Chapter 1 - Real Numbers

Exercise 1.4

Rational No.:- $\frac{p}{q}$ $q \neq 0$

→ Terminating

→ Non terminating — Repeating.

Exp $\frac{7}{2} = 3.5$ terminating

$$\begin{array}{r|l} 2 & 7 \\ & \underline{6} \\ & 10 \\ & \underline{10} \\ & \times \end{array} \quad 3.5$$

$$\frac{10}{3} = 3.3333\ldots\ldots$$

$$3\overline{)10}\;3.333\ldots\ldots$$

$$\begin{array}{r} 9 \\ \hline 10 \\ 9 \\ \hline 10 \\ 9 \\ \hline 10 \\ 9 \\ \hline 10 \end{array}$$

Non terminating | Repeating.

Rational No. :- $\frac{p}{q}$

terminate → q will be in the form of $(2^n 5^m.)$

$q = 2^n 5^m.$ No. will terminate.

terminating ⇄ $2^n 5^m$ q

EXERCISE 1.4

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:

(i) $\frac{13}{3125}$ (ii) $\frac{17}{8}$ (iii) $\frac{64}{455}$ (iv) $\frac{15}{1600}$

(v) $\frac{29}{343}$ (vi) $\frac{23}{2^3 5^2}$ (vii) $\frac{129}{2^2 5^7 7^5}$ (viii) $\frac{6}{15}$

(ix) $\frac{35}{50}$ (x) $\frac{77}{210}$

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

1. (i) $\frac{13}{3125} = \frac{13}{5^5} \rightarrow$ terminating

$$\begin{array}{r|l} 5 & 3125 \\ \hline 5 & 625 \\ \hline 5 & 125 \\ \hline 5 & 25 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$\underline{5^5}$

② (i) $\dfrac{13}{3125} = \dfrac{13 \times 2^5}{5^5 \times 2^5} = \dfrac{13 \times 32}{(10)^5}$

$= \dfrac{416}{100000} = 0.00416$

$9 + 2 = 11$

13×32

$\underline{3} \quad \underline{1} \quad \underline{6}$

$\underline{416}$

(iv) $\dfrac{15}{1600} = \dfrac{15}{16} \cdot \dfrac{1}{100}$

$= \dfrac{15 \times 5^4}{2^4 \times 5^4} \cdot \dfrac{1}{100}$

terminating

$\dfrac{15 \times 625}{(10)^4} \cdot \dfrac{1}{(10)^2} = \dfrac{9375}{1000000}$

$= 0.009375$

$$\begin{array}{c|c} 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \\ \hline & 1 \end{array}$$

$5 + 10 = 15$

$625 \quad 15$

$\overset{3}{6}\ \ \overset{1}{3}\ \ \overset{2}{7}\ \ 5$

9375

$2 + 30 = 32$

3. The following real numbers have decimal expansions as given below. In each case, decide whether they are (i) rational or not. If they are rational, and of the form $\frac{p}{q}$, what can (ii) you say about the prime factors of q?

(i) 43.123456789 (ii) 0.120120012000120000... (iii) $43.\overline{123456789}$

(i) Rational → Terminating

q will be in the form of $2^n 5^m$

n, m are non-negative integers.