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 $\frac{a}{b}=\frac{a\div m}{b\div m}$.

$\frac{-48}{60}=\frac{-42\div 12}{98\div 12}=\frac{-4}{5}$

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

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

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

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

(vi) $\frac{-1}{2}=\frac{-1\times1}{2\times1}=\frac{-1}{2}$

$\frac{-1}{1}=\frac{-1\times2}{1\times2}=\frac{-2}{2}$

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

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

Question 6.

Solution:

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

$\frac{-4}{3}=\frac{-4\times7}{3\times7}=\frac{-28}{21}$

$\frac{-8}{7}=\frac{-8\times3}{7\times3}=\frac{-24}{21}$

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

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

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

$\frac{-7}{9}=\frac{-7\times8}{9\times8}=\frac{-56}{72}$

$\frac{-5}{8}=\frac{-5\times9}{8\times9}=\frac{-45}{72}$

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

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

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

$\frac{-1}{3}=\frac{-1\times5}{3\times5}=\frac{-5}{15}$

$\frac{-4}{5}=\frac{-4\times3}{5\times3}=\frac{-12}{15}$

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

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

(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.

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

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

$$\frac{-7}{18} = \frac{-17\times 2}{18\times 2} = \frac{-14}{36}$$

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

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

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

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

$$\frac{-3}{4} = \frac{-3\times 12}{4\times 12} = \frac{-30}{48}$$

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

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

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

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

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

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

$$\frac{-3}{5}=\frac{-3\times12}{5\times12}=\frac{-36}{60}$$

$$\frac{-7}{10}=\frac{-7\times6}{10\times6}=\frac{-42}{60}$$

$$\frac{-11}{15}=\frac{-11\times4}{15\times4}=\frac{-44}{60}$$

$$\frac{-13}{20}=\frac{-13\times3}{20\times3}=\frac{-39}{60}$$

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

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

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

$$\frac{-4}{7}=\frac{-4\times12}{7\times12}=\frac{-12}{84}$$

$$\frac{-9}{14}=\frac{-9\times6}{14\times6}=\frac{-54}{84}$$

$$\frac{-13}{28}=\frac{-13\times3}{28\times3}=\frac{-39}{84}$$

$$\frac{-23}{42}=\frac{-23\times2}{42\times2}=\frac{-46}{84}$$

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

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

Question 9.

Solution:

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

$$\frac{-2}{1}=\frac{-2\times6}{1\times6}=\frac{-12}{6}$$

$$\frac{-13}{6}=\frac{-13\times1}{6\times1}=\frac{-13}{6}$$

$$\frac{-8}{3}=\frac{-8\times2}{3\times2}=\frac{-16}{6}$$

$$\frac{-1}{3}=\frac{-1\times2}{3\times2}=\frac{-2}{6}$$

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

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

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

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

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

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

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

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

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

(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.

$$\frac{-10}{11}=\frac{-10\times12}{11\times12}=\frac{-120}{132}$$
$$\frac{-19}{22}=\frac{-19\times6}{22\times6}=\frac{-114}{132}$$
$$\frac{-23}{33}=\frac{-23\times4}{33\times4}=\frac{-92}{132}$$
$$\frac{-39}{44}=\frac{-39\times3}{44\times3}=\frac{-117}{132}$$
$$\frac{-92}{132}>\frac{-114}{132}>\frac{-117}{132}>\frac{-120}{132}$$

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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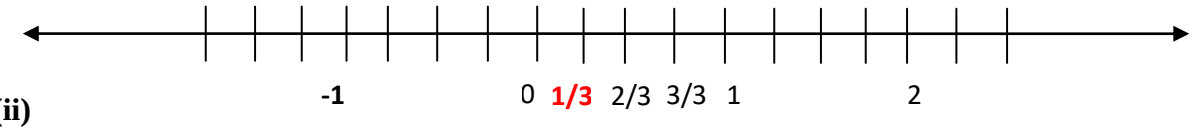
Exercise 1B

Question 1.

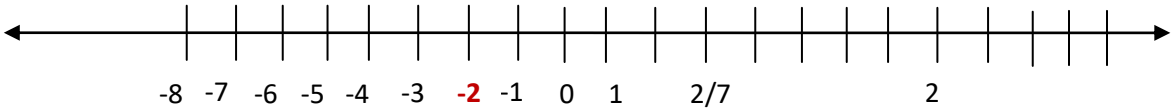
(i)

Solution:



(ii)

Solution:



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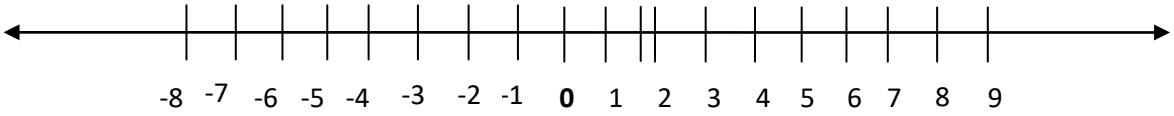
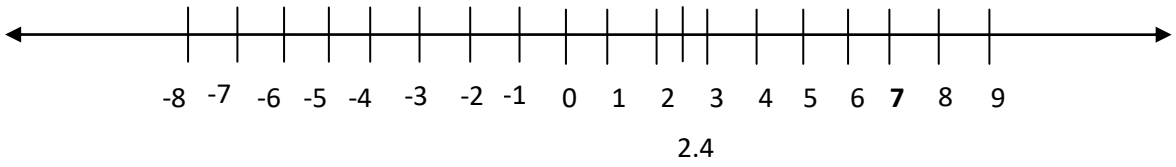
Solution:



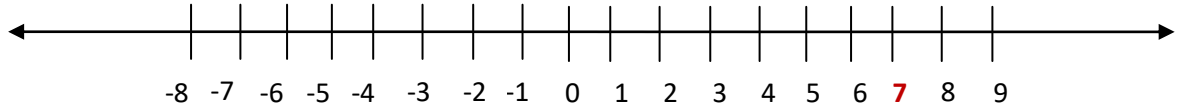
(iv)

Solution:



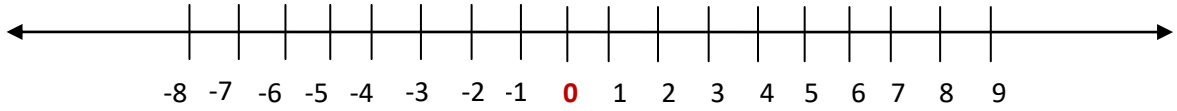
(v)

Solution:



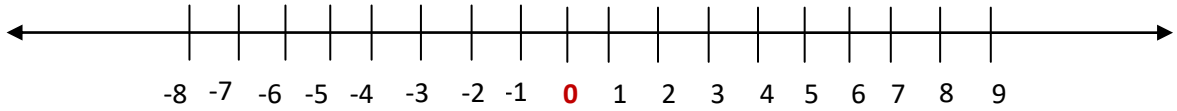
(vi)

Solution:



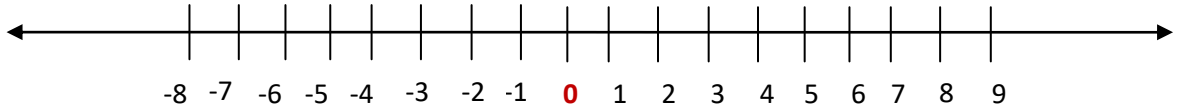
(vii)

Solution:



(viii)

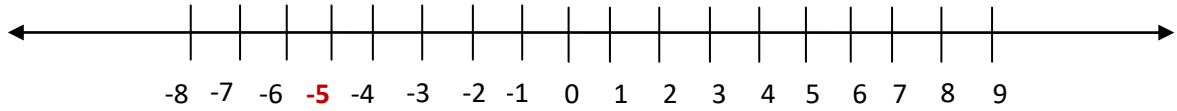
Solution:



Question 2.

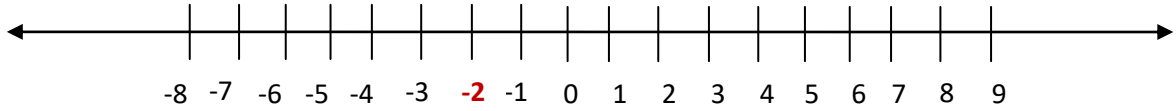
(i)

Solution:



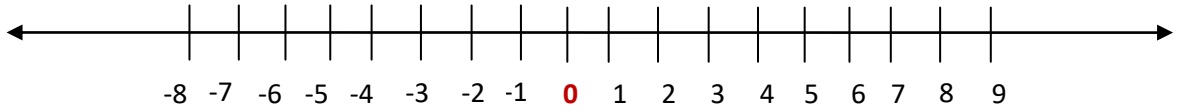
(ii)

Solution:



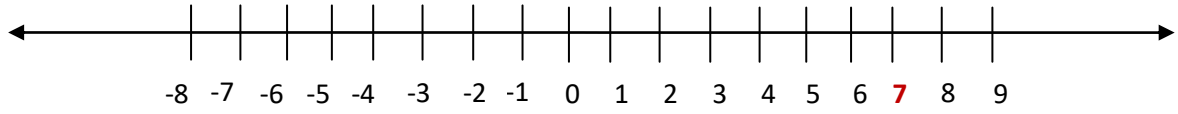
(iii)

Solution:



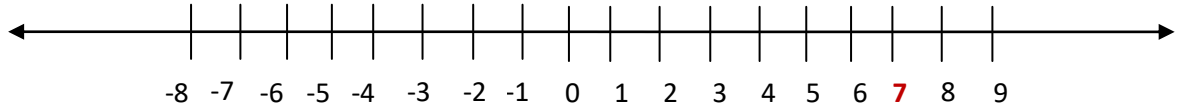
(iv)

Solution:



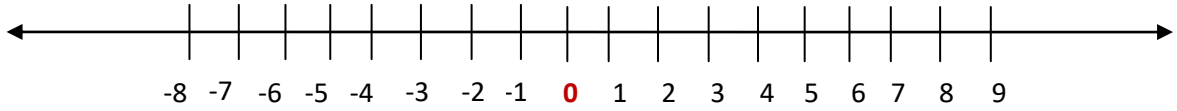
(v)

Solution:



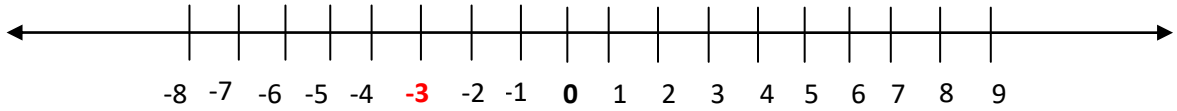
(vi)

Solution:



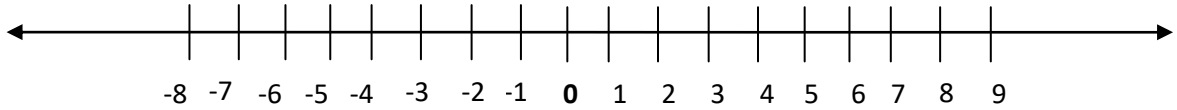
(vii)

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

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

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

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

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

Question 6.

(i)

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

(ii)

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

(iii)

Solution: 18

(iv)

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

(v)

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

(vi)

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

(vii)

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

(viii)

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:

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

(ii)

Solution:

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

(iii)
Solution:

$$\frac{-13}{20}+\frac{11}{14}+\frac{-5}{7}+\frac{7}{10}$$

$$=\frac{-13+14}{20}+\frac{11-10}{14}$$

$$=\frac{1}{20}+\frac{1}{14}$$

$$=\frac{7+10}{140}$$

$$=\frac{17}{140}$$

(iv)
Solution:

$$\frac{-6}{7}+\frac{-5}{6}+\frac{-4}{9}+\frac{-15}{7}$$

$$=\frac{-6-15}{7}+\frac{-15-8}{18}$$

$$=\frac{-21}{7}+\frac{-23}{18}$$

$$=\frac{-54-23}{18}$$

$$=\frac{-77}{18}$$

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

Thsab-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)≠(b-a)

(vi) Rational numbers are not associative under subtraction.

a-(b-c)≠(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:

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

(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.

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

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

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

(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:

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

$= \frac{1}{2}\left(\frac{3+4}{12} \right)$

$= \frac{1}{2} \times \frac{7}{12}$

$= \frac{7}{24}$

Question 2.

Solution:

$$\frac{1}{2}(2+3)$$

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

Question 3.

Solution:

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

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

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

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

Question 4.

Solution:

$$\frac{1}{2}(-3-2)$$

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

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:

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

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* $\frac{-17}{24} = \frac{1}{2}\left(\frac{-3}{4}+\frac{-17}{24}\right) = \frac{-35}{48}$

Number between $\frac{-3}{4}$ *and* $\frac{-35}{24} = \frac{1}{2}\left(\frac{-3}{4}+\frac{-35}{24}\right) = \frac{-53}{48}$

Number between $\frac{-3}{4}$ *and* $\frac{-53}{24} = \frac{1}{2}\left(\frac{-3}{4}+\frac{-53}{24}\right) = \frac{-71}{48}$

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

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

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Exercise 1G

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

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

Question 4.
Solution:
Money saved = Total money earned – total expenses
$$= 80 - \left(\frac{68}{5} + \frac{51}{2} + \frac{22}{5} \right)$$
$$= 80 - \left(\frac{136 + 255 + 44}{10} \right)$$
$$= 80 - \frac{435}{10}$$
$$= 80 - \frac{87}{2}$$
$$= \frac{160 - 87}{2}$$
$$= \frac{73}{2}$$
$$= Rs.36\frac{1}{2}$$

Question 5.
Solution:
Cost of cloth
$$= \frac{17}{5} \times \frac{147}{4}$$
$$= \frac{2499}{20}$$
$$= Rs.124\frac{19}{20}$$

Question 6.

Solution:

Distance = speed × time

$$= \frac{15}{2} \times \frac{202}{5}$$

$$= \frac{3030}{10}$$

$$= 303km$$

Question 7.

Solution:

Area of rectangle = length × breadth

$$= \frac{183}{5} \times \frac{50}{3}$$

$$= \frac{9150}{15}$$

$$= 610m^2$$

Question 8.

Solution:

Area of square = $(\text{side})^2$

$$= \frac{17}{2} \times \frac{17}{2}$$

$$= \frac{289}{4}$$

$$= 72\frac{1}{4}m^2$$

Question 9.

Solution:

Cost of 34 litres petrol

$$= 63\frac{3}{4} \times 34$$

$$= \frac{255}{4} \times 34$$

$$= \frac{8670}{4}$$

$$= Rs.216\frac{30}{4}$$

Question 10.

Solution:

Distance covered

$$= \frac{25}{6} \times 1020$$

$$= \frac{25500}{6}$$

$$= 4250 km$$

Question 11.

Solution:

Cost of one metre cloth

$$= \frac{231}{4} \div \frac{7}{2}$$

$$= \frac{231}{4} \times \frac{2}{7}$$

$$= \frac{462}{28}$$

$$= 16\frac{14}{28}$$

$$= Rs.16\frac{1}{2}$$

Question 12.

Solution:

Length of each piece of cord

$$= \frac{143}{2} \div 26$$

$$= \frac{143}{2} \times \frac{1}{26}$$

$$= \frac{143}{52}$$

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

$$= 2\frac{3}{4} m$$

Question 13.

Solution:

Area of room = length × breadth

Length = area ÷breadth

$$= \frac{261}{4} \div \frac{87}{10}$$

$$= \frac{261}{4} \times \frac{10}{87}$$

$$= \frac{4176}{348}$$

$$= 12m$$

Question 14.

Solution:

Let the other fraction be x.

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

$$x = 9\frac{3}{5} \div 9\frac{3}{7}$$

$$x = \frac{48}{5} \div \frac{60}{7}$$

$$x = \frac{48}{5} \times \frac{7}{60}$$

$$x = \frac{336}{330}$$

$$x = \frac{56}{55}$$

$$x = 1\frac{1}{55}$$

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.

$$\frac{3}{8}x = 240$$

$$x = 240 \div \frac{3}{8}$$

$$x = 240 \times \frac{8}{3}$$

$$x = \frac{1920}{3}$$

$$x = 640$$

Number of boys = total – number of girls

$= 640 - 240$

$= 400$

Question 16.

Solution:

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

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:

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

Money left = 300 – 100 = 200

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

Money left = 200 – 50 = Rs.150

Question 18.

Solution:

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

Money left = 16000 – 4000 = 12000

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

Money left = 12000 – 3600 = 8400

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

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:

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 if 0
(v) Distributive law of multiplication over addition

Question 9.
Solution:
Required number

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

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

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

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

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