STD - 9 - MATHEMATICS - FIRST BELL - CLASS – 11

Chapter – 2

DECIMAL FORMS

What did we learn in the last class ?

- *We can find the decimal form of a fraction if its denominator can be written as the product of the prime numbers 2 and 5 .*

What is the decimal form of $\frac{1}{3}$?

We have found out the decimal form of the fractions by converting their denominators (using the idea equal fractions) into powers of 10 . Here we can nott convert 3 into powers of 10 . But although no fraction with denominator a power of 10 is equal to $\frac{1}{3}$ *, we can compute* fractions of this type *closer and closer to* $\frac{1}{3}$

First let's find a fraction with denominator 10 , which is closer to $\frac{1}{3}$

For this , multiply both the numerator and denominator of $\frac{1}{3}$ *by* 10 .

$$\frac{1}{3} = \frac{1 \times 10}{3 \times 10} = \frac{10}{3 \times 10} = \frac{10}{3} \times \frac{1}{10}$$

$$= (3 + \frac{1}{3}) \times \frac{1}{10}$$

$$= 3 \times \frac{1}{10} + \frac{1}{3} \times \frac{1}{10}$$

$$= \frac{3}{10} + \frac{1}{30}$$

$$\begin{array}{r|l} & 3 \\ \hline 3 & 10 \\ & 9 \\ \hline & 1 \end{array}$$

That is, $\frac{1}{3} = \frac{3}{10} + \frac{1}{30}$ $\Longrightarrow$ $\frac{1}{3} - \frac{3}{10} = \frac{1}{30}$

$$\frac{1}{3} - \frac{3}{10} = \frac{1}{30}$$

Now let's multiply both the numerator and the denominator of $\frac{1}{3}$ *by* 100 .

$$\frac{1}{3} = \frac{1 \times 100}{3 \times 100} = \frac{100}{3 \times 100} = \frac{100}{3} \times \frac{1}{100}$$

$$= (33 + \frac{1}{3}) \times \frac{1}{100}$$

$$= 33 \times \frac{1}{100} + \frac{1}{3} \times \frac{1}{100}$$

$$= \frac{33}{100} + \frac{1}{300}$$

$$\begin{array}{r|l} & 33 \\ \hline 3 & 100 \\ & 9 \\ \hline & 10 \\ & 9 \\ \hline & 1 \end{array}$$

That is, $\frac{1}{3} = \frac{33}{100} + \frac{1}{300}$ $\Longrightarrow$ $\frac{1}{3} - \frac{33}{100} = \frac{1}{300}$

$$\frac{1}{3} - \frac{33}{100} = \frac{1}{300}$$

Now let's multiply both the numerator and the denominator of $\frac{1}{3}$ by 1000.

$$\frac{1}{3} = \frac{1 \times 1000}{3 \times 1000} = \frac{1000}{3 \times 1000} = \frac{1000}{3} \times \frac{1}{1000}$$

$$= (333 + \frac{1}{3}) \times \frac{1}{1000}$$

$$= 333 \times \frac{1}{1000} + \frac{1}{3} \times \frac{1}{1000}$$

$$= \frac{333}{1000} + \frac{1}{3000}$$

$$\begin{array}{r} 333 \\ \hline 1000 \\ 9 \\ \hline 10 \\ 9 \\ \hline 10 \\ 9 \\ \hline 1 \end{array}$$

The result will be ,

$$\frac{1}{3} - \frac{3333}{10000} = \frac{1}{30000}$$

We can continue this process .

Let's write the result obtained while dividing both the numerator and denominator of $\frac{1}{3}$ *in order .*

$$\frac{1}{3} - \frac{3}{10} = \frac{1}{30}$$

$$\frac{1}{3} - \frac{33}{100} = \frac{1}{300}$$

$$\frac{1}{3} - \frac{333}{1000} = \frac{1}{3000}$$

$$\frac{1}{3} - \frac{3333}{10000} = \frac{1}{30000}$$

That is ,

$$\frac{1}{3} - 0.3 = \frac{1}{30}$$

$$\frac{1}{3} - 0.33 = \frac{1}{300}$$

$$\frac{1}{3} - 0.333 = \frac{1}{3000}$$

$$\frac{1}{3} - 0.3333 = \frac{1}{30000}$$

Here $\frac{1}{300}$ *is smaller than* $\frac{1}{30}$

$\frac{1}{3000}$ *is smaller than* $\frac{1}{300}$

$\frac{1}{30000}$ *is smaller than* $\frac{1}{3000}$

The distance between $\frac{1}{3}$ *and* 0.3333 *is the least here*

If we continue like this , the number on the right side of the equal sign gets closer and closer to zero .

The fractions with decimal forms $0.3\ ,\ 0.33\ ,\ 0.333\ ,\ 0.3333\ ,\ldots\ldots\ldots\ldots$

get closer and closer to $\frac{1}{3}$

We write this fact in shorthand as follows

$$\frac{1}{3} = 0.33333\ldots\ldots\ldots$$

Find three fractions getting closer and closer to $\frac{1}{3}$ *and denominators as powers of* 10 ?

$$\frac{3}{10}\ ,\ \frac{33}{100}\ ,\ \frac{333}{1000}$$

Let's discuss another problem .

a) *Find three fractions getting closer and closer to* $\frac{5}{6}$ *and denominators as* 10 , 100 *and* 1000 ?

b) *Write the decimal form of* $\frac{5}{6}$?

a) (*Here we can not convert* 6 *into the powers of* 10 *.So we can use the above method*)

$$\frac{5}{6} = \frac{5 \times 10}{6 \times 10} = \frac{50}{6 \times 10} = \frac{50}{6} \times \frac{1}{10}$$

$$= (8 + \frac{2}{6}) \times \frac{1}{10}$$

$$= 8 \times \frac{1}{10} + \frac{2}{6} \times \frac{1}{10}$$

$$\begin{array}{r|l} & 8 \\ \hline 6 & 50 \\ & 48 \\ \hline & 2 \end{array}$$

$$\frac{5}{6} = \frac{8}{10} + \frac{2}{60} \quad ==> \quad \frac{5}{6} - \frac{8}{10} = \frac{2}{60}$$

$$\frac{5}{6} = \frac{5 \times 100}{6 \times 100} = \frac{500}{6 \times 100} = \frac{500}{6} \times \frac{1}{100}$$

$$= (83 + \frac{2}{6}) \times \frac{1}{100}$$

$$= 83 \times \frac{1}{100} + \frac{2}{6} \times \frac{1}{100}$$

$$\begin{array}{r|l} & 83 \\ \hline 6 & 500 \\ & 48 \\ \hline & 20 \\ & 18 \\ \hline & 2 \end{array}$$

$$\frac{5}{6} = \frac{83}{100} + \frac{2}{600} \quad ==> \quad \frac{5}{6} - \frac{83}{100} = \frac{2}{600}$$

$$\frac{5}{6} = \frac{5 \times 1000}{6 \times 1000} = \frac{5000}{6 \times 1000} = \frac{5000}{6} \times \frac{1}{1000}$$

$$= (833 + \frac{2}{6}) \times \frac{1}{1000}$$

$$= 833 \times \frac{1}{1000} + \frac{2}{6} \times \frac{1}{1000}$$

$$\begin{array}{r|l} & 833 \\ \hline 6 & 5000 \\ & 48 \\ \hline & 20 \\ & 18 \\ \hline & 20 \\ & 18 \\ \hline & 2 \end{array}$$

$$\frac{5}{6} = \frac{833}{1000} + \frac{2}{6000} \quad ==> \quad \frac{5}{6} - \frac{833}{1000} = \frac{2}{6000}$$

$$\frac{5}{6} = \frac{8}{10} = \frac{83}{100} = \frac{833}{1000}$$

b) $\frac{5}{6} = 0.83333.....$

More activities

1. *For each of the fractions given below , find three fractions with denominators powers of* 10 *getting closer and closer to it and hence write its decimal form .*

$a)\ \frac{2}{3}$ $b)\ \frac{1}{6}$

2) a) *Find two fractions getting closer and closer to* $\frac{1}{11}$ *and denominators as* 100 *and* 1000 ?

b) Write the decimal form of $\frac{1}{11}$