Number System

Solution of Exercise 1.3:

Question 1:

(i)

$\frac{36}{100} = \begin{array}{l|l} 100 & \begin{array}{l} 0.36 \\ \overline{)360} \\ \overline{)300} \\ \overline{)600} \\ \overline{)600} \\ 0 \end{array} \end{array}$ Since there is not recurring of number pattern therefore its decimal expansion is 0.36 terminating (because of remainder is zero).

(ii)

$\frac{1}{11} = \begin{array}{l|l} 11 & \begin{array}{l} 0.0909 \\ \overline{)1000} \\ \overline{)900} \\ \overline{)1000} \\ \overline{)900} \\ 100 \end{array} \end{array}$ Since there is recurring of number 09 pattern therefore its decimal expansion $0.\overline{09}$ is no terminating repeating.

(iii)

$4\frac{1}{8}$

$\frac{33}{8} = 8\overline{)\begin{array}{r}4.125\\ 33\\ 32\\ \hline 10\\ 8\\ \hline 20\\ 16\\ \hline 40\\ 40\\ \hline 0\end{array}}$ Since there is no recurring of number pattern therefore its decimal expansion 4.125 is terminating.

(iv)

$\frac{3}{13} = 13\overline{)\begin{array}{r}0.230769\\ 30\\ 26\\ \hline 40\\ 39\\ \hline 100\\ 91\\ \hline 90\\ 78\\ \hline 120\\ 117\\ \hline 3\end{array}}$ Since there is recurring of number 0.230769 pattern therefore its decimal expansion $0.\overline{230769}$ is no terminating repeating.

(v)

$$\frac{2}{11}=\begin{array}{l|l} & 0.1818 \\ 11 & \overline{20} \\ & \overline{11} \\ & \overline{90} \\ & \overline{88} \\ & \overline{20} \\ & \overline{11} \\ & \overline{90} \\ & \overline{88} \\ & 2 \end{array}$$

Since there is recurring of number 0.1818 pattern therefore its decimal expansion $0.\overline{18}$ is no terminating repeating

(vi)

$$\frac{329}{400}=\begin{array}{l|l} & 0.8225 \\ 400 & \overline{3290} \\ & \overline{3200} \\ & \overline{900} \\ & \overline{800} \\ & \overline{1000} \\ & \overline{800} \\ & \overline{2000} \\ & \overline{2000} \\ & 0 \end{array}$$

Since there is no recurring of number pattern therefore its decimal expansion 0.8225 is terminating.

Question 2: Given $\frac{1}{7}=0.\overline{142857}$

Similarly $\frac{2}{7}$ can be written as $2\times\frac{1}{7}=0.\overline{285714}$

$\frac{3}{7}$ can be written as $3\times\frac{1}{7}=0.\overline{428571}$

$\frac{4}{7}$ can be written as $4\times\frac{1}{7}=0.\overline{571428}$

$\frac{5}{7}$ can be written as $5\times\frac{1}{7}=0.\overline{714285}$

$\frac{6}{7}$ can be written as $6\times\frac{1}{7}=0.\overline{857142}$

Question 3:

(i)

Let $x=0.\bar{6}$ .note that only 6 is repeating. Since only one digit is repeating, we multiply x by 10 to get

$10x=6.6666666$

$10x=6+0.6666666$

$10x=6+x$

$x=\frac{6}{9}$ or $\frac{2}{3}$

(ii)

Let $x=0.4\bar{7}$ .note that only 7 is repeating. Since only one digit is repeating, we multiply x by 10 to get

$10x=4.7777777$

$10x=4.3+0.47777777$

$10x=4.3+x$

$x=\frac{43}{90}$

(iii)

Let $x=0.\overline{001}$ .note that only 001 is repeating block of 3 digits. Since block of three digit is repeating, we multiply x by 1000 to get

$1000x = 1.001001001001001$

$1000x = 1 + 0.\overline{001}$

$1000x = 1 + x$

$x = \frac{1}{999}$

Question 4:

Let $x = 0.\bar{9}$ .note that only 9 is repeating. Since only one digit is repeating, we multiply x by 10 to get

$10x = 9.999999$

$10x = 9 + 0.\bar{9}$

$10x = 9 + x$

$x = 1$

Question 5:

$$\frac{1}{17} = 17\overline{)\begin{array}{r}0.0588235294117647\\ 100\\ 85\\ \hline 150\\ 136\\ \hline 140\\ 136\\ \hline 40\\ 34\\ \hline 60\\ 51\\ \hline 90\\ 85\\ \hline 50\\ 34\\ \hline 160\\ 153\\ \hline 70\\ 68\\ \hline 20\\ 17\\ \hline 30\\ 17\\ \hline 130\\ 119\\ \hline 110\\ 102\\ \hline 80\\ 68\\ \hline 120\\ 119\\ \hline 1\end{array}}$$

Since there is recurring of number pattern therefore its decimal expansion is $0.\overline{0588235294117647}$ recurring, non-terminating.

Question 6 & 7 : do your self

Question 8:

Let the given rational numbers are $\frac{5}{7} = 0.\overline{714285}$ and $\frac{9}{11} = 0.\overline{81}$.

As we know there are infinite irrational numbers between the two rational number so choose any three value randomly between a given value.

0.72787672458732424782….., 0.735842266981……., 0.743666852369844569855……...

Question 9:

(i) $\sqrt{23} = 4.7958315233.....$ (**Irrational**).

(ii) $\sqrt{225} = 15$ (**Rational**).

(iii) $0.3796 = \frac{3796}{10000}$ (**Rational**).

(iv) $7.478478.....$ (**Irrational**).

(v) $1.1010010001.....$ (**Irrational**).