

ToppersNotes

SSC

MATHS

Maths I

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SSC (CGL)

↓
Pre (2h)↓
Main (2h)

Reasoning - 50

Maths - 50

G.S - 50

Eng - 50

- | | | | |
|---------------------|---|--------------------|-------|
| 1) Trigo | - 7-8 Marks | } Pre-20Q | |
| 2) Algebra | 5-6 Marks | | |
| 3) Mensuration | 4-5 Marks | } Main-70Q | |
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| 5) Percentage | ↳ Profit & loss
↳ Mix & Allegation.
↳ Average
↳ Ratio & Prop
↳ Partnership
↳ Age
↳ S.I & C.I. | | |
| 6) Time & work | | | |
| | | ◦ Pipe and Cistern | } -4Q |
| | | ◦ Work and wages | |
| 7) Speed & distance | | | |
| | | ◦ Boats & Streams | } -4Q |
| | | ◦ Average speed | |
| 8) - D.T | → 5-6Q | | |

Remainder theorem

$$+x \quad +2 \quad -3 \quad -3 \quad +3 \quad 0$$

$$L1 + L2 + L3 + L4 + L5 + L6 \quad + L_{1,00,000}$$

$$\begin{array}{c} 1 \\ \diagdown \quad \diagup \\ 1 \quad 2 \\ \hline 9 \quad 9 \\ L1 \quad L2 \end{array}$$

$$\begin{array}{c} -8 \\ \diagdown \quad \diagup \\ 2 \quad 7 \\ \hline 9 \quad 9 \\ L2 \quad L3 \end{array}$$

$$\begin{array}{c} -7 \quad +6 \\ \diagdown \quad \diagup \\ 6 \quad 3 \\ \hline 9 \quad 9 \\ L3 \quad L4 \end{array}$$

$$\begin{array}{c} +6 \quad -3 \\ \diagdown \quad \diagup \\ 24 \\ \hline 9 \\ L6 \end{array}$$

Cont Simplify

$$\begin{array}{r} 4 \times 8 \times 1 \\ \hline 93 \\ 8 \rightarrow 2 \\ \hline 3 \end{array}$$

Remainder - 0

$$2 \times 35 = 70$$

$$\begin{array}{r} 35 \\ -10 \\ \hline 25 \\ +2 \\ \hline 27 \end{array} = \frac{35}{6} = +5 \times 2 = \textcircled{10} \text{ - Remainder}$$

$2 \times 6 = 12$ if we simplify any term, then the remainder become multiplied by the term that ~~is~~ cancelled
find last digit / last 2 digit

→ $1996 \times 103 \times 507 \times 1897699$

if we find last 2 digit of any multiple term, then we divide by 100 to that term

$$\begin{array}{cccc} -4 & +3 & +7 & -1 \\ 1996 & \times 103 & \times 507 & \times 1897699 \end{array}$$

$$\frac{(-4) \times 3 \times 7 \times (-1)}{100} = \frac{84}{100} \text{ last two digit / Remainder}$$

$$\begin{array}{r} -1 \quad +5 \quad -9 \\ 27 \times 40 \\ \hline 7 \end{array} = \frac{(-1)(+5)}{7} = \frac{-5}{7} = 7-5 = \textcircled{2} \text{ R}$$

$$= \frac{(+6)(+5)}{7} = \frac{30}{7} = \textcircled{+2} \text{ R}$$

$$= \frac{(-1)(-9)}{7} = \frac{9}{7} = \textcircled{+2} \text{ Remainder}$$

$$\begin{array}{r} -2 \\ 42 \times 70 \\ \hline 9 \end{array} = \frac{-12}{9} \quad \left| \begin{array}{l} \textcircled{+6} \text{ Remainder} \\ \text{in that case we hide (-) sign} \\ \text{and divide} \end{array} \right.$$

$$= \frac{\textcircled{-12}}{9} = \frac{-3}{9} = 9-8 = \textcircled{6} \text{ Remainder}$$

$$\begin{array}{r} +6 \quad +7 \\ 42 + 70 \\ \hline 9 \end{array} = \frac{13}{9} = \textcircled{+4}$$

$$\begin{array}{r} 6 \quad -7 \\ 42 \rightarrow 70 \\ \hline 9 \end{array} = \frac{-1}{9} = 9-1 = \textcircled{8}$$

$$\begin{array}{r} -2 \quad -2 \\ 88 + 70 \\ \hline 9 \end{array} = \frac{-4}{9} = \textcircled{5}$$

$$16 + 7 = 23 \quad \frac{23}{9} = \textcircled{2.5}$$

$$100 + 16 = 116 \quad \frac{116}{9} = \textcircled{12.8}$$

$$\begin{array}{r} +1 \quad +7 \\ 415 + 574 \\ \hline 9 \end{array} = \frac{\textcircled{2}}{9}$$

$$\begin{array}{r} \sqrt{46} \\ 36 \\ \hline 88 \\ 81 \\ \hline 7 \\ 9) 574 \overline{) 63} \\ 54 \\ \hline 34 \\ 27 \\ \hline 7 \end{array}$$

find last two digit

$$123 \times 96 \times 76 \times 51 \times 174 \times 97$$

then, we divide it by '100' for find two digit
 Here we divide it by 4^6

$$123 \times 24 \times 76 \times 51 \times 174 \times 97 = 6$$

then last, we multiple by the '4'

$$= 4 \times 6 = 24 \text{ last two digits}$$

$$2) \quad 53 \times 39 \times 55 \times 127 \times 39 \times 36 \times 312$$

$$= 25 \text{ divide by '4' } (25/4)$$

$$53 \times 39 \times 55 \times 127 \times 39 \times 36 \times 312$$

$$4 \times 5$$

$$53 \times 39 \times 5 \times 127 \times 39 \times 9 \times 312$$

$$= \frac{8}{5} = +3$$

$$= 20 \times 3 = 60$$

last two digits

Ques

$$(34) = -1 = 7-1 = \boxed{6}$$

Ques

$$(34)^{39} = (-1)^{39} = -1 = 7-1 = \boxed{6}$$

Ques

$$(34)^{38} = (-1)^{38} = \boxed{1}$$

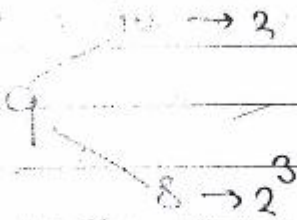
Ques

$$(3)^{60} = (-2)^{60} \quad \left| \begin{array}{l} \text{long calculation} \\ \text{?} \end{array} \right.$$

Ques

$$(2)^{39} = \frac{(2^3)^{13}}{9} = \frac{(8)^{13}}{9} = (-1)^{13} = \boxed{-1}$$

$9-1 = \boxed{8} \text{ Rem}$



Ques

$$(2)^{40} = \frac{2^1 \times 8^{13}}{9} = \frac{2^1 \times (8)^{13}}{9} = 2 \times (-1)^{13} = -2$$

$$2 \times (2)^{39} = 2^1 \times (2^3)^{13} = 2^1 \times 8^{13} \quad \left| \begin{array}{l} 9-2 \\ \text{Rem} \end{array} \right. = \boxed{7}$$

$$\frac{(7)^{98}}{400} = \frac{(7^4)^{24} \cdot 7^2}{400} = \frac{(2401)^{24} \cdot 49}{400} = (1)^{24} = 1 \text{ Ans}$$

$$7^1 = 7$$

$$7^2 = 49$$

$$7^3 = 343$$

$$7^4 = 2401$$

$$7^5 = 16807$$

$$\frac{(3)^{95}}{82} = \frac{3^3 \times 3^{92}}{82} = \frac{27 \times (3^4)^{23}}{82}$$

$$3^1 = 3$$

$$3^2 = 9$$

$$3^3 = 27$$

$$3^4 = 81$$

$$= \frac{27 \times (81)^{23}}{82} = \frac{-27}{82}$$

$$= 82 - 27 = 55$$

Ans

Remainder

Ques

7777777

100 term

13

अगर किसी संख्या में कोई अंक लगातार
6 बार लिखा गया हो | तो वो term
7, 11, 13, 37 से पूरी-पूरी बचता हो
जाएगा

(111111), (222222), (555555), (999999)

$$\begin{array}{r} 7777 \\ = 7(1111) \end{array}$$

$\begin{array}{r} 13 \overline{) 11111} \\ \underline{13} \\ 11 \\ \underline{11} \\ 0 \end{array}$ <p>13-1=12 Ans</p>	$\begin{array}{r} 13 \overline{) 77777} \\ \underline{65} \\ 127 \\ \underline{117} \\ 10 \end{array}$ <p>10 Ans</p>	<p>upto 100</p> $\begin{array}{r} 6 \overline{) 100} \\ \underline{96} \\ 4 \end{array}$
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$\begin{array}{r} 13 \overline{) 77777} \\ \underline{65} \\ 127 \\ \underline{117} \\ 107 \\ \underline{104} \\ 3 \end{array}$ <p>3 Remainder</p>	$\begin{array}{r} 13 \overline{) 7777} \\ \underline{65} \\ 127 \\ \underline{117} \\ 107 \\ \underline{104} \\ 3 \end{array}$
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Rule of divisibility

divide

$\begin{array}{r} 123456789101112134516118 \\ \underline{16} \end{array}$	$\begin{array}{r} 16 \overline{) 1718} \\ \underline{16} \\ 118 \\ \underline{112} \\ 6 \end{array}$ <p>Remainder 6 Ans</p>
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- 2 → last 1 digit 2 से भाग हो जाए
- 4 → last 2 digit 4 से भाग हो जाए
- 8 → last 3 digit 8 से भाग हो जाए
- 16 → last 4 digit 16 से भाग हो जाए
- 32 → last 5 digit 32 से भाग हो जाए

when divide by 32

$$\begin{array}{r} 123456789101112131415161718 \\ \hline 32 \end{array}$$

$$\begin{array}{r} 192 \\ 32 \overline{) 61718} \\ \underline{32} \\ 297 \\ \underline{288} \\ 91 \\ \underline{64} \\ 278 \end{array}$$

How to check number is completely divide or not

3 \rightarrow Sum of all digit divide by '3'

9 \rightarrow Sum of all digit divide by '9'

6 \rightarrow Divide by '2' and '3'

8 \rightarrow Last 3 digit divide by '8'

11 \rightarrow when sum of alternate number difference is zero or divisible by '11'.

5678943 \rightarrow not divide by '11'

$$\begin{array}{r} 24 \\ - 18 \\ \hline 6 \end{array}$$

7) How to check the term is divide by 7 or not

$$\begin{array}{r}
 5467 \mid 5x_2 \\
 \underline{-10} \\
 5457 \\
 \underline{-14} \\
 531 \\
 \underline{-2} \\
 51 \\
 \underline{-2} \\
 3
 \end{array}$$

(Remainder)
 then last digit comes zero or multiple of

$$\underbrace{65432577}$$

take pairs from last 3 digits and add alternate pair and then check their difference. if difference is zero or multiple of 7, then the whole term is divide by 7 otherwise not.

$$\begin{array}{r}
 577 \\
 + 65 \\
 \hline
 642 \\
 - 432 \\
 \hline
 210
 \end{array}$$

this term is divide by 7

this term is divide by 7

First 'n' natural number sum

$$1 + 2 + 3 + 4 + 5 + \dots + n$$

$$= \frac{n(n+1)}{2}$$

Ans $\left(1 - \frac{1}{n+1}\right) + \left(1 - \frac{2}{n+1}\right) + \left(1 - \frac{3}{n+1}\right) + \dots + \left(1 - \frac{n}{n+1}\right)$

$$1 - \frac{1}{n+1} + 1 - \frac{2}{n+1} + 1 - \frac{3}{n+1} + \dots + 1 - \frac{n}{n+1}$$

when any digit is added upto n times, then their sum is n.

$$\textcircled{n} - \frac{1}{n+1} - \frac{2}{n+1} - \frac{3}{n+1} - \dots - \frac{n}{n+1}$$

$$n - \left[\frac{1}{n+1} + \frac{2}{n+1} + \frac{3}{n+1} + \dots + \frac{n}{n+1} \right]$$

$$n - \left[\frac{1+2+3+\dots+n}{n+1} \right]$$

$$n - \frac{n(n+1)}{2(n+1)} = n - \frac{n}{2} = \boxed{\frac{n}{2}} \text{ Ans}$$

Ques 2 $\left(1 + \frac{1}{3}\right) \left(1 + \frac{2}{3}\right) \left(1 - \frac{2}{5}\right) \left(1 + \frac{6}{7}\right) \left(1 - \frac{12}{13}\right)$

$$\frac{\cancel{2}}{4} \times \frac{4}{\cancel{2}} \times \frac{\cancel{5}}{3} \times \frac{3}{\cancel{5}} \times \frac{\cancel{13}}{7} \times \frac{1}{\cancel{13}}$$

$$= \boxed{\frac{1}{7}} \text{ Ans}$$

Ques $\left(2 - \frac{1}{3}\right) \left(2 - \frac{3}{5}\right) \left(2 - \frac{5}{7}\right) \dots \left(2 - \frac{999}{1001}\right)$

$$\frac{\cancel{5}}{3} \times \frac{\cancel{7}}{5} \times \frac{\cancel{9}}{7} \dots \times \frac{1003}{1001}$$

$$= \boxed{\frac{1003}{3}} \text{ Ans}$$

$$\left(\frac{1}{2^2}\right) \left(1 - \frac{1}{3^2}\right) \left(1 - \frac{1}{4^2}\right) \dots \left(1 - \frac{1}{89^2}\right)$$

$$\frac{3}{4} \times \frac{8}{9} \times \frac{15}{16}$$

or $\left(\frac{2^2 - 1^2}{2^2}\right) \left(\frac{3^2 - 1^2}{3^2}\right) \left(\frac{4^2 - 1^2}{4^2}\right) \dots \left(\frac{89^2 - 1^2}{89^2}\right)$

$$\frac{\cancel{1} \times \cancel{4}}{\cancel{2} \times \cancel{2}} \times \frac{\cancel{2} \times \cancel{4}}{\cancel{3} \times \cancel{3}} \times \frac{\cancel{3} \times \cancel{5}}{\cancel{4} \times \cancel{4}} \dots \frac{\cancel{88} \times \cancel{90}}{\cancel{89} \times \cancel{89}}$$

$$\frac{1}{2} \times \frac{90}{89} = \boxed{\frac{45}{89}} \text{ Ans}$$

$$\begin{array}{r} 89 \\ 89 \\ \hline 7921 \\ - 715 \\ \hline 776 \\ - 718 \\ \hline 5825 \end{array}$$

Ques

$$\frac{1}{2} + \frac{1}{3} - \frac{1}{4} - \frac{1}{2} - \frac{1}{3} + \frac{1}{4} + \frac{1}{2} + \frac{1}{3} - \frac{1}{4}$$

order

Sum of first 6 term = 0

" " " 12 term = 0

" " " 36 term = 0

last four terms are $\frac{1}{2} + \frac{1}{3} - \frac{1}{4} - \frac{1}{2}$

$$\frac{4-3}{12} = \frac{1}{12}$$

Ans

Ques

$$999 \frac{95}{99} \times 99$$

$$\left[999 + \frac{95}{99} \right] \times 99$$

$$99000$$

$$- 4$$

$$\underline{98996} \text{ Ans}$$

87
85
102
99
99
9801
9599
x9898
9

Ques

$$9 \frac{4}{9} \times 9$$

$$\left[9 + \frac{4}{9} \right] \times 9$$

$$\left[9 + \frac{9 \times 4}{9} \right] \times 9$$

$$10 \times 9 = 90$$

$$- 5$$

$$\underline{85}$$

Ans $9999 \frac{1}{9} \times 9$

$$\left[9999 + \frac{1}{9} \right] \times 9$$

$$\frac{9999 \times 9 + 1}{9} = 8$$

$$10,000 \times 9$$

$$90000$$

$$-8$$

$$\underline{89992}$$

$$\frac{1}{5} + 999 \frac{44}{45} \times 9$$

$$\frac{1}{5} + \left[\left(999 + \frac{44}{45} \right) \times 9 \right]$$

$$\left[\frac{1}{5} + \frac{8999}{1} \right] \frac{1000 \times 9}{9000}$$

$$\frac{8999}{8999}$$

or

$$\frac{1}{5} + \left[999 \frac{44}{45} \times 9 \right]$$

$$\frac{1}{5} + \left[999 + \frac{44}{45} \right] \times 9$$

$$\frac{1}{5} + \left[\frac{999 \times 45 + 44}{45} \right] \times 9$$

$$\frac{1}{5} + \frac{45000 - 45744}{5} = \frac{1}{5} - \frac{45000 - 1}{5}$$

$$= 9000 \text{ Ans}$$