NUMBER SYSTEMS

CONVERSION OF DECIMAL NUMBER INTO RATIONAL OF THE FORM P/Q

CONVERSION OF DECIMAL NUMBERS INTO RATIONAL NUMBERS OF THE FORM P/Q :

(i) **Procedure for terminating decimal :**

Step. 1 : Count the number of numerals to the right of the decimal point. Let it be m.

Step. 2: Drop the decimal point and in the denominator write 1 followed by m zeros.

Step. 3: Simplify the fraction.

Ex.1: Convert 6.225 to the form p/q.

Sol. 1. Number of numerals to the right of decimal is 3 i.e. m = 3.

2. Write
$$6.225 = \frac{6225}{1000}$$

3. Simplify (divide the numerator and denominator by 25) = $6.225 = \frac{249}{40}$

(ii) Conversion of Pure Recurring Decimal to the form p/q.

- **Step.1**: Obtain the repeating decimal and put it equal to x.
- **Step 2 :** Write the number in decimal form by removing bar from the top of repeating digits and listing repeating digits at least twice :

e.g. write x = 0.8 as x = 0.888

- **Step 3**: Determine the no. of digits having bar on their heads.
- **Step 4 :** If the repeating decimal has 1 place repetition, multiply by 10, a two place repetition, multiply by 100, a three place repetition, multiply by 1000 and so on.
- Step 5 : Subtract the number in step II from the numbers obtained in step IV.
- **Step 6**: Divide both sides of the equation by the coefficient of x.
- **Step 7**: Write the rational number in its simplest form.

CLASS 9

Ex.2: Express 0.585 in the form p/q.

Sol. Let x = 0.585

 $x = 0.585585585 \dots$ (i)

Here, we have 3 repeating digits after the decimal point. So, we multiply

both sides of (i) by $10^3 = 1000$ to get

1000 x = 585.585585(ii)

Subtracting (i) from (ii), we get

 $1000 \text{ x} - \text{x} = (585.585585 \dots) - (0.585585\dots)$

999 x = 585

$$x = \frac{585}{999}$$

(iii) Conversion of a Mixed Recurring Decimal to the form p/q.

- **Step 1**: Obtain the mixed recurring decimal and write it equal to x.
- **Step 2 :** Determine the number of digits after the decimal point which do not have bar on them. Let there be n digits without bar just after the decimal point.
- **Step 3 :** Multiply both sides of x by 10ⁿ, so that only the repeating decimal is on the right side of the decimal point.
- **Step 4 :** Use the method of converting pure recurring decimal to the form p/q and obtain the value of x.
- **Ex.3:** Express 0.225 in the form p/q.
- **Sol.** Let x = 0.225(i)

The no of digits after the decimal point which do not have bar on them is 2. Multiply both sides of x by 10^2 .

100 x = 225(ii)

Here, we have 1 repeating digit after the decimal point.

So, multiply both sides of (ii) by 10 to get.

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 $1000 \text{ x} = 225.55 \dots$(iii) Subtracting (ii) from (iii) 1000 x - 100 x = (225.55....) - (22.55...) $900 \text{ x} = 203 \Rightarrow \text{x} = \frac{203}{900}$ Express each of the following numbers in the form $\frac{p}{r}$. Ex.4 (i) 0.15 (ii) 0.675 (iii) -25.6875 (i) $0.15 = \frac{15}{100}$ Sol. Dividingumerat and denominator by the commodivisor of numerate and denominator $=\frac{15\div5}{100\div5}=\frac{3}{20}$ $0.675 = \frac{675}{1000}$ (ii) $=\frac{675\div25}{1000\div25}\Rightarrow=\frac{27}{40}$ $-25.6875 = \frac{-25687}{10000}$ (iii) $=\frac{-256875625}{10000625}=\frac{-411}{16}$ Express each of the following decimals in the form $\frac{p}{q}$: Ex.5 (ii) 0<u>3</u>5 (iii) 0<u>58</u>5 (i) 0.6 **Sol.** (i) Let $x = 0.\overline{6}$ then, x = 0.666.......(i) Here, we have only one repeating digit, So, we multiply both sides of (i) by 10 to get 10 x = 6.66........(ii) Subtracting (i) from (ii), we get

(ii)

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 $10 \text{ x} - \text{x} = (6.66 \dots) - (0.66 \dots)$ $\Rightarrow 9x = 6 \qquad \Rightarrow x = \frac{6}{9}$ $\Rightarrow x = \frac{2}{3}$ Hence $0\overline{6} = \frac{2}{3}$ Let $x = 0\overline{35}$ \Rightarrow x = 0.353535....(i) Here, we have two repeating digits after the decimal point. So, we multiply sides of (i) by $10^2 = 100$ to get 100x = 35.3535.......(ii) Subtracting (i) from (ii), we get 100 x - x = (35.3535....) - (0.3535....) \Rightarrow 99 x = 35 $\Rightarrow x = \frac{35}{99}$ Hence, $0\overline{35}$ Let x = 0.585(iii) \Rightarrow x = 0.585585585...(i) Here, we have three repeating digits after the decimal point. so, we multiple both sides of (i) by $10^3 = 1000$ to get 1000 x = 585.585585.......(ii) Subtracting (i) from (ii), we get 1000x - x = (585.585585...) - (0.585585585...)1000x - x = 585 \Rightarrow 999x = 585 $\Rightarrow x = \frac{585}{999} = \frac{195}{333} = \frac{65}{111}$

The above example suggests us the following rule to convert a pure recurring

decimal into a rational number in the form $\frac{p}{q}$.