Day 3

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FACTORIALS BASED BEST QUESTIONS.

Concept : FACTORIAL

$5! = 120$

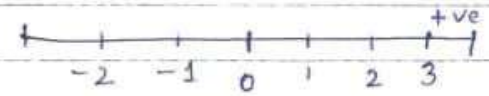
$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$

$n! = n \times (n-1) \times (n-2) \times (n-3) \cdots$

$= (n-1+1)(n-2+1)(n-3+1) \cdots (n-r+1)$

$n! = n \times (n-1)!$

$(n-1)! = (n-1) \times (n-2)!$



* the negative no, which is near to zero that is bigger

Remember.

$1! = 1$	$4! = 24$	$7! = 5040$
$2! = 2$	$5! = 120$	$8! = 40320$
$3! = 6$	$6! = 720$	$9! = 362880$
		$10! = 3628800$.

(1)

$a = 3$
$b = 4$
$c = 3$
$d = 6$

(2)

$a = 5$
$b = 4$
$c = 3$
$d = 12$

(3)

$a = 1$
$b = 7$
$c = 9$
$d = 3$

(*) 4! and onwards every factorial is ÷ 4

(*) 5! and onwards every factorial has it unit digit = 0

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Questions

(1) if $a! + b! + c! + d! + e!$ is a two digit number, find the maximum value (general question)

a = 3
b = 4
c = 3
d = 6

$a! = 1! = 1$
$b! = 2! = 2$
$c! = 3! = 6$
$d! = 4! = 24$ ✓ = is a two digit no, gives the maximum value
$e! = 5! = 120$ ×

(2) If the unit digit of $a! + b! + c!$ is 9 then find the value of $(a!)(b!)(c!)$

a = 5
b = 4
c = 3
d = 12

$a! = 1! = 1$
$b! = 2! = 2$ } +9
$c! = 3! = 6$

$(1)(2)(6) = 12$ //

(3) what will be the ten's digit of $1! + 2! + 3! + 4! + 5! + \ldots\ldots + 10!$? {ten's one's

a = 1
b = 7
c = 9
d = 3

$= 1! + 2! + 3! + 4! + 5! + 6! + 7! + 8! \cdots$ last two digit

$= 1 + 2 + 6 + 24 + 120 + 720 + 5040 + 40320 + 362880 +$
$+ 3628800$

$= 1 + 2 + 6 + 24 + 20 + 20 + 40 + 20 + 80 + 00$

$= 213$

hundred - ends
tens ✓
once

A = 2
b = 5
c = 7
d = 3

(4) Find the unit digit of

$1! + 2! + 3! + 4! + \ldots + 50!$

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$5! \ldots\ldots 50!$ = unit digit 0

$1! = 1$

$2! = 2$

$3! = 6$

$4! = 24$

$\overline{13}$

(5) Find the unit digit of

$1!^{1} + 2!^{2} + 3!^{3} + \ldots + 89!^{89}$

a = 7
b = 5
c = 9
d = 6

$(1)^2 + (2)^2 + (6)^3 + (24)^4 + \underbrace{\ldots\ldots (89!)^{86}}_{\text{unit digit} = 0}$

$= 1 + 4 + 216 + 256$

$4^4 = 256$

$= 1 + 4 + 6 + 6 = 17$

(6) Find unit digit :

$(23)^{93!} \times (77)^{23!} \times (38)^{23!} \times (25)^{11!}$

a = 0
b = 2
c = 1
d = 3

$= (3)^{93!} \times (7)^{23!} \times (8)^{23!} \times (5)^{11!}$

$= (3)^{4!} \times (7)^4 \times (8)^4 \times (5)^4$

$1 \times 2401 \quad 4096$

unit digits $= 1 \times 1 \times 6 \times 5$

$= 30$

$4)23(5$ $\quad 20$ $\quad 3$

$4)93(23$ $\quad 8$ $\quad 13$ $\quad 12$ $\quad 1$

(*) 4 factorial and onwards it will give you 4

(7) Find unit digits :

$9^{(9000!+9)} + 8^{(8000!+8)} + \ldots + 2^{(2000!+2)}$

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a = 3
b = 4
c = 6
d = None

$= 9^{(4+9)} + 8^{(4+8)} + \ldots + 2^{(4+2)}$

$= 9^{13} + 8^{12} + 7^{11} + 6^{10} + 5^{9} + 4^{8} + 3^{7} + 2^{6}$

$= 9^{\text{odd}} + 8^{4} + 7^{3} + 6 + 5 + 6 + 3^{3} + 2^{2}$

$= 9 + 4096 + 343 + 6 + 5 + 6 + 27 + 4$

$= 46$

(8) Can a factorial be defined for negative number?

a yes
b no

$(\ )^2$

(9) Find the perfect square among the following

a = 37! x 38! x (*) option Attack !
b = 36! x 35!
c = 39! x 40!
d = 34! x 37!

$n! = n(n-1)!$

a) $37! \times 38!$

$37! \times 38 \times 37!$

$(37!)^2 \times 38 \times$

c = 39! x 40!

$39! \times 40 \times 39!$

$(39!)^2 \times 40 \times$

b) = 36! x 35!

$36 \times 35! \times 35!$

$(6)^2 \times (35!)^2$ ✓

d = 34! x 37!

$34! \times 37 \times 36 \times 35 \times 34!$

$(34!)^2 \times 37 \times (6)^2 \times 35 \times$

Remember

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(*) Minimum $5! = 120$ you should know

(*) $4!$ & onwards $\div 4$

(*) $5!$ & onwards $\rightarrow 0$ (unit digit)