4 Rational Numbers

Exercise 4.1

1. **Rational numbers :** Rational numbers are the ones that can be written in the radio from *i.e.*, $\frac{p}{q}$, where p and q are integers and $q \quad 0$.

Examples : $\frac{3}{5}$ and $\frac{4}{9}$ are national number.

2. $\frac{4}{5}$ and $\frac{8}{9}$ are rational numbers but not fractions because rational number are the $\frac{p}{q}$ where p and q are integers.

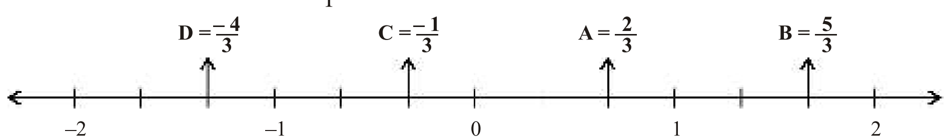
3. The negative rational numbers are $\frac{4}{5}$ and $\frac{5}{11}$.

4. (a) Rational number of $7 \quad \frac{7}{1}$ (b) Rational number of $0 \quad \frac{0}{1}$

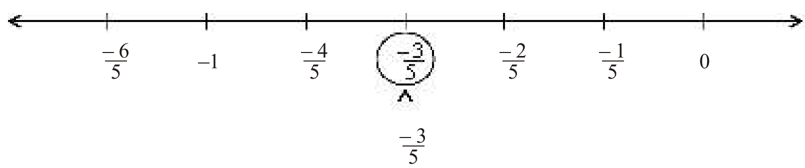
(c) Rational number of $1.6 \quad \frac{16}{10}$ (d) Rational number of $0.3 \quad \frac{3}{10}$

(e) Rational number of $53 \quad \frac{53}{1}$

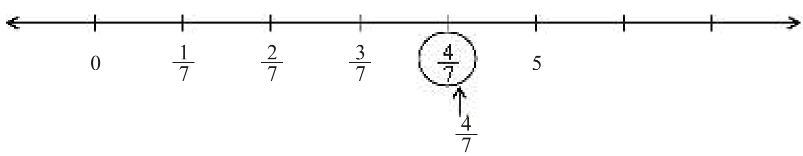
5.



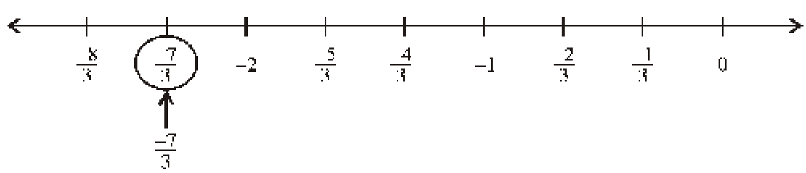
6. (a) $\frac{3}{5}$



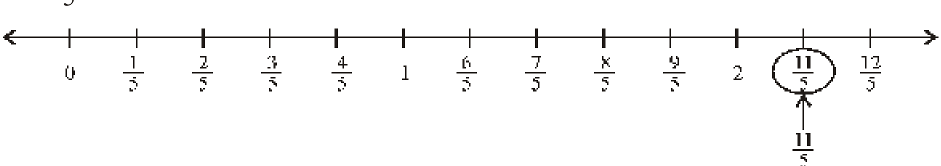
(b) $\frac{4}{7}$



(c) $\frac{7}{3}$



(d) $\frac{11}{5}$



7. **(Standard form of Rational Numbers :** A rational number $\frac{p}{q}$ is said to be in its standard form if p and q have no common factor and q is a positive integer.)

In the given numbers $\frac{5}{9}, \frac{8}{11}, \frac{8}{7}, \frac{24}{36}, \frac{5}{15}, \frac{32}{96}, \frac{2}{3}, \frac{8}{7}$ and $\frac{2}{3}$ are standard form of rational numbers. Only these numbers fulfill the condition of standard form of rational numbers.

8. (a) Dividing $\frac{12}{16}$ by the HCF of 12 and 16.

HCF of 12 and 16 is 4. Then, $\frac{12 \quad 4}{16 \quad 4} \quad \frac{3}{4}$

(b) Dividing $\frac{84}{120}$ by the HCF of 84 and 120

HCF of 84 and 120 is 12. Then, $\frac{84 \quad 12}{120 \quad 12} \quad \frac{7}{10}$

(c) Dividing $\frac{60}{180}$ by the HCF of 60 and 180

HCF of 60 and 180 is 60. Then, $\frac{60 \quad 60}{180 \quad 12} \quad \frac{1}{3}$

(d) Dividing $\frac{39}{49}$ by the HCF of 39 and 49

HCF of 39 and 49 is 1. Then, $\frac{39 \quad 1}{49 \quad 1} \quad \frac{39}{49}$

(e) Dividing $\frac{28}{70}$ by the HCF of 28 and 70.

HCF of 28 and 70 is 14. Then, $\frac{28 \quad 14}{70 \quad 14} \quad \frac{2}{5}$

(f) Dividing $\frac{32}{96}$ by the HCF of 32 and 96.

HCF of 32 and 96 is 32. Then, $\frac{32 \quad 32}{96 \quad 32} \quad \frac{1}{3}$

9. (a) True (b) True (c) False (d) True (e) False (f) False
(g) True (h) True (i) False (j) False

Exercise 4.2

1. (a) Givern : $\frac{2}{3}$ and $\frac{8}{9}$

2 9 18
3 8 24 Cross multiplication

Thus, $\frac{2}{3}$ and $\frac{8}{9}$ are not equivalent pair of rational number.

(b) Given : $\frac{5}{6}$ and $\frac{25}{30}$

5 30 150
6 25 150 Cross multiplication

Thus, $\frac{5}{6}$ and $\frac{25}{30}$ are equivalent pair of rational number.

(c) Given : $\frac{1}{3}$ and $\frac{5}{15}$

$$\begin{matrix} 1 & 15 & 15 \\ 3 & 5 & 15 \end{matrix}$$ Cross multiplication

Thus, $\frac{1}{3}$ and $\frac{5}{15}$ are equivalent pair of rational number.

(d) Given : $\frac{4}{11}$ and $\frac{12}{22}$

$$\begin{matrix} 4 & 22 & 88 \\ 1 & 12 & 132 \end{matrix}$$ Cross multiplication

Thus, $\frac{4}{11}$ and $\frac{12}{22}$ are not equivalent pair of rational number.

2. $\frac{5}{6}$ and $\frac{5}{x}$ (given)

By cross multiplication, we have

$$5 \quad x \quad 5 \quad 6$$
$$5x \quad 30$$
$$x \quad \frac{30}{5} \qquad 6$$
$$x \quad 6$$

3. $\frac{2}{9}$ and $\frac{2}{x}$ (given)

By cross multiplication, we have

$$2 \quad x \quad 9 \quad 2$$
$$2x \quad 18$$
$$x \quad \frac{18}{2} \quad 9 \qquad x \quad -9$$

4. (a) First four rational number equivalent to $\frac{3}{7}$ are :

$\frac{3 \quad 2}{7 \quad 2} \quad \boxed{\frac{6}{14}}$; $\frac{3 \quad 3}{7 \quad 3} \quad \boxed{\frac{9}{21}}$; $\frac{3 \quad 4}{7 \quad 4} \quad \boxed{\frac{12}{28}}$

$\frac{3 \quad 5}{7 \quad 5} \quad \boxed{\frac{15}{35}}$

(b) First four rational number equivalent to $\frac{4}{9}$ are :

$\frac{4 \quad 2}{9 \quad 2} \quad \boxed{\frac{8}{18}}$; $\frac{4 \quad 3}{9 \quad 3} \quad \boxed{\frac{12}{21}}$; $\frac{4 \quad 4}{9 \quad 4} \quad \boxed{\frac{16}{36}}$

$\frac{4 \quad 5}{9 \quad 5} \quad \boxed{\frac{20}{45}}$

(c) First four rational number equivalent to $\frac{5}{11}$ are :

$\frac{5 \quad 2}{11 \quad 2} \quad \boxed{\frac{10}{22}}$; $\frac{5 \quad 3}{11 \quad 3} \quad \frac{15}{33}$; $\frac{5 \quad 4}{11 \quad 4} \quad \frac{20}{44}$

$$\frac{5 \quad 5}{11 \quad 5} \quad \boxed{\frac{25}{55}}$$

5. (a) $\frac{4}{13} \quad \frac{4 \quad 1}{13 \quad 1} \quad \frac{4}{13}$ (b) $\frac{3}{5} \quad \frac{3 \quad 1}{5 \quad 1} \quad \frac{3}{5}$

(c) $\frac{1}{9} \quad \frac{1 \quad 1}{9 \quad 1} \quad \frac{1}{9}$ (d) $\frac{7}{15} \quad \frac{7 \quad 1}{15 \quad 1} \quad \frac{7}{15}$

6. (a) $\frac{12}{5}$, we need numerator 48 $\quad \frac{12 \quad 4}{5 \quad 4} \quad \frac{48}{20}$

(b) $\frac{12}{5}$, we need numeration 84 $\quad \frac{12 \quad 7}{5 \quad 7} \quad \frac{84}{35} \quad \frac{84}{35}$

(c) $\frac{12}{5}$, we need denominator 25 $\quad \frac{12 \quad 5}{5 \quad 5} \quad \frac{60}{25}$

(d) $\frac{12}{5}$, we need denominator 30 $\quad \frac{12 \quad 6}{5 \quad 6} \quad \frac{72}{30}$

7. (a) $\frac{2}{7} \quad \frac{?}{49} \quad \frac{12}{?}$

By which number was 7 multiplied to obtain 49?

Clearly, the number is 49 7 7

$\frac{2}{7} \quad \frac{2 \quad 7}{7 \quad 7} \quad \frac{14}{49}$

Again, what number is 2 multiplied to get 12?

The number is, 12 2 6

$\frac{2}{7} \quad \frac{2 \quad 6}{7 \quad 6} \quad \frac{12}{42}$

Hence, $\frac{2}{7} \quad \frac{\boxed{14}}{49} \quad \frac{12}{\boxed{42}}$

(b) $\frac{4}{5} \quad \frac{?}{30} \quad \frac{28}{?}$

By which number was 5 multiplied to obtain 30?

Clearly, the number is 30 5 6

$\frac{4}{5} \quad \frac{4 \quad 6}{5 \quad 6} \quad \frac{24}{30}$

Again, what number is 4 multiplied to get 28?

The number is, 28 4 7

$\frac{4}{5} \quad \frac{4 \quad 7}{5 \quad 7} \quad \frac{28}{35}$

Hence, $\frac{4}{5} \quad \frac{\boxed{24}}{30} \quad \frac{28}{\boxed{35}}$

8. (a) $\frac{1}{5} \quad \frac{8}{x}$ (given)

By cross multiplication, we have

$1 \quad x \quad 8 \quad 5$

$1x \quad 40$

$x \quad \frac{40}{1} \quad 40$

(b) $\frac{7}{3} \quad \frac{x}{6}$ (given)

By cross multiplication, we have,

$7 \quad 6 \quad 3 \quad x$

$42 \quad 3x$

$x \quad \frac{42}{3} \quad 14$

(c) $\frac{13}{6}$ $\frac{65}{x}$ (given)

By cross multiplication, we have

$13 \quad x \quad 65 \quad 6$

$13x \quad 390$

$x \quad \frac{390}{13} \quad 30$

(d) $\frac{16}{x}$ 4 (given)

By cross multiplication, we have

$4 \quad x \quad 16 \quad 1$

$4x \quad 16$

$x \quad \frac{16}{4} \quad 4$

9. (a) $\frac{3}{7}$ and $\frac{3}{7}$:

Since a positive rational number is greater than negative rational number.

$$\frac{3}{7} \quad \frac{3}{7}$$

$\frac{3}{7}$ is greater than $\frac{3}{7}$ rational number.

(b) $\frac{11}{15}$ and 0 :

Since, a zero is greater than negative rational number.

$$\frac{11}{15} \quad 0$$

0 is greater than $\frac{11}{15}$ rational number.

(c) $\frac{3}{8}$ and $\frac{8}{12}$

Making the denominator positive, we have $\frac{3}{8}$ and $\frac{8}{12}$

LCM of 8 and 12 24 and $\frac{3}{8} \quad \frac{3}{3} \quad \frac{9}{24}$;

$$\frac{8}{12} \quad \frac{2}{2} \quad \frac{16}{24}$$

Since, They have the same positive denominators we compare the numerator 9 16

$$\frac{9}{24} \quad \frac{16}{24}$$

$$\frac{3}{8} \quad \frac{8}{12}$$

$\frac{3}{8}$ is greater rational number to $\frac{8}{12}$.

(d) $\frac{6}{11}$ and $\frac{6}{11}$

Making the denominator positive, we have $\frac{6}{11}$ and $\frac{6}{11}$.

Since, positive rational number is greater than a negative rational number.

$$\frac{6}{11} \quad \frac{6}{11}$$

$$\frac{6}{11} \quad \frac{6}{11}$$

$\frac{6}{11}$ is greater rational number to $\frac{6}{11}$.

10. (a) $\frac{2}{3}, \frac{5}{11}$

Making the denominator positive, we have $\frac{2}{3}$ and $\frac{5}{11}$

LCM of 3 and 11   33

and $\frac{2}{3} \quad \frac{11}{11} \quad \frac{22}{33}$;

$$\frac{5}{11} \quad \frac{3}{3} \quad \frac{15}{33}$$

Since, they have same positive denominators we compare the numerator 22   15.

$$\frac{22}{33} \quad \frac{15}{33}$$

$$\frac{2}{3} \quad \frac{5}{11}$$

$\frac{5}{11}$ is smaller rational number to $\frac{2}{3}$.

(b) $\frac{7}{12}$ and $\frac{5}{9}$

LCM of 12 and 9   36

$$\frac{7}{12} \quad \frac{7 \quad 3}{12 \quad 3} \quad \frac{21}{36}$$

$$\frac{5}{9} \quad \frac{5 \quad 4}{9 \quad 4} \quad \frac{20}{36}$$

Since, they have same positive denominators we compare the numerator   21   20.

$$\frac{21}{36} \quad \frac{20}{36}$$

$$\frac{7}{12} \quad \frac{5}{9}$$

$\frac{7}{12}$ is smaller rational number to $\frac{5}{9}$.

(c) $\frac{13}{5}$ and   3

LCM of 5 and 1   5

$$\frac{13 \quad 1}{5 \quad 1} \quad \frac{13}{5}$$

$$\frac{3 \quad 5}{1 \quad 5} \quad \frac{15}{5}$$

Since, they have same positive denominators we compare the numerator   13   15

$$\frac{13}{5} \quad \frac{15}{5}$$

$$\frac{13}{5} \quad 3$$

$\frac{3}{1}$ is smaller rational number to $\frac{13}{5}$

(d) $\frac{5}{6}$ and $\frac{4}{5}$

LCM of 6 and 5   30

$$\frac{5}{6}\ \frac{5}{5}\quad \frac{25}{30}$$

$$\frac{4}{5}\ \frac{6}{6}\quad \frac{24}{30}$$

Since, they have same positive denominators we compare the numerator :

25 24

$\frac{25}{30}\ \frac{24}{30}$ $\qquad$ $\frac{5}{6}\ \frac{4}{5}$

$\frac{5}{6}$ is smaller rational number to $\frac{4}{5}$.

11. (a) Comparison between $\frac{3}{4}$ and $\frac{1}{4}$.

Since, they have same positive denominators than we compare the numerator as $\quad$ 3 1

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

(b) Comparison between $\frac{5}{6}$ and $\frac{10}{12}$.

Making same denominators

LCM of 6 and 12 is 12 :

$$\frac{5}{6}\ \frac{2}{2}\quad \frac{10}{12}$$

$$\frac{10}{12}\ \frac{1}{1}\quad \frac{10}{12}$$

Since, they have same numerator and denominators.

$$\frac{10}{12}\ \ \frac{10}{12}$$

(c) Comparison between $\frac{2}{3}$ and $\frac{1}{3}$.

Since, they have same positive denominators and a positive rational number is greater than a negative rational number.

$$\frac{2}{3}\ \ \frac{1}{3}$$

(d) Comparison between 0 and $\frac{5}{6}$.

Since, zero is smaller positive rational number.

$$0\ \ \frac{5}{6}$$

(e) Comparison between 6 and $\frac{26}{5}$.

Making same denominators

LCM of 1 and 5 is 5.

$$\frac{6}{1}\ \frac{5}{5}\quad \frac{30}{5}$$

$$\frac{26}{5}\ \frac{1}{1}\quad \frac{26}{5}$$

Since, they have same positive denominators than we compare the numerator as 30 26

$$\frac{30}{5} \quad \frac{26}{5}$$

$$6 \; \frac{26}{5}$$

(f) Comparison between $\frac{4}{5}$ and $\frac{7}{10}$.

Making the denominator positive $\frac{4}{5}$ and $\frac{7}{10}$.

Making the denominator same.

LCM of 5 and 10 10

$$\frac{4 \quad 2}{5 \quad 2} \quad \frac{8}{10}$$

$$\frac{7 \quad 1}{10 \quad 1} \quad \frac{7}{10}$$

Since, they have same positive denominator than we compare the numerator as 8 7

$$\frac{8}{10} \quad \frac{7}{10}$$

$$\frac{4}{5} \; \frac{7}{10}$$

12. (a) To find order in the above rational number, we shall first make the denominator positive. So we have

$$\frac{4}{9}, \frac{5}{6}, \frac{2}{3}, \frac{11}{18}$$

$\frac{11}{18}$ being positive is the largest.

(Remember that a positive rational number is always greater than the negative rational number).

To compare $\frac{4}{9}, \frac{5}{6}$ and $\frac{2}{3}$

LCM of 9, 6 and 3 18

Thus, $\frac{4}{9} \quad \frac{4 \quad 2}{9 \quad 2} \quad \frac{8}{18}$,

$\frac{5}{6} \quad \frac{5 \quad 3}{6 \quad 3} \quad \frac{15}{18}$,

And, $\frac{2}{3} \quad \frac{2 \quad 6}{3 \quad 6} \quad \frac{12}{18}$

Since, the same positive denominators we compare the numerator as 15 12 8. We have

$$\frac{5}{6} \quad \frac{2}{3} \quad \frac{4}{9}$$

Ascending order $\frac{5}{6} \quad \frac{2}{3} \quad \frac{4}{9} \quad \frac{11}{18}$

(b) To find order in the above rational number, we shall first make the denominator positive. So we have

$$\frac{7}{5}, \frac{19}{30}, \frac{3}{10}, \frac{8}{15}$$

$\frac{19}{30}$ and $\frac{3}{10}$ are positive rational number.

LCM of 30 and 10 30

$\frac{19}{30} \quad \frac{1}{1} \quad \frac{19}{30}; \qquad \frac{3 \quad 3}{10 \quad 3} \quad \frac{9}{30}$

Denominator are same we compare numeration.

$$19 \quad 9$$

$$\frac{19}{30} \quad \frac{9}{10}$$

$\frac{9}{10}$ is largest positive rational number.

Remember that a positive rational number is always greater than the negative rational number.

Again, comparing $\frac{7}{5}$ and $\frac{8}{15}$.

LCM of 5 and 15 15

$$\frac{7}{5} \quad \frac{7 \quad 3}{5 \quad 3} \quad \frac{21}{15}$$

$$\frac{8}{15} \quad \frac{8 \quad 1}{15 \quad 1} \quad \frac{8}{15}$$

Same positive denominator than we compare the numerator as

21 8

$$\frac{21}{15} \quad \frac{8}{15}$$

We have, $\frac{7}{5} \quad \frac{8}{15}$

Ascending order $\frac{7}{5} \quad \frac{8}{15} \quad \frac{19}{30} \quad \frac{9}{10}$

13. (a) $\frac{1}{2}$ and $\frac{3}{4}$

To find the rational numbers between these two numbers, we make this denominators equal

$\frac{1}{2} \quad \frac{1}{2} \quad \frac{40}{40} \quad \frac{40}{80}$ and $\frac{3}{4} \quad \frac{3}{4} \quad \frac{20}{40} \quad \frac{60}{80}$

Now, we can find any two rational numbers between $\frac{40}{80}$ and $\frac{60}{80}$

The number can be, $\frac{41}{80}, \frac{42}{80}, \frac{43}{80}, \frac{44}{80}$........., etc.

Hence, $\frac{41}{80}, \frac{42}{80}$ are the required two rational numbers.

(b) We have $\frac{1}{2}$ and $\frac{1}{2}$

Middle rational number between $\frac{1}{2}$ and $\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1 \quad 1}{2} \quad \frac{1}{2} \quad 0 \quad 0$

Ist middle rational number between $\frac{1}{2}$ and 0.

$$\frac{1}{2} \quad \frac{1}{2} \quad 0 \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{4}$$

Two rational between $\frac{1}{2}$ and $\frac{1}{2}$ are $\frac{1}{4}$, 0.

14. (a) 2 and 1

2 and 1 may be written as rational numbers $\frac{2}{1}$ and $\frac{1}{1}$

To find the rational numbers between these two numbers, we make their denominators equal.

$\frac{2}{1} \quad \frac{2 \quad 10}{1 \quad 10} \quad \frac{20}{10}$ and $\frac{1}{1} \quad \frac{1 \quad 10}{1 \quad 10} \quad \frac{10}{10}$

Now, we can find any rational numbers between $\frac{20}{10}$ and $\frac{10}{10}$.

The numbers can be $\frac{19}{10}, \frac{18}{10}, \frac{17}{10}, \frac{16}{10}, \frac{11}{10}$, ... , etc.

Four rational between 2 and 1 are $\frac{19}{10}, \frac{18}{10}, \frac{17}{10}$, and $\frac{16}{10}$.

(b) $\frac{4}{5}$ and $\frac{3}{4}$

To find the rational numbers between these two numbers, we make these denominators equal.

$\frac{4}{5} \quad \frac{4 \quad 40}{5 \quad 40} \quad \frac{160}{200}$ and $\frac{3}{4} \quad \frac{3 \quad 50}{4 \quad 50} \quad \frac{150}{200}$

Now, we can find any rational numbers between $\frac{160}{200}$ and $\frac{150}{200}$.

The numbers can be $\frac{159}{200}, \frac{158}{200}, \frac{157}{200}, \frac{156}{200}$, ………, etc.

Four rational between $\frac{4}{5}$ and $\frac{3}{4}$ are $\frac{159}{200}, \frac{158}{200}, \frac{157}{200}$ and $\frac{156}{200}$.

15. (a) $\frac{5}{11}$ and $\frac{1}{11}$

$\frac{4}{11}, \frac{3}{11}, \frac{2}{11}, \frac{1}{11}, \frac{0}{11}$ these 5 rational numbers in between $\frac{5}{11}$ and $\frac{1}{11}$

we want 10 rational numbers between $\frac{5}{11}$ and $\frac{1}{11}$

So, $\frac{5}{11} \quad \frac{10}{10} \quad \frac{50}{110}$ and $\frac{1}{11} \quad \frac{10}{10} \quad \frac{10}{110}$

Now, we can find 10 rational number between $\frac{5}{11}$ and $\frac{1}{11}$.

The numbers can be $\frac{49}{110}, \frac{48}{110}, \frac{47}{110}, \frac{46}{110}, \frac{45}{110}, \frac{44}{110}, \frac{43}{110}, \frac{42}{110}, \frac{41}{110}, \frac{40}{110}$, $\frac{39}{110}$, ... etc.

Hence, ten rational number between $\frac{5}{11}$ and $\frac{1}{11}$ are

$\frac{49}{110}, \frac{48}{110}, \frac{47}{110}, \frac{46}{100}, \frac{45}{110}, \frac{44}{10}, \frac{43}{110}, \frac{42}{110}, \frac{41}{110}$ and $\frac{40}{110}$.

(b) $\frac{1}{3}$ and $\frac{1}{4}$

To find the rational numbers between these two numbers.

To make the denominators equal.

$\frac{1}{3} \quad \frac{1}{3} \quad \frac{80}{240} \quad \frac{80}{240}$ and $\frac{1}{4} \quad \frac{1}{4} \quad \frac{60}{60} \quad \frac{60}{240}$

Now, we can find 10 rational numbers between $\frac{80}{240}$ and $\frac{60}{240}$

The number can be $\frac{79}{240}, \frac{78}{240}, \frac{77}{240}, \frac{76}{240}, \frac{75}{240}, \frac{74}{240}, \frac{73}{240}, \frac{72}{240}, \frac{71}{240}, \frac{70}{240}$

Hence, ten rational number between $\frac{1}{3}$ and $\frac{1}{4}$ are

$\frac{79}{240}, \frac{78}{240}, \frac{77}{240}, \frac{76}{240}, \frac{75}{240}, \frac{74}{240}, \frac{73}{240}, \frac{72}{240}, \frac{71}{240}$ and $\frac{70}{240}$.

Exercise 4.3

1. (a) $\frac{3}{8} \quad \frac{5}{8} \quad \frac{3 \quad 5}{8} \quad \frac{8}{8} \quad 1$

(b) $\frac{3}{8} \quad \frac{5}{8} \quad \frac{3 \quad 5}{8} \quad \frac{2}{8} \quad \frac{1}{4}$

(c) $\frac{3}{8} \quad \frac{5}{8} \quad \frac{3 \quad 5}{8} \quad \frac{2}{8} \quad \frac{1}{4}$

(d) $\frac{3}{8} \quad \frac{5}{8} \quad \frac{3 \quad 5}{8} \quad \frac{8}{8} \quad 1$

2. (a) $\frac{11}{12} \quad \frac{1}{4} \quad \frac{11 \quad 3}{12} \quad \frac{8}{12} \quad \frac{2}{3}$

(b) $\frac{3}{10} \quad \frac{9}{5} \quad \frac{3 \quad 18}{10} \quad \frac{15}{10} \quad \frac{3}{2} \quad 1\frac{1}{2}$

(c) $\frac{5}{12} \quad \frac{1}{4} \quad \frac{5 \quad 3}{12} \quad \frac{8}{12} \quad \frac{2}{3}$

(d) $\frac{7}{25} \quad \frac{3}{5} \quad \frac{7 \quad 15}{25} \quad \frac{22}{25}$

3. (a) $\frac{3}{4} \quad \frac{2}{3} \quad \frac{4}{5}$

LCM of 4, 3 and 5 is 60.

$\frac{3}{4} \quad \frac{3}{4} \quad \frac{15}{15} \quad \frac{45}{60}$

$\frac{2}{3} \quad \frac{2}{3} \quad \frac{20}{20} \quad \frac{40}{60}$

$\frac{4}{5} \quad \frac{4}{5} \quad \frac{12}{12} \quad \frac{48}{60}$

$\frac{45}{60} \quad \frac{40}{60} \quad \frac{48}{60}$

$\frac{45 \quad 40 \quad 48}{60}$

$\frac{85 \quad 48}{60} \quad \frac{37}{60}$

(b) $\frac{7}{2} \quad \frac{5}{6} \quad \frac{5}{8}$

LCM of 2, 6 and 8 is 24.

$\frac{7}{2} \quad \frac{7}{2} \quad \frac{12}{12} \quad \frac{84}{24}$

$\frac{5}{6} \quad \frac{5}{6} \quad \frac{4}{4} \quad \frac{20}{24}$

$\frac{5}{8} \quad \frac{5}{8} \quad \frac{3}{3} \quad \frac{15}{24}$

$\frac{84}{24} \quad \frac{20}{24} \quad \frac{15}{24}$

$\frac{20}{24} \quad \frac{15}{24} \quad \frac{84}{24}$

$\frac{20 \quad 15 \quad 84}{24} \quad \frac{20 \quad 99}{24} \quad \frac{79}{24}$

(c) $\frac{5}{7} \quad \frac{11}{14} \quad \frac{16}{21}$

LCM of 7, 14 and 21 is 42.

$\frac{5}{7} \quad \frac{5}{7} \quad \frac{6}{6} \quad \frac{30}{42}$

$\frac{11}{14} \quad \frac{11}{14} \quad \frac{3}{3} \quad \frac{33}{42}$

(d) $\frac{4}{5} \quad \frac{7}{10} \quad \frac{8}{15}$

LCM of 5, 10 and 15 is 30.

$\frac{4}{5} \quad \frac{4}{5} \quad \frac{6}{6} \quad \frac{24}{30}$

$\frac{7}{10} \quad \frac{7}{10} \quad \frac{3}{3} \quad \frac{21}{30}$

$\frac{16}{21} \quad \frac{16}{21} \quad \frac{2}{2} \quad \frac{32}{42}$

$\frac{30}{42} \quad \frac{33}{42} \quad \frac{32}{42}$

$\frac{30}{42} \quad \frac{32}{42} \quad \frac{33}{42} \quad \frac{30 \quad 32 \quad 33}{42}$

$\frac{62 \quad 33}{42} \quad \frac{29}{42}$

$\frac{8}{15} \quad \frac{8}{15} \quad \frac{2}{2} \quad \frac{16}{30}$

$\frac{24}{30} \quad \frac{21}{30} \quad \frac{16}{30}$

$\frac{24 \quad 21 \quad 16}{30}$

$\frac{61}{30}$

4. (a) $\frac{2}{5} \quad \frac{8}{6} \quad \frac{4}{5} \quad \frac{5}{6}$

$\frac{2}{5} \quad \frac{4}{5} \quad \frac{5}{6} \quad \frac{8}{6}$

LCM of 5, 5, 6 and 6 30

$\frac{2}{5} \quad \frac{2}{5} \quad \frac{6}{6} \quad \frac{12}{30}$; $\frac{4}{5} \quad \frac{4}{5} \quad \frac{6}{6} \quad \frac{24}{30}$

$\frac{5}{6} \quad \frac{5}{6} \quad \frac{5}{5} \quad \frac{25}{30}$;

$\frac{8}{6} \quad \frac{8}{6} \quad \frac{5}{5} \quad \frac{40}{30}$

$\frac{12}{30} \quad \frac{24}{30} \quad \frac{25}{30} \quad \frac{40}{30}$

$\frac{12 \quad 24 \quad 25 \quad 40}{30}$

$\frac{61 \quad 40}{30} \quad \frac{21}{30} \quad \frac{7}{10}$

(b) $\frac{11}{3} \quad \frac{3}{4} \quad \frac{11}{6} \quad \frac{3}{8}$

LCM of 3, 4, 6 and 8 24

$\frac{11}{3} \quad \frac{11}{3} \quad \frac{8}{8} \quad \frac{88}{24}$;

$\frac{3}{4} \quad \frac{3}{4} \quad \frac{6}{6} \quad \frac{18}{24}$;

$\frac{11}{6} \quad \frac{11}{6} \quad \frac{4}{4} \quad \frac{44}{24}$; $\frac{3}{8} \quad \frac{3}{8} \quad \frac{3}{3} \quad \frac{9}{24}$

$\frac{88}{24} \quad \frac{18}{24} \quad \frac{44}{24} \quad \frac{9}{24}$

$\frac{88 \quad 18 \quad 44 \quad 9}{24}$

$\frac{150 \quad 9}{24}$

$\frac{141}{24} \quad \frac{47}{8}$

(c) $\frac{13}{2} \quad \frac{14}{3} \quad \frac{21}{2} \quad \frac{7}{12}$

$\frac{13}{2} \quad \frac{7}{12} \quad \frac{14}{3} \quad \frac{21}{2}$

LCM of 2, 12, 3 and 2 12

$\frac{13}{2} \quad \frac{13}{2} \quad \frac{6}{6} \quad \frac{78}{12}$; $\frac{7}{12} \quad \frac{7}{12} \quad \frac{1}{1} \quad \frac{7}{12}$

$\frac{14}{3} \quad \frac{14}{3} \quad \frac{4}{4} \quad \frac{56}{12}$; $\frac{21}{2} \quad \frac{21}{2} \quad \frac{6}{6} \quad \frac{126}{12}$

$\frac{78}{12} \quad \frac{7}{12} \quad \frac{56}{12} \quad \frac{126}{12}$

$\frac{78 \quad 7 \quad 56 \quad 126}{12}$

$\frac{85 \quad 182}{12}$

$\frac{97}{12}$

(d) $\frac{8}{7} \quad \frac{4}{9} \quad \frac{11}{7} \quad \frac{5}{6}$

LCM of 7, 9, 7 and 6 126

$$\frac{8}{7} \quad \frac{8}{7} \; \frac{18}{18} \quad \frac{144}{126}; \; \frac{4}{9} \quad \frac{4}{9} \; \frac{14}{14} \quad \frac{56}{126};$$

$$\frac{11}{7} \quad \frac{11}{7} \; \frac{18}{18} \quad \frac{198}{126}; \; \frac{5}{6} \quad \frac{5}{6} \; \frac{21}{21} \quad \frac{105}{126}$$

$$\frac{144}{126} \quad \frac{56}{126} \quad \frac{198}{126} \quad \frac{105}{126}$$

$$\frac{144 \quad 56 \quad 198 \quad 105}{126} \qquad \frac{398 \quad 105}{126} \qquad \frac{293}{126}$$

5. Let the correct number is x to make the given statements true.

(a) $\frac{1}{4} \quad x \quad 2$

$x \quad 2 \quad \frac{1}{4}$

$x \quad \frac{2 \quad 4 \quad 1}{4}$

$x \quad \frac{8 \quad 1}{4} \quad \frac{7}{4}$

(b) $\frac{7}{8} \quad x \quad 4$

$x \quad 4 \quad \frac{7}{8}$

$x \quad \frac{4 \quad 8 \quad 7}{8}$

$x \quad \frac{39}{8}$

(c) $\frac{5}{9} \quad x \quad 0$

$x \quad 0 \quad \frac{5}{9}$

$x \quad \frac{5}{9}$

(d) $x \quad \frac{5}{7} \quad \frac{3}{14}$

$x \quad \frac{3}{14} \quad \frac{5}{7}$

$x \quad \frac{3 \quad 10}{14} \quad \frac{13}{14}$

(e) $x \quad \frac{5}{9} \quad 0$

$x \quad 0 \quad \frac{5}{9}$

$x \quad \frac{5}{9}$

(f) $0 \quad x \quad \frac{4}{7}$

$x \quad \frac{4}{7} \quad 0$

$x \quad \frac{4}{7}$

6. (a) $\frac{5}{8} \quad \frac{1}{8} \quad \frac{5 \quad 1}{8} \quad \frac{4}{8} \quad \frac{1}{2}$

(b) $\frac{3}{7} \quad \frac{5}{7} \quad \frac{3 \quad 5}{7} \quad \frac{8}{7}$

(c) $\frac{1}{3} \quad \frac{5}{3} \quad \frac{1 \quad 5}{3} \quad \frac{6}{3} \quad 2$

(d) $\frac{5}{11} \quad \frac{3}{11} \quad \frac{5 \quad 3}{11} \quad \frac{2}{11}$

7. (a) Subtract $\frac{8}{9}$ from $\frac{5}{6}$ $\quad \frac{5}{6} \quad \frac{8}{9} \quad \frac{15 \quad 16}{18} \quad \frac{31}{18}$

(b) Subtract $\frac{10}{9}$ from $1 \quad 1 \quad \frac{10}{9} \quad 1 \quad \frac{10}{9} \quad \frac{9 \quad 10}{9} \quad \frac{1}{9}$

(c) Subtract $\frac{8}{15}$ from $0 \quad 0 \quad \frac{8}{15} \quad 0 \quad \frac{8}{15} \quad \frac{8}{15}$

(d) Subtract $\frac{13}{15}$ from $\frac{9}{20} \quad \frac{9}{20} \quad \frac{13}{15} \quad \frac{27 \quad 52}{60} \quad \frac{25}{60} \quad \frac{5}{12}$

8. Sum of two rational number $\quad 4$

One of the number $\quad \frac{11}{5}$

The other number $\quad \frac{4}{1} \quad \frac{11}{5} \quad 4 \quad \frac{11}{5} \quad \frac{20 \quad 11}{5} \quad \frac{9}{5}$

9. Sum of two rational number $\quad \frac{13}{21}$

One of the number $\quad \frac{5}{7}$

The other number $\quad \frac{13}{21} \quad \frac{5}{7} \quad \frac{13 \quad 15}{21} \quad \frac{28}{21} \quad \frac{4}{3}$

10. Let required number be x.

Then, other number $x \quad 3$

According to question $x \quad 3 \quad \frac{8}{9}$

$$x \quad \frac{8}{9} \quad 3$$

$$\frac{8 \quad 27}{9} \quad \frac{19}{9}$$

Thus, required number $\frac{19}{9}$

11. $\frac{9}{28} \quad \frac{5}{7} \quad \frac{15}{14} \quad \frac{9}{28} \quad \frac{10 \quad 15}{14} \quad \frac{9}{28} \quad \frac{5}{14} \quad \frac{9 \quad 10}{28} \quad \frac{1}{28}$

12. $\frac{4}{5} \quad \frac{11}{20} \quad \frac{9}{10} \quad \frac{4}{5} \quad \frac{11}{20} \quad \frac{9}{10} \quad \frac{16 \quad 11}{20} \quad \frac{9}{10}$

$$\frac{27}{20} \quad \frac{9}{10} \quad \frac{27 \quad 18}{20} \quad \frac{45}{20} \quad \frac{9}{4}$$

13. (a) The additive inverse of $\frac{3}{7} \quad \frac{3}{7}$

(b) The additive inverse of $\frac{5}{12} \quad \frac{5}{12}$

(c) The additive inverse of $\frac{8}{9}$ or $\frac{8}{9} \quad \frac{8}{9}$

(d) The additive inverse of $\frac{3}{11}$ or $\frac{3}{11} \quad \frac{3}{11}$

(e) $\frac{6}{13}$ can be written as $\frac{6}{13}$.

The additive inverse of $\frac{6}{13}$ is $\frac{6}{13}$.

14. Total number of fruits 240

Apples $\frac{1}{3}$, Oranges $\frac{1}{4}$, Bananas $\frac{1}{5}$

Remaining mangoes $1 \quad \frac{1}{3} \quad \frac{1}{4} \quad \frac{1}{5}$

$$1 \quad \frac{20 \quad 15 \quad 12}{60}$$ [The LCM of 3, 4, 5 = 60]

$$1 \quad \frac{47}{60} \quad \frac{13}{60}$$

No. of Apples $\frac{1}{3}$ Total no of fruits $\frac{1}{3} \quad 240 \quad 80$

No of Oranges $\frac{1}{4}$ Total no of fruits $\frac{1}{4} \quad 240 \quad 60$

No of Bananas $\frac{1}{5}$ Total no of fruits $\frac{1}{5} \quad 240 \quad 48$

and No of Mangoes $\frac{13}{60}$ Total no of fruits $\frac{13}{60} \quad 240 \quad 52$

15. The diference of two rational number $\frac{6}{25}$

The greater number $\frac{4}{6}$

the smaller number $\frac{4}{6}\quad\frac{6}{25}\quad\frac{100\quad 36}{150}\quad\frac{64}{150}\quad\frac{32}{75}$

16. Let the required rational number be $\frac{a}{b}$.

$$\frac{a}{b}\quad\frac{3}{11}\quad\frac{4}{7}$$

$$\frac{a}{b}\quad\frac{4}{7}\quad\frac{3}{11}\quad\frac{4}{7}\quad\frac{3}{11}$$

$$\frac{44\quad 21}{77}\quad\frac{23}{77}$$ [The LCM of 7, 11 = 77]

Exercise 4.4

1. (a) $\frac{5}{11}$ (b) $\frac{2}{7}$ (c) $\frac{7}{8}$ (d) 1 (e) $\frac{5}{9}$

2. (a) ${\frac{1}{2}}^{1}\quad\frac{1}{\frac{1}{2}}\quad 2$ (b) ${\frac{3}{2}}^{1}\quad\frac{1}{\frac{3}{2}}\quad\frac{2}{3}$ (c) ${\frac{5}{6}}^{1}\quad\frac{1}{\frac{5}{6}}\quad\frac{6}{5}$

(d) $\frac{3}{2}\quad{\frac{2}{3}}^{1}\quad{\frac{3\quad 2}{2\quad 3}}^{1}\quad{\frac{6}{6}}^{1}\quad{\frac{1}{1}}^{1}\quad(\ 1)^{1}\quad\frac{1}{(\ 1)}\quad\frac{1}{1}\quad 1$

(e) $(\ 1)^{1}\quad\frac{1}{(\ 1)}\quad\frac{1}{1}\quad 1$

3. (a) $\frac{5}{3}\quad\frac{7}{15}\quad\frac{5\quad 7}{3\quad 15}\quad\frac{1\quad 7}{3\quad 3}\quad\frac{7}{9}$ (b) $\frac{2}{3}\quad\frac{4}{5}\quad\frac{2\quad 4}{3\quad 5}\quad\frac{8}{15}$

(c) $\frac{15}{2}\quad\frac{17}{5}\quad\frac{15\quad 17}{2\quad 5}\quad\frac{3\quad 17}{2\quad 1}\quad\frac{51}{2}$ or $\frac{51}{2}$ (d) $\frac{10}{19}\quad 57\quad 10\quad 3\quad 30$

4. (a) $\frac{1}{2}\quad\frac{1}{4}\quad\frac{1}{2}\quad 6\quad\frac{1\quad 1}{2\quad 4}\quad(1\quad 3)\quad\frac{1}{8}\quad 3\quad\frac{1\quad 24}{8}\quad\frac{25}{8}$

(b) $5\quad\frac{2}{15}\quad 6\quad\frac{2}{9}\quad 1\quad\frac{2}{3}\quad 2\quad\frac{2}{3}\quad\frac{2}{3}\quad\frac{4}{3}\quad\frac{2}{3}\quad\frac{4}{3}\quad\frac{2\quad 4}{3}\quad\frac{2}{3}$

(c) $\frac{5}{18}\quad\frac{15}{7}\quad 1\quad\frac{1}{4}\quad\frac{1}{2}\quad\frac{1}{4}\quad\frac{5}{6}\quad\frac{5}{7}\quad\frac{1}{4}\quad\frac{1}{8}\quad\frac{25}{42}\quad\frac{1}{4}\quad\frac{1}{8}\quad\frac{25}{42}\quad\frac{1}{4}\quad\frac{1}{8}$

LCM of 42, 4 and 8 168

$$\frac{100\quad 42\quad 21}{168}\quad\frac{121\quad 42}{168}\quad\frac{79}{168}$$

5. (a) 2 divide by $\frac{1}{2}$ $2\quad\frac{1}{2}\quad 2\quad 2\quad 4$ (b) 1 divide by $\frac{1}{3}$ $1\quad\frac{1}{3}\quad 1\quad 3\quad 3$

(c) 5 divide by $\frac{5}{7}$ $5\quad\frac{5}{7}\quad 5\quad\frac{7}{5}\quad 1\quad 7\quad 7$

(d) $\frac{7}{4}$ divide by 1 $\frac{7}{4}\quad 1\quad\frac{7}{4}\quad 1\quad\frac{7}{4}$

(e) 0 divide by $\frac{2}{3}$ 0 $\frac{2}{3}$ 0 $\frac{3}{2}$ 0

(f) $\frac{8}{7}$ divide by 4 $\frac{8}{7}$ 4 $\frac{8}{7}$ $\frac{1}{4}$ $\frac{2}{7}$

6. (a) $\frac{2}{9} \quad \frac{1}{9} \quad \frac{2}{9} \quad \frac{9}{1} \quad 2$ (b) $\frac{3}{13} \quad \frac{5}{39} \quad \frac{3}{13} \quad \frac{39}{5} \quad \frac{9}{5} \quad \frac{9}{5}$

(c) $\frac{56}{7} \quad \frac{8}{14} \quad \frac{56}{7} \quad \frac{14}{8} \quad 14$ (d) $\frac{105}{11} \quad \frac{15}{121} \quad \frac{105}{11} \quad \frac{121}{15} \quad 7 \quad 11 \quad 77$

7. (a) The multiplicative inverse of $\frac{6}{11}$ $\frac{11}{6}$ (b) The multiplicative inverse of $\frac{9}{5}$ $\frac{5}{9}$

(c) The multiplicative inverse of $\frac{1}{10}$ 10

(d) The multiplicative inverse of 5 $\frac{1}{5}$

8. Product of two rational numbers   5

One rational number   9

other number   (5)   (9)   5 $\frac{1}{9}$ $\frac{5}{9}$ $\frac{5}{9}$

9. The required number $\frac{32}{11} \quad \frac{6}{11} \quad \frac{32}{11} \quad \frac{11}{6} \quad \frac{16}{3} \quad 5\frac{1}{3}$

10. Sum of $\frac{7}{8}$ and $\frac{3}{5}$ $\frac{7}{8}$ $\frac{3}{5}$,

LCM of 8 and 5   40, $\frac{35 \quad 24}{40} \quad \frac{11}{40}$

Now, $\frac{11}{40} \quad \frac{1}{2}$

$\frac{11}{40} \quad \frac{2}{1} \quad \frac{11}{20}$

11. Length of rope   20 m,

Pieces of equal size are cut $\frac{5}{4}$ m

Number of pieces are cut off   20 $\frac{5}{4}$ 20 $\frac{4}{5}$ 16.

16 pieces are cut off in 20 m rope.
So, no rope is left.

12. (a) $\frac{13}{15} \quad \frac{3}{5} \quad \frac{3}{15} \quad \frac{3}{5} \quad \frac{3 \quad 9}{15} \quad \frac{13 \quad 9}{15} \quad \frac{4}{15} \quad \frac{22}{15} \quad \frac{4}{15} \quad \frac{15}{22} \quad \frac{2}{11}$

(b) $\frac{3}{7} \quad \frac{5}{9} \quad \frac{5}{12} \quad \frac{12}{49} \quad \frac{3 \quad (\ 5)}{7 \quad 9} \quad \frac{5 \quad 12}{12 \quad 49} \quad \frac{5}{21} \quad \frac{5}{49} \quad \frac{5}{21} \quad \frac{49}{5} \quad \frac{7}{3}$

13. (a) False (since division by 0 is not defined.)
(b) False (c) True (d) False (e) True (f) False (g) True

Exercise 4.5

1. If a rational number is in its lowest term and its denominator has no factor other than 2 or 5 on both.

Then, rational number has a terminating decimal representation. Otherwise, it has a non-terminating repeating decimal representing.

In the given rational numbers $\frac{1}{12}, \frac{13}{27}, \frac{19}{45}$ and $\frac{71}{75}$ have factors other than 2 or 5. Hence these are non-terminating decimals.

On the other hand, rational number $\frac{5}{10}, \frac{18}{30}, \frac{33}{20}$ and $\frac{26}{25}$ have factor of either 2 or 5 or both. Hence, these are terminating decimals.

2. (a) $\frac{2}{11}$ 2 11

11) 2.000000 (0.1818
–11
90
–88
20
–11
–90
88
2

$\frac{2}{11}$ 0.1818

(b) $\frac{11}{8}$ 11 8

8) 11 (1.375
–8
30
–24
60
–56
40
–40
0

$\frac{11}{8}$ 1.375

(c) $\frac{16}{32}$ 16 32

32) 160 (0.5
–160
0

$\frac{16}{32}$ 0.5

(d) $\frac{26}{25}$ 26 25

25) 26 (1.04
–25
100
–100
0

$\frac{26}{25}$ 1.04

(e) $\frac{49}{15}$ 49 15

15) 49 (3.2666
–45
40
–30
100
–90
100
–90
10

$\frac{49}{15}$ 3.2666

(f) $\frac{85}{12}$ 85 12

12) 85 (7.0833
–84
100
–96
40
–36
4

$\frac{85}{12}$ 7.0833

(g) $\frac{26}{500}$ 26 500

500) 2600 (0.052
–2500
1000
–1000
0

$\frac{26}{500}$ 0.052

(h) $\frac{303}{125}$ 303 125

125) 303 (4.424
–250
530
–500
300
–250
500
–500
0

$\frac{303}{125}$ 2.424

3. (a) $3.125 \quad \frac{3125}{1000} \quad \frac{25}{8} \quad 3\frac{1}{8}$ (b) $5.005 \quad \frac{5005}{1000} \quad \frac{1001}{200} \quad 5\frac{1}{200}$

(c) Let, $x \quad 2.\overline{3}$

Here, only one digit in decimal part is repeating, so we multiply it by 10.

$$10x \quad 2.\overline{3} \qquad \ldots(1)$$

Subtracting (1) from (2), we get

$$10x \quad x \quad 23.\overline{3} \quad 2.\overline{3}$$

$$9x \quad 21 \qquad \ldots(2)$$

$$x \quad \frac{21}{9} \quad \frac{7}{3} \quad 2\frac{1}{3}$$

$$x \quad 2.\overline{3} \quad 2\frac{1}{3}$$

(d) Let $x \quad 1.4\overline{7}$

Here, we have two digits in the decimal part out of which only one digit is repeating. First, we multiply it by 10 so that only repeating decimal is left on the right side of the decimal point.

$$10x \quad 14.\overline{7} \qquad \ldots(1)$$

Now, only one digit is repeating, so again we multiply it by 10.

$$100x \quad 14.\overline{7} \qquad \ldots(2)$$

Subtracting (1) from (2), we get

$$100x \quad 10x \quad 147.\overline{7} \quad 14.\overline{7}$$

$$90x \quad 133$$

$$x \quad \frac{133}{90} \quad 1\frac{43}{90}$$

(e) Let $x \quad 0.1\overline{3}$

Here, we have two digits in the decimal part out of which only one digit is repeating. First, we multiply it by 10 so that only repeating decimal is left on the right side of the decimal point.

$10x \quad 1.\overline{3}$ ...(1)

Now, only one digit is repeating, so again we multiply it by 10.

$$100x \quad 13.\overline{3} \qquad \ldots(2)$$

Subtracting (1) from (2), we get.

$$100x \quad 10x \quad 13.\overline{3} \quad 1.\overline{3}$$

$$90x \quad 12$$

$$x \quad \frac{12}{90} \quad \frac{4}{30} \quad \frac{2}{15}$$

(f) Let $x \quad 3.\overline{185}$ ...(1)

Here, three digit in decimal part is repeating, so we multiply it by 1000.

$$1000x \quad 3185.\overline{185} \qquad \ldots(2)$$

Subtracting (1) from (2), we get

$$1000x \quad x \quad 3185.\overline{185} \quad 3.\overline{185}$$

$$999x \quad 3182$$

$$x \quad \frac{3182}{999} \quad 3\frac{185}{999}$$

(g) Let $x \quad 0.8\overline{3}$

Here, we have two digits in the decimal part out of which only one digit in repeating. First, we multiply it by 10 so that only.
repeating decimal is left on the right side of the decimal point.

$$10x \quad 8.\overline{3} \qquad \ldots(1)$$

Now, only one digit is repeating so again we multiply it by 10.

$$100x \quad 83.\overline{3} \qquad \ldots(2)$$

Subtracting (1) from (2), we get

$$100x \quad 10x \quad 83.\overline{3} \quad 8.\overline{3}$$

$$90x \quad 75 \qquad x \quad \frac{75}{90} \quad \frac{25}{30}$$

(h) $12.68 \quad \frac{1268}{100} \quad \frac{317}{25} \quad 12\frac{17}{25}$

4. (a) Let $x \quad 0.66666...$ ...(1)

or $x \quad 0.\overline{6}$

Here, only one digit in decimal part is repeating, so we multiply it by 10.

$$10x \quad 6.\overline{6} \qquad ...(2)$$

Subtracting (1) from (2), we get

$$10x - x \quad 6.\overline{6} - 0.\overline{6}$$

$$9x \quad 6$$

$$x \quad \frac{6}{9} \quad \frac{2}{3}$$

$$x \quad \frac{2}{3} \quad \frac{p}{q}$$

Thus, this number can be expressed as rational number.

(b) Let $x \quad 0.217217217$

or $x \quad 0.\overline{217}$ ...(1)

Here, Three digits in decimal part are repeating, so we multiply it by 1000.

$$1000x \quad 217.\overline{217} \qquad ...(2)$$

Subtracting (1) from (2), we get

$$1000x - 217.\overline{217} - 0.\overline{217}$$

$$999x \quad 217$$

$$x \quad \frac{217}{999} \quad \frac{p}{q}$$

Thus, this number can be expressed as rational number.

(c) Let $x \quad 7.40505005...$

Since no digit or group of digits in decimal part is repeating, so it can't expressed as rational number.

(d) These also can't be expressed as rational number.

(e) These also can't be expressed as rational number.

(f) These also can't be expressed as rational number.

5. (a) $3.\overline{5} \quad 4.\overline{7}$

First, we convert decimals number into rational numbers.

Let $x \quad 3.\overline{5}$ …(1)

Here, we have one digits in decimal part is repeating, so we multiply by 10.

$$10x \quad 35.\overline{5} \qquad \ldots(2)$$

Subtracting (1) from (2), we get

$$10x \quad x \quad 35.\overline{5} \quad 3.\overline{5}$$

$$9x \quad 32$$

$$x \quad \frac{32}{9}$$

Again, Let $y \quad 4.\overline{7}$ …(3)

Here, we have one digits in decimal part is repeating, so we multiply by 10

$$10y \quad 47.\overline{7}$$

Subtracting (3) from (4), we get

$$10y \quad y \quad 47.\overline{7} \quad 4.\overline{7}$$

$$9y \quad 43$$

$$y \quad \frac{43}{9}$$

$$4.\overline{7} \quad \frac{43}{9}$$

Then, $x \quad y \quad 3.\overline{5} \quad 4.\overline{7} \quad \frac{32}{9} \quad \frac{43}{9} \quad \frac{32 \quad 43}{9} \quad \frac{75}{9} \quad \frac{25}{3} \quad 8\frac{1}{3}$

(b) $0.\overline{2} \quad 0.\overline{3} \quad 0.\overline{4}$

First, we convert decimals number into rational numbers.

Let $x \quad 0.\overline{2}$ …(1)

Here, we have one digits in decimal part is repeating, so we multiply by 10.

$$10x \quad 2.\overline{2} \qquad …(2)$$

Subtracting (1) from (2), we get

$$10x \quad x \quad 2.\overline{2} \quad 0.\overline{2}$$

$$9x \quad 2$$

$$x \quad \frac{2}{9}$$

And $y \quad 0.\overline{3}$ …(3)

Here, we have one digits in decimal part is repeating, so we multiply by 10.

$$10y \quad 3.\overline{3} \qquad …(4)$$

Subtracting (3) from (4), we get

$$10y \quad y \quad 3.\overline{3} \quad 0.\overline{3} \quad 3$$

$$9y \quad 3$$

$$y \quad \frac{3}{9}$$

Again, $z \quad 0.\overline{4}$ …(5)

Here, we have one digits in decimal part is repeating, so, we multiply by 10.

$$10x \quad 4.\overline{4} \qquad …(6)$$

Subtracting (5) from (6), we get

$$10z \quad z \quad 4.\overline{4} \quad 0.4$$

$$9z \quad 4$$

$$z \quad \frac{4}{9}$$

Then, $x \quad y \quad z = 0.\overline{2} \quad 0.\overline{3} \quad 0.\overline{4}$

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

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

$$\frac{9}{9} \quad 1$$

MCQ's

1. (b) **2.** (c) **3.** (b) **4.** (c) **5.** (b) **6.** (b)
7. (b) **8.** (d) **9.** (d) **10.** (d)