

ROJGAR WITH ANKIT

Number System

PART-15

Remainder Theorem :

$$(-1)^{\text{Odd}} = -1$$

$$(-1)^{\text{Even}} = +1$$

i). $\frac{2^{73}}{9}$

$$= \frac{(2^3)^{24} \times 2^1}{9}$$

$$= \frac{(8)^{24} \times 2}{9}$$

$$= \frac{(-1)^{24} \times 2}{9} = \frac{1 \times 2}{9} = \frac{2}{9} \rightarrow \text{Remainder}$$

2). $\frac{2^{67}}{7}$

$$\Rightarrow \frac{(2^3)^{22} \times 2^1}{7}$$

$$\Rightarrow \frac{(8)^{22} \times 2}{7} \Rightarrow \frac{1 \times 2}{7} \Rightarrow \frac{2}{7} \rightarrow \text{Rem.}$$

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$$\begin{array}{l}
 3 \nmid \frac{3^{273}}{80} \xrightarrow{81} \\
 \frac{(3^4)^{68} \times 3^1}{80} \Rightarrow \textcircled{3} \text{ Remainder}
 \end{array}$$

$$\begin{array}{l}
 4 \nmid \frac{4^{49}}{15} \xrightarrow{16} \\
 \frac{(4^2)^{24} \times 4}{15} \Rightarrow \textcircled{4} \text{ Remainder}
 \end{array}$$

$$\begin{array}{l}
 5 \nmid \frac{4^{515}}{63} \xrightarrow{64} \\
 \frac{(4^3)^{171} \times 4^2}{63} \Rightarrow \frac{1 \times 16}{63} \Rightarrow \textcircled{16} \text{ Ans}
 \end{array}$$

$$\begin{array}{l}
 6 \nmid \frac{6^{513}}{7} = (-1)^{513} \\
 \Rightarrow -1 + 7 = \textcircled{6} \text{ Ans}
 \end{array}$$

$$\begin{array}{l}
 7 \nmid \frac{8^{293}}{513} \xrightarrow{512} \xrightarrow{514} \\
 \frac{(8^3)^{97} \times 8^2}{513} \Rightarrow \frac{(512)^{97} \times 64}{513} \\
 \Rightarrow (-1)^{97} \times 64 \\
 \Rightarrow -64 + 513 \\
 \Rightarrow \boxed{449} \text{ Ans}
 \end{array}$$

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Fermat's Theo^m

$$\text{co-prime} \left(\frac{a^{p-1}}{p} = 1 \right. \\ \left. p \text{ prime No.} \right)$$

$$\text{Eg: } \frac{4^{42}}{43} = 1$$

$$\frac{3^{40}}{41} = 1 \\ 41 \rightarrow \text{prime No.}$$

$$\frac{7^{52}}{53} = 1$$

$$\frac{9^{82}}{83} = 1$$

$$\frac{100^{100}}{101} = 1$$

$$a). \frac{-1^{68}}{67} + 25 = \frac{+1+25}{68} = \frac{26}{68} \rightarrow \text{Rem.}$$

$$b). \frac{24^{43}}{23} = 1 + 20 = 21$$

$$c). \frac{42^{28}}{29} = 1$$

$$d). \frac{61^{513}}{15} = (+1)^{513} = +1$$

$$e). \frac{76^{17}}{25} = 1$$

1). D = prime No.

2). power (Denominator से 1 कम होनी चाहिए)

3). Numerator/Denominator में कुछ भी common नहीं होना चाहिए।

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$$\Rightarrow 1). \frac{101^{47}}{25} = \textcircled{1}$$

$$2). \frac{99^{48} + 21}{25} = 1 + 21 = \textcircled{22}$$

$$3). \frac{426^{329} + 11}{25} = 1 + 11 = \textcircled{12}$$

$$4). \frac{48^{102}}{103} = \textcircled{1}$$

$$5). \frac{344^{513}}{7} = \textcircled{1}$$

$$6). \frac{(60)^{989} + 53}{61} = -1 + 53 = \textcircled{52}$$

$$7). \frac{48^{29} + 13}{7} = -\frac{1 + 13}{7} = \frac{12}{7} = \textcircled{5}$$

$$8). \frac{9^{49} + 7}{10} = -1 + 7 = \textcircled{6}$$

$$9). \frac{242^{513}}{3} = (-1)^{513} = -1 + 3 = \textcircled{2}$$

(1). यदि $14331433 \times 1422 \times 1425$ को 12 से विभाजित किया जाता है तो शेषफल ज्ञात करें-

(If $14331433 \times 1422 \times 1425$ is divisible by 12, then find the Remo obtained) - $1433 \overset{1}{14} \overset{711}{33} \overset{237}{1} \overset{1}{25}$
 $2 \times 3 = \textcircled{6}$

(2). $\overset{+2}{72} \times \overset{+3}{73} \times \overset{+8}{78} \times \overset{+6}{76}$ को 35 से विभाजित करने पर शेषफल = ?
 $\frac{72 \times 73 \times 78 \times 76}{35} \Rightarrow \frac{48 \times 6}{35} = \frac{78}{35} = \textcircled{8}$ Ans

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(3). 2^{384} को 17 से विभाजित करने पर शेषफल होगा-
(Remainder will be)-

$$\frac{2^{384}}{17} = \frac{(2^4)^{96}}{17} = \frac{(16)^{96}}{17} = (-1)^{96} = (+1) \text{ Ans}$$

2nd Method

Fermat's The^m: $\frac{2^{384}}{17} = \left(\frac{2^{16}}{17} \right)^{24} = (+1) \text{ Ans}$

↙
prime No.