{10} = (-16) \div \left(\frac{6}{5} \div \frac{-9}{10}\right)$$

$$(-16) \times \frac{5}{6} \times \frac{10}{-9} = (-16) \times \frac{5}{6} \times \frac{10}{-9}$$

$$\frac{800}{54} = \frac{48}{4}$$

$$\frac{400}{27} \neq 12$$

(iii) False

$$\left(\frac{-3}{5} \div \frac{-12}{35}\right) \div \frac{1}{14} = \frac{-3}{5} \div \left(\frac{-12}{35} \div \frac{1}{14}\right)$$

$$\frac{-3}{5} \times \frac{-12}{35} \times \frac{14}{1} = \frac{-3}{5} \times \frac{35}{12} \times \frac{14}{1}$$

$$\frac{1470}{60} = \frac{105}{240}$$

$$\frac{49}{2} \neq \frac{7}{16}$$

Question 4.

Solution:

$$x \times (-12) = -9$$

$$x = \frac{-9}{-12}$$

$$x = \frac{3}{4}$$

Question 5.

Solution:

$$x \times \frac{-4}{3} = \frac{-16}{9}$$

$$x = \frac{-16}{9} \times \frac{3}{-4}$$

$$x = \frac{48}{36}$$

$$x = \frac{4}{3}$$

Question 6.

Solution:

$$x \times \frac{-15}{56} = \frac{-5}{7}$$

$$x = \frac{-5}{7} \times \frac{56}{-15}$$

$$x = \frac{56}{21}$$

$$x = \frac{8}{3}$$

Question 7.

Solution:

$$x \times \frac{-8}{39} = \frac{1}{26}$$

$$x = \frac{1}{26} \times \frac{39}{-8}$$

$$x = \frac{-39}{208}$$

$$x = \frac{-3}{16}$$

Question 8.

Solution:



$$\frac{-33}{8} \div x = \frac{-11}{2}$$

$$\frac{1}{x} = \frac{-11}{2} \times \frac{8}{-33}$$

$$\frac{1}{x} = \frac{88}{66}$$

$$\frac{1}{x} = \frac{4}{3}$$

$$x = \frac{3}{4}$$

Question 9.

Solution:

$$\left(\frac{13}{5} + \frac{-12}{7} \right) \div \left(\frac{-31}{7} \times \frac{1}{-2} \right)$$

$$= \frac{91+60}{35} \div \frac{31}{14}$$

$$= \frac{31}{35} \times \frac{14}{31}$$

$$= \frac{2}{5}$$

Question 10.

Solution:

$$\left(\frac{65}{12} + \frac{8}{3} \right) \div \left(\frac{65}{12} - \frac{8}{3} \right)$$

$$= \frac{97}{12} \div \frac{33}{12}$$

$$= \frac{97}{12} \times \frac{12}{33}$$

$$= \frac{97}{33}$$

Question 11.

Solution:

$$(i) \frac{9}{8} \div \frac{-3}{4} = \frac{-3}{2}$$

$$(ii) \frac{-14}{19} \div \frac{-7}{5} = \frac{10}{19}$$

$$(iii) \frac{4}{5} \div (-3) = \frac{-4}{15}$$

$$(iv) (-12) \div 10 = \frac{-6}{5}$$

Question 12.

Solution:

(i) No, rational numbers are not closed under division in general.

(ii) No.

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c} = \frac{ad}{bc}$$

$$\frac{c}{d} \div \frac{a}{b} = \frac{c}{d} \times \frac{b}{a} = \frac{cb}{da}$$

$$\text{thus } \frac{a}{b} \div \frac{c}{d} \neq \frac{c}{d} \div \frac{a}{b}$$

(iii) No, rational numbers are not associative under division.

$$\frac{a}{b} \div \left(\frac{c}{d} \div \frac{e}{f} \right) \neq \left(\frac{a}{b} \div \frac{c}{d} \right) \div \frac{e}{f}$$

(iv) No, we cannot divide 1 by 0. The answer will be infinity which is not defined.

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Exercise 1F

Question 1.

Solution:

$$\begin{aligned} & \frac{1}{2} \left(\frac{1}{4} + \frac{1}{3} \right) \\ &= \frac{1}{2} \left(\frac{3+4}{12} \right) \\ &= \frac{1}{2} \times \frac{7}{12} \\ &= \frac{7}{24} \end{aligned}$$

Question 2.**Solution:**

$$\begin{aligned}\frac{1}{2}(2+3) \\&= \frac{5}{2}\end{aligned}$$

Question 3.**Solution:**

$$\begin{aligned}\frac{1}{2}\left(\frac{-1}{3} + \frac{1}{2}\right) \\&= \frac{1}{2}\left(\frac{-2+3}{6}\right) \\&= \frac{1}{2} \times \frac{1}{6} \\&= \frac{1}{12}\end{aligned}$$

Question 4.**Solution:**

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

Question 5.**Solution:**

$$\text{Number between 4 and 5} = \frac{1}{2}(4+5) = \frac{9}{2}$$

$$\text{Number between 4 and } \frac{9}{2} = \frac{1}{2}\left(4 + \frac{9}{2}\right) = \frac{1}{2} \times \frac{17}{2} = \frac{17}{4}$$

$$\text{Number between } \frac{9}{2} \text{ and } 5 = \frac{1}{2}\left(\frac{9}{2} + 5\right) = \frac{1}{2} \times \frac{19}{2} = \frac{19}{4}$$

Question 6.**Solution:**

$$\text{Number between } \frac{2}{3} \text{ and } \frac{3}{4} = \frac{1}{2}\left(\frac{2}{3} + \frac{3}{4}\right) = \frac{17}{24}$$

Number between $\frac{2}{3}$ and $\frac{17}{24} = \frac{1}{2} \left(\frac{2}{3} + \frac{17}{24} \right) = \frac{11}{16}$

Number between $\frac{17}{24}$ and $\frac{3}{4} = \frac{1}{2} \left(\frac{17}{24} + \frac{3}{4} \right) = \frac{35}{48}$

Question 7.

Solution:

Number between $-\frac{3}{4}$ and $\frac{5}{6} = \frac{1}{2} \left(-\frac{3}{4} + \frac{5}{6} \right) = \frac{1}{24}$

Number between $-\frac{3}{4}$ and $\frac{1}{24} = \frac{1}{2} \left(-\frac{3}{4} + \frac{1}{24} \right) = \frac{-17}{48}$

Number between $-\frac{3}{4}$ and $\frac{-17}{48} = \frac{1}{2} \left(-\frac{3}{4} + \frac{-17}{48} \right) = \frac{-35}{48}$

Number between $-\frac{3}{4}$ and $\frac{-35}{48} = \frac{1}{2} \left(-\frac{3}{4} + \frac{-35}{48} \right) = \frac{-53}{48}$

Number between $-\frac{3}{4}$ and $\frac{-53}{48} = \frac{1}{2} \left(-\frac{3}{4} + \frac{-53}{48} \right) = \frac{-71}{48}$

Number between $-\frac{3}{4}$ and $\frac{-71}{48} = \frac{1}{2} \left(-\frac{3}{4} + \frac{-71}{48} \right) = \frac{-107}{96}$

Number between $\frac{5}{6}$ and $\frac{1}{24} = \frac{1}{2} \left(\frac{5}{6} + \frac{1}{24} \right) = \frac{21}{48}$

Number between $\frac{5}{6}$ and $\frac{21}{48} = \frac{1}{2} \left(\frac{5}{6} + \frac{21}{48} \right) = \frac{61}{96}$

Number between $\frac{5}{6}$ and $\frac{61}{96} = \frac{1}{2} \left(\frac{5}{6} + \frac{61}{96} \right) = \frac{141}{192}$

Number between $\frac{61}{96}$ and $\frac{141}{192} = \frac{1}{2} \left(\frac{61}{96} + \frac{141}{192} \right) = \frac{263}{384}$

Question 8.

Solution:

We may write $-1 = \frac{-10}{10}$ and $2 = \frac{20}{10}$

Therefore 12 rational numbers are

$\frac{-9}{10}, \frac{-8}{10}, \frac{-7}{10}, \frac{-6}{10}, \frac{-5}{10}, \dots, \frac{18}{10}$ and $\frac{19}{10}$.

WORD PROBLEMS

Question 1.

Solution:

Length of remaining rope = total length – length of cut pieces

$$= 11 - \left(2\frac{3}{5} + 3\frac{3}{10} \right)$$

$$= 11 - \left(\frac{13}{5} + \frac{33}{10} \right)$$

$$= 11 - \left(\frac{26 + 33}{50} \right)$$

$$= 11 - \frac{59}{10}$$

$$= \frac{110 - 59}{10}$$

$$= \frac{51}{10} m$$

Question 2.

Solution:

Weight of rice in drum = weight of drum full of rice – weight of empty drum

$$= \frac{241}{6} - \frac{55}{4}$$

$$= \frac{482 - 165}{12}$$

$$= \frac{317}{12}$$

$$= 26\frac{5}{12} kg$$

Question 3.

Solution:

Weight of pears = total weight – weight of apples and oranges

$$\begin{aligned}
&= \frac{58}{3} - \left(\frac{73}{9} + \frac{19}{6} \right) \\
&= \frac{58}{3} - \left(\frac{146 + 57}{18} \right) \\
&= \frac{58}{3} - \frac{203}{18} \\
&= \frac{348 - 203}{18} \\
&= \frac{145}{18} \\
&= 8\frac{1}{18} \text{ kg}
\end{aligned}$$

Question 4.

Solution:

Money saved = Total money earned – total expenses

$$\begin{aligned}
&= 80 - \left(\frac{68}{5} + \frac{51}{2} + \frac{22}{5} \right) \\
&= 80 - \left(\frac{136 + 255 + 44}{10} \right) \\
&= 80 - \frac{435}{10} \\
&= 80 - \frac{87}{2} \\
&= \frac{160 - 87}{2} \\
&= \frac{73}{2} \\
&= \text{Rs.} 36\frac{1}{2}
\end{aligned}$$

Question 5.

Solution:

Cost of cloth

$$\begin{aligned}
&= \frac{17}{5} \times \frac{147}{4} \\
&= \frac{2499}{20} \\
&= \text{Rs.} 124\frac{19}{20}
\end{aligned}$$

Question 6.**Solution:**

Distance = speed $\times$ time

$$\begin{aligned} &= \frac{15}{2} \times \frac{202}{5} \\ &= \frac{3030}{10} \\ &= 303km \end{aligned}$$

Question 7.**Solution:**

Area of rectangle = length $\times$ breadth

$$\begin{aligned} &= \frac{183}{5} \times \frac{50}{3} \\ &= \frac{9150}{15} \\ &= 610m^2 \end{aligned}$$

Question 8.**Solution:**

Area of square = (side)²

$$\begin{aligned} &= \frac{17}{2} \times \frac{17}{2} \\ &= \frac{289}{4} \\ &= 72\frac{1}{4}m^2 \end{aligned}$$

Question 9.**Solution:**

Cost of 34 litres petrol

$$\begin{aligned} &= 63\frac{3}{4} \times 34 \\ &= \frac{255}{4} \times 34 \\ &= \frac{8670}{4} \\ &= Rs.216\frac{30}{4} \end{aligned}$$

Question 10.**Solution:**

Distance covered

$$\begin{aligned} &= \frac{25}{6} \times 1020 \\ &= \frac{25500}{6} \\ &= 4250 \text{ km} \end{aligned}$$

Question 11.**Solution:**

Cost of one metre cloth

$$\begin{aligned} &= \frac{231}{4} \div \frac{7}{2} \\ &= \frac{231}{4} \times \frac{2}{7} \\ &= \frac{462}{28} \\ &= 16 \frac{14}{28} \\ &= \text{Rs. } 16 \frac{1}{2} \end{aligned}$$

Question 12.**Solution:**

Length of each piece of cord

$$\begin{aligned} &= \frac{143}{2} \div 26 \\ &= \frac{143}{2} \times \frac{1}{26} \\ &= \frac{143}{52} \\ &= \frac{9}{4} \\ &= 2 \frac{3}{4} \text{ m} \end{aligned}$$

Question 13.**Solution:**

Area of room = length $\times$ breadth

Length = area $\div$ breadth

$$\begin{aligned} &= \frac{261}{4} \div \frac{87}{10} \\ &= \frac{261}{4} \times \frac{10}{87} \\ &= \frac{4176}{348} \\ &= 12m \end{aligned}$$

Question 14.

Solution:

Let the other fraction be x.

$$\begin{aligned} 9\frac{3}{7} \times x &= 9\frac{3}{5} \\ x &= 9\frac{3}{5} \div 9\frac{3}{7} \\ x &= \frac{48}{5} \div \frac{60}{7} \\ x &= \frac{48}{5} \times \frac{7}{60} \\ x &= \frac{336}{330} \\ x &= \frac{56}{55} \\ x &= 1\frac{1}{55} \end{aligned}$$

Question 15.

Solution: If $\frac{5}{8}$ is number of boys then ratio of girls is $1 - \frac{5}{8} = \frac{3}{8}$

Let x be the total number of students.

$$\begin{aligned} \frac{3}{8}x &= 240 \\ x &= 240 \div \frac{3}{8} \\ x &= 240 \times \frac{8}{3} \\ x &= \frac{1920}{3} \\ x &= 640 \end{aligned}$$

$$\begin{aligned}\text{Number of boys} &= \text{total} - \text{number of girls} \\ &= 640 - 240 \\ &= 400\end{aligned}$$

Question 16.

Solution:

$$\text{Ratio of read book} = \frac{7}{9}$$

$$\text{Ratio of unread book} = 1 - \frac{7}{9} = \frac{2}{9}$$

$$\frac{2}{9}x = 40$$

$$x = 40 \div \frac{2}{9}$$

$$x = 40 \times \frac{9}{2}$$

$$x = \frac{360}{2}$$

$$x = 180$$

Question 17.

Solution:

$$\text{Amount spent on notebooks} = 300 \times \frac{1}{3} = \frac{300}{3} = 100$$

$$\text{Money left} = 300 - 100 = 200$$

$$\text{Amount spent on stationary} = 200 \times \frac{1}{4} = \frac{200}{4} = 50$$

$$\text{Money left} = 200 - 50 = \text{Rs.150}$$

Question 18.

Solution:

$$\text{Money spent on food} = 16000 \times \frac{1}{4} = \text{Rs.4000}$$

$$\text{Money left} = 16000 - 4000 = 12000$$

$$\text{Money spent on house rent} = 12000 \times \frac{3}{10} = \text{Rs.3600}$$

$$\text{Money left} = 12000 - 3600 = 8400$$

$$\text{Money spent on education} = 8400 \times \frac{5}{21} = \text{Rs.2000}$$

Money left = 8400 – 2000 = Rs.6400

Question 19.

Solution:

Let x be the required number.

$$\frac{3}{5}x = \frac{2}{7}x + 44$$

$$\frac{3}{5}x - \frac{2}{7}x = 44$$

$$\left(\frac{21-10}{35}\right)x = 44$$

$$\frac{11}{35}x = 44$$

$$x = 44 \times \frac{35}{11}$$

$$x = \frac{1540}{11}$$

$$x = 140$$

Question 20.

Solution:

$$\text{Ratio of spectators in open} = 1 - \frac{2}{7} = \frac{5}{7}$$

Total number be x.

$$\frac{5}{7}x = 15000$$

$$x = 15000 \times \frac{7}{5}$$

$$x = \frac{10500}{5}$$

$$x = 21000$$

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Exercise 1H

OBJECTIVE QUESTIONS

Tick (✓) the correct answer in each of the following:

Question 1.

Solution: (c) $\frac{13}{48}$

Question 2.

Solution: (b) $\frac{-28}{15}$

Question 3.

Solution: (a) $\frac{11}{78}$

Question 4.

Solution: (b) $\frac{16}{7}$

Question 5.

Solution: (d) $\frac{-67}{8}$

Question 6.

Solution: (b) $\frac{-17}{20}$

Question 7.

Solution: (c) $\frac{-13}{60}$

Question 8.

Solution: (b) $\frac{11}{3}$

Question 9.

Solution: (c) $\frac{1}{21}$

Question 10.

Solution: (d) $\frac{-5}{2}$

Question 11.

Solution: (b) $\frac{-7}{3}$



Question 12.

Solution:(a) $\frac{-2}{3}$

Question 13.

Solution: (c) $\frac{32}{75}$

Question 14.

Solution:(d) $\frac{7}{5}$

Question 15.

Solution:(c) $\frac{1}{3}$

Question 16.

Solution: (b) $\frac{-49}{71}$ and (c) $\frac{-9}{16}$

Question 17.

Solution: (a) $\frac{-3}{10}$

Question 18.

Solution: (b) $\frac{-5}{6}$

Question 19.

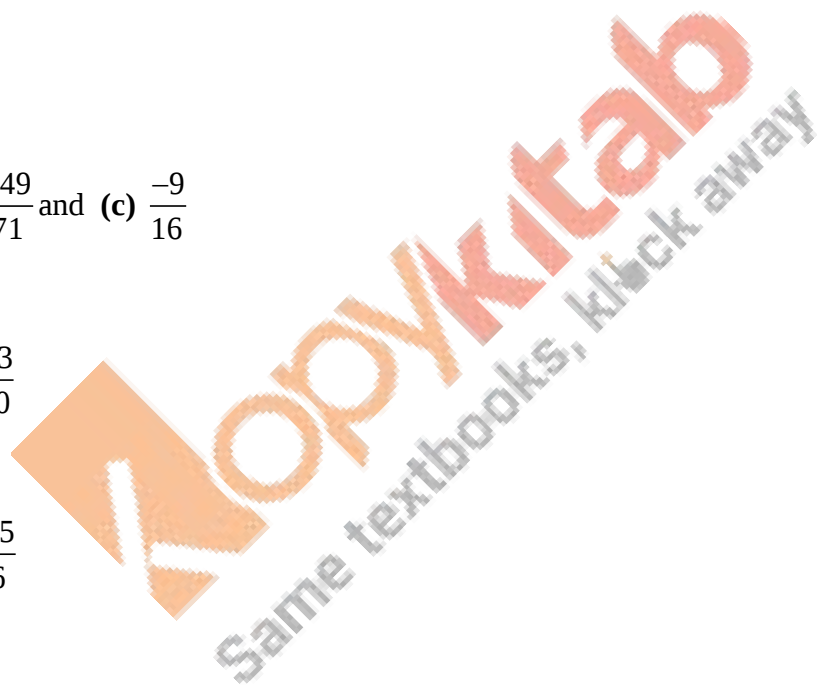
Solution: (d) $\frac{-5}{6}$

Question 20.

Solution: (c) $\frac{5}{9}$

Question 21.

Solution: (c) $\frac{-4}{3}$



Question 22.

Solution: (d) $\frac{-5}{24}$

Question 23.

Solution: (b) is a negative rational number

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TEST PAPER 1

A. Question 1.

Solution:

(i) Additive inverse of $\frac{7}{-10}$ is $\frac{7}{10}$

(ii) Additive inverse of $\frac{8}{5}$ is $\frac{-8}{5}$

Question 2.

Solution:

Let the other number be x.

$$x + \frac{-11}{5} = -4$$

$$x = -4 + \frac{11}{5}$$

$$x = \frac{-20 + 11}{5}$$

$$x = \frac{-9}{5}$$

Question 3.

Solution:

Let required number be x.

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

$$x = \frac{2}{3} + \frac{3}{5}$$

$$x = \frac{10 + 9}{15}$$

$$x = \frac{19}{15}$$

Question 4.**Solution:**

Let required number be x.

$$\frac{-3}{4} - x = \frac{-1}{2}$$

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

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

$$x = \frac{-1}{4}$$

Question 5.**Solution:**

(i) multiplicative inverse of $\frac{-3}{4}$ is $\frac{4}{-3}$

(ii) multiplicative inverse of $\frac{-3}{4}$ is $\frac{4}{-3}$

Question 6.**Solution:**

Let the number be x.

$$-12 \times x = -8$$

$$x = (-8) \div (-12)$$

$$x = \frac{8}{12}$$

$$x = \frac{2}{3}$$

Question 7.**Solution:**

(i) $\frac{3}{5} \times \frac{10}{7} = \frac{-3 \times 10}{5 \times 7} = \frac{-30}{35} = \frac{-6}{7}$

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

(iii) $(-6)^{-1} = \frac{1}{(-6)} = \frac{1}{-6}$

Question 8.**Solution:**

- (i) commutative law of multiplication
- (ii) Existence of multiplicative identity
- (iii) Associative law of multiplication
- (iv) Multiplicative property of 0
- (v) Distributive law of multiplication over addition

Question 9.**Solution:**

Required number

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

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

$$= \frac{1}{2} \times \frac{1}{6}$$

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

Rational number between $\frac{-1}{3}$ and $\frac{1}{12}$

$$= \frac{1}{2} \times \left(\frac{-1}{3} + \frac{1}{12} \right)$$

$$= \frac{1}{2} \times \left(\frac{1-4}{12} \right)$$

$$= \frac{1}{2} \times \frac{-3}{12}$$

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

B.**Question 10.****Solution: (c)** $\frac{4}{15}$ **Question 11.****Solution: (d)** $\frac{-17}{12}$ **Question 12.****Solution: (b)** $\frac{-4}{5}$

Question 13.

Solution: (a) $\frac{5}{6}$

Question 14.

Solution: (b) $\frac{5}{4}$

Question 15.

Solution: (c) $\frac{-8}{15}$

Question 16.

Solution: (b) $\frac{-9}{7}$

Question 17.

Solution: (b) $\frac{-1}{12}$

C. Question 18.

Solution:

(i) $\frac{25}{8} \div \frac{-5}{16} = -10$

(ii) $\frac{-8}{9} \times \frac{3}{4} = \frac{-2}{3}$

(iii) $(-1) + \frac{7}{9} = \frac{-2}{9}$

(iv) $\frac{2}{3} - \frac{3}{5} = \frac{1}{15}$

D. Question 19.

Solution:

(i) Rational numbers are always closed under subtraction. -T

(ii) Rational numbers are always closed under division. -F

(iii) $1 \div 0 = 0$ - F

(iv) Subtraction is commutative on rational numbers. -F

(v) $-\left(\frac{-7}{8}\right) = \frac{7}{8}$ - T