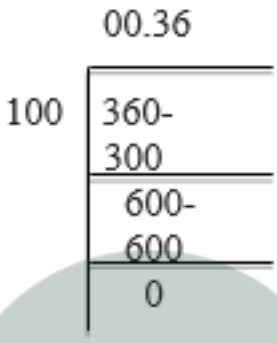
NCERT Solutions for Class 9 Maths Chapter 1 Number Systems Ex 1.3

Question 1.

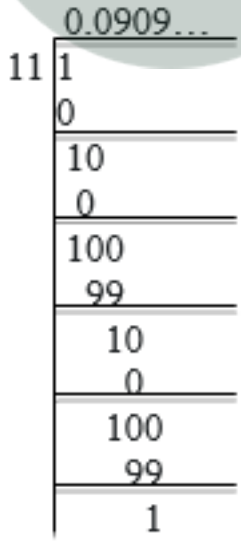
Write the following in decimal form and say what kind of decimal expansion each has :

(i) 36/100



= 0.36 (Terminating)

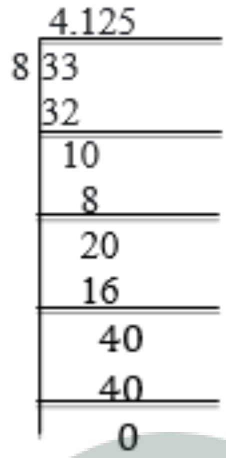
(ii)1/11



= 0.0909... = $0.\overline{09}$ (Non terminating and repeating)

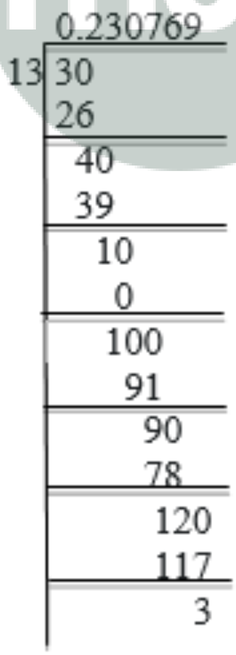
(iii) 33/8

$$4\frac{1}{8} = \frac{33}{8}$$



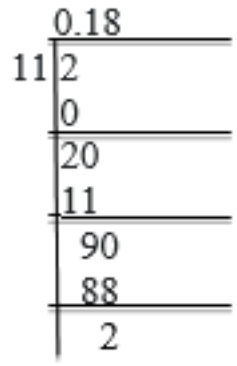
= 4.125 (Terminating)

(iv) 3/13



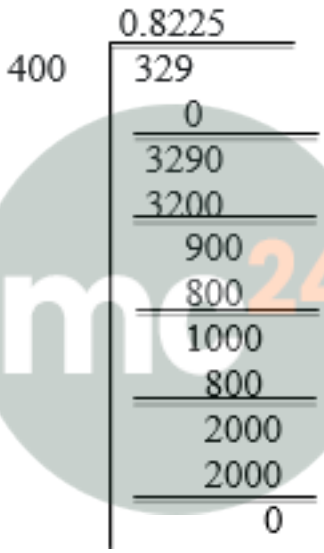
$$= 0.230769\ldots = 0.\overline{230769}$$

(v) 2/11



$= 0.181818181818\ldots = 0.\overline{18}$ (Non terminating and repeating)

(vi) 329/400



= 0.8225 (Terminating)

Question 2.

You know that 1/7 = $0.14\overline{2}857$. Can you predict what the decimal expansions of 2/7 , 13/7 , 4/7 , 5/7 , 6/7 are , without actually doing the long division? If so, how?

Solution.

We are given that 1/7 = $0.14\overline{2}857$.

∴ 2/7 = 2 x 1/7 = 2 x ($0.14\overline{2}857$) =$0.28\overline{2}714$

3/7 = 3 x 1/7 = 3 x ($0.14\overline{2}857$) = $0.42\overline{8}571$

4/7 = 4 x 1/7 = 4 x ($0.14\overline{2}857$) = $0.57\overline{1}428$

5/7 = 5 x 1/7 = 5 x($0.14\overline{2}857$) = $0.71\overline{4}285$

6/7 = 6 x 1/7 = 6 x ($0.14\overline{2}857$) = $0.85\overline{7}142$

Thus, without actually doing the long division we can predict the decimal expansions of the given rational numbers.

Question 3.
Express the following in the form pq where p and q are integers and q ≠ 0.
(i) 0. $\overline{6}$
(ii) 0.4$\overline{7}$
(iii) 0. $\overline{001}$
Solution:
(i) Let x = 0. $\overline{6}$ = 0.6666… … (1)
As there is only one repeating digit,
multiplying (1) by 10 on both sides, we get
10x = 6.6666… … (2)
Subtracting (1) from (2), we get
10x – x = 6.6666… -0.6666…
⇒ 9x = 6 ⇒ x = 6/9 = 2/3
Thus, 0. $\overline{6}$ = 2/3

(ii) Let x = 0.4$\overline{7}$ = 0.4777… … (1)
As there is only one repeating digit, multiplying (1) by lo on both sides, we get
10x = 4.777
Subtracting (1) from (2), we get
10x – x = 4.777…… – 0.4777…….
⇒ 9x = 4.3 ⇒ x = 43/90
Thus, 0.4$\overline{7}$ = 43/90

(iii) Let x = 0. $\overline{001}$= 0.001001… … (1)
As there are 3 repeating digits,
multiplying (1) by 1000 on both sides, we get
1000x = 1.001001 … (2)
Subtacting (1) from (2), we get
1000x – x = (1.001…) – (0.001…)
⇒ 999x = 1 ⇒ x = 1/999
Thus, 0. $\overline{001}$= 1/999

Question 4.
Express 0.99999… in the form p/q Are you surprised by your answer? With your teacher and classmates discuss why the answer makes sense.
Solution.

Let x = 0.99999….. …. (i)
As there is only one repeating digit,
multiplying (i) by 10 on both sides, we get
10x = 9.9999 … (ii)
Subtracting (i) from (ii), we get
10x – x = (99999) — (0.9999)
⇒ 9x = 9 ⇒ x = 9/9 = 1
Thus, 0.9999 =1
As 0.9999… goes on forever, there is no such a big difference between 1 and 0.9999
Hence, both are equal.

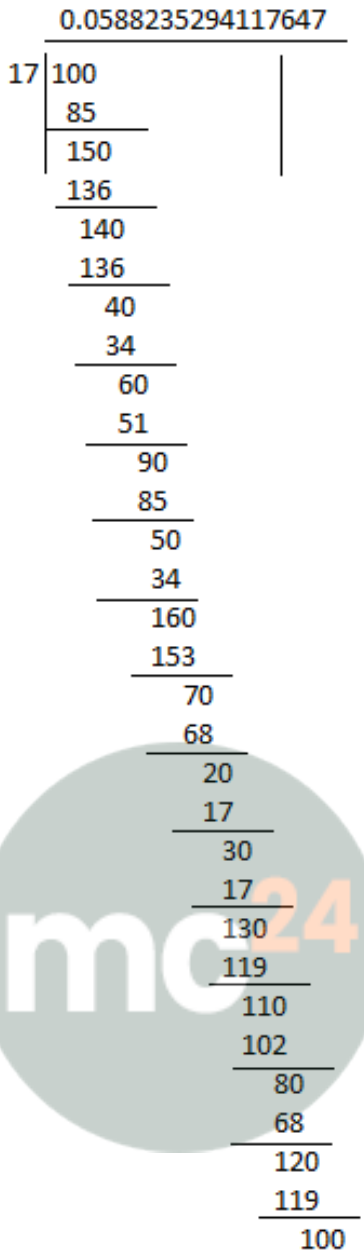
Questions 5.

What can the maximum number of digits be in the repeating block of digits in the decimal expansion of 1/17 ? Perform the division to check your answer.

Solution.

1/17

Dividing 1 by 17:



$$\frac{1}{17} = 0.\overline{0588235294117647}$$

There are 16 digits in the repeating block of the decimal expansion of 1/17.

Questions 6.

Look at several examples of rational numbers in the form p/q (q ≠ 0), where p and q are integers with no common factors other than 1 and having terminating decimal representations (expansions). Can you guess what property q must satisfy?

Solution.

We observe that when q is 2, 4, 5, 8, 10… Then the decimal expansion is terminating. For example:

1/2 = 0. 5, denominator q = 2^1

7/8 = 0. 875, denominator q =2^3

4/5 = 0. 8, denominator q = 5^1

We can observe that the terminating decimal may be obtained in the situation where prime factorization of the denominator of the given fractions has the power of only 2 or only 5 or both.

Question 7.

Write three numbers whose decimal expansions are non-terminating non-recurring.

Solution.

We know that all irrational numbers are non-terminating non-recurring. three numbers with decimal expansions that are non-terminating non-recurring are:

1. √3 = 1.732050807568
2. √26 =5.099019513592
3. √101 = 10.04987562112

Question 8.
Find three different irrational numbers between the rational numbers 5/7 and 9/11 .
Solution.
We have,

$$\begin{array}{r} 0.714285\ldots \\ 7\overline{)\ 5.0} \\ -49 \\ \hline 10 \\ -7 \\ \hline 30 \\ -28 \\ \hline 20 \\ -14 \\ \hline 60 \\ -56 \\ \hline 40 \\ -35 \\ \hline 5 \end{array} \quad \text{and} \quad \begin{array}{r} 0.8181\ldots \\ 11\overline{)\ 9.0} \\ -88 \\ \hline 20 \\ -11 \\ \hline 90 \\ -88 \\ \hline 20 \\ -11 \\ \hline 9 \end{array}$$

$\therefore \quad \frac{5}{7} = 0.\overline{714285}$ and $\frac{9}{11} = 0.\overline{81}$

Three irrational numbers between 0. $\overline{7142851}$ and 0. $\overline{81}$ are
(i) 0.750750075000 .....
(ii) 0.767076700767000 ……
(iii) 0.78080078008000 ……

Question 9.
Classify the following numbers as rational or irrational
(i) √23
(ii) √225
(iii) 0.3796
(iv) 7.478478.....
(v) 1.101001000100001.....

Solution.
(i) ∵ 23 is not a perfect square.
∴ √23 is an irrational number.
(ii) ∵ 225 = 15 x 15 = 15^2
∴ 225 is a perfect square.
Thus, √225 is a rational number.
(iii) ∵ 0.3796 is a terminating decimal.
∴ It is a rational number.
(iv) 7.478478... = 7. $\overline{478}$
Since, 7. $\overline{478}$ is a non-terminating recurring (repeating) decimal.
∴ It is a rational number.
(v) Since, 1.101001000100001... is a non terminating, non-repeating decimal number.
∴ It is an irrational number.