Board – NCRT	Class – 10th	Topic – Real Number 1.4

Q.1 Without actually performing the long division, state whether the following rational numbers will have a terminating decimal expansion or a non-terminating repeating decimal expansion:

$\frac{13}{3125}$	$\frac{17}{8}$	$\frac{64}{455}$	$\frac{15}{1600}$	$\frac{29}{343}$
$\frac{23}{2^3 5^2}$	$\frac{129}{2^2 5^7 7^5}$	$\frac{6}{15}$	$\frac{35}{50}$	$\frac{77}{210}$

Sol:

(i) $\frac{13}{3125}$

$3125 = 5^5$

The denominator is in the form of 5^m, hence, the decimal expansion of $\frac{13}{3125}$ is terminating.

(ii) $\frac{17}{8}$

$8 = 2^4$

The denominator is in the form of 2^m, hence, the decimal expansion of $\frac{17}{8}$ is terminating.

(iii) $\frac{64}{455}$

455 5×7×13

Since the denominator is not in the form of $2^m \times 5^n$, and it also contains 7 and 13 as its factors, its decimal expansion will be non-terminating repeating.

(iv) $\frac{15}{1600}$

$1600 = 2^6 \times 5^2$

The denominator is in the form of $2^m \times 5^n$, hence, the decimal expansion of $\frac{15}{1600}$ is terminating.

(v) $\frac{29}{343}$

$343 = 7^3$

Since the denominator is not in the form of$2^m \times 5^n$, hence, the decimal expansion of $\frac{29}{343}$ is non - terminating repeating.

(vi) $\frac{23}{2^3 \times 5^2}$

The denominator is in the form of $2^m \times 5^n$, hence, the decimal expansion of $\frac{23}{2^3 \times 5^2}$ is terminating.

(vii) $\frac{129}{2^2 \times 5^7 \times 7^5}$

Since the denominator is not in the form $2^m \times 5^n$, and it has 7 as its factor, the decimal expansion of $\frac{129}{2^2 \times 5^7 \times 7^5}$ is non - terminating repeating.

(viii) $\frac{6}{15} = \frac{2 \times 3}{3 \times 5} = \frac{2}{5}$

The denominator is in the form of 5^n, hence, the decimal expansion of $\frac{6}{15}$ is terminating.

(ix) $\frac{35}{50} = \frac{7 \times 5}{10 \times 5} = \frac{7}{10}$

$10 = 2 \times 5$

Since the denominator is not in the form of $2^m \times 5^n$, hence, the decimal expansion of $\frac{35}{50}$ is terminating.

(x) $\frac{77}{210} = \frac{11 \times 7}{30 \times 7} = \frac{11}{30}$

$30 = 2 \times 3 \times 5$

Since the denominator is not in the form of $2^m \times 5^n$, and it also has 3 as its factors, the decimal expansion of $\frac{77}{210}$ is non-terminating repeating.

Q.2 Write down the decimal expansions of those rational numbers in Q. 1 above which have terminating decimal expansions.

Sol: (i) $\frac{13}{3125} = 0.00416$

$$
\begin{array}{r}
0.00416 \\
3125\overline{)13.00000} \\
0 \\
\hline
130 \\
0 \\
\hline
1300 \\
0 \\
\hline
13000 \\
12500 \\
\hline
5000 \\
3125 \\
\hline
18750 \\
18750 \\
\hline
\times
\end{array}
$$

(ii) $\frac{17}{8} = 2.125$

$$
\begin{array}{r}
2.125 \\
8\overline{)\ 17} \\
\underline{16} \\
10 \\
\underline{8} \\
20 \\
\underline{16} \\
40 \\
\underline{40} \\
\times
\end{array}
$$

(iii) $\frac{15}{1600} = 0.009375$

$$
\begin{array}{r}
0.009375 \\
1600\overline{)15.000000} \\
0 \\
\hline
150 \\
0 \\
\hline
1500 \\
0 \\
\hline
15000 \\
14400 \\
\hline
6000 \\
4800 \\
\hline
12000 \\
11200 \\
\hline
8000 \\
8000 \\
\hline
\times
\end{array}
$$

(iv) $\frac{6}{15} = \frac{2\times3}{3\times5} = 0.4$

$$
\begin{array}{r}
0.4 \\
5\overline{)2.0} \\
0 \\
\hline
20 \\
20 \\
\hline
\times \\
\hline
\end{array}
$$

(v) $\frac{35}{50} = 0.7$

$$
\begin{array}{r}
0.7 \\
50\overline{)35.0} \\
0 \\
\hline
350 \\
350 \\
\hline
\times \\
\hline
\end{array}
$$

Q.3 The following real numbers have decimal expansions as given below. In each case, decide whether they are rational or not. If they are rational, and in the form of, what can you say about the prime factor of q?

(i) 43. 123456789

(ii) 0. 120120012000120000…

(iii) $43.\overline{123456789}$

Sol: **(i)** 43. 123456789

Since this number has a terminating decimal expansion, it is a rational number in the form of $\frac{p}{q}$ and q is in the form of $2^m \times 5^n$

i.e., the prime factors of q will be either 2 or 5 or both.

(ii) $0.120120012000120000\ldots\ldots$

The decimal expansion is neither terminating nor recurring.

Therefore, the given number is an irrational number.

(iii) $43.\overline{123456789}$

Since the decimal expansion is non-terminating recurring, the given number is a rational number in the form of $\frac{p}{q}$ and q is not in the form of $2^m \times 5^n$ i.e., the prime factors of q will also have a factor other than 2 or 5.