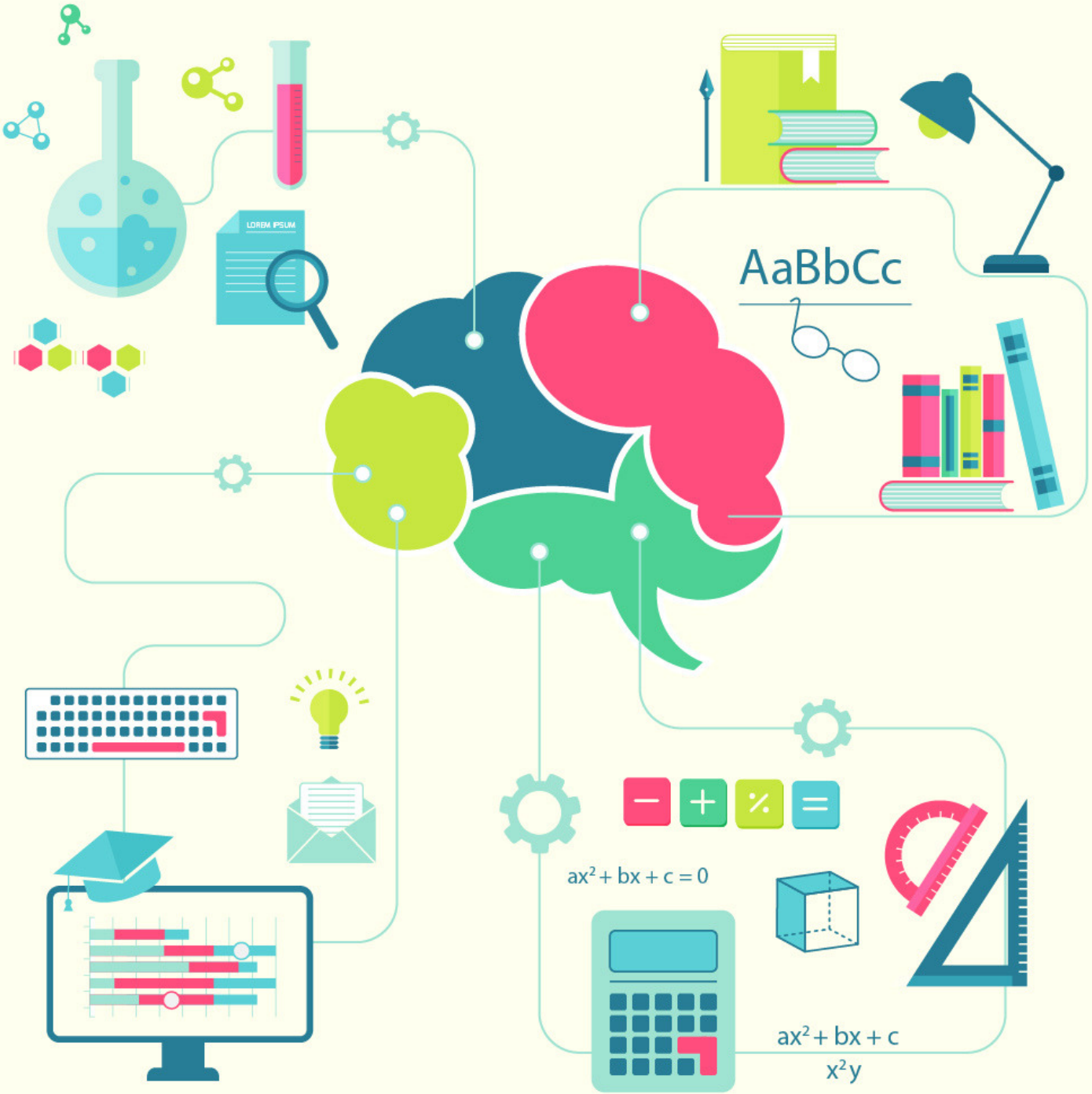
cracku

CAT Questions on Factorial PDF



Question 1: What is the remainder when 96! is divided by 291 ?

a) 86
b) 96
c) 76
d) 66

Question 2: What is the remainder when 120!120! is divided by 120^{24} ?

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

Question 3: Which digit from the right end of 933! is the first non-zero digit?

a) 300
b) 232
c) 400
d) 320

Question 4: In which position from the right is the first non-zero digit present in 334!?

a) 81st
b) 82nd
c) 83rd
d) 84th

Question 5: Find the number of zeroes at the end of 179!.

a) 32
b) 51
c) 43
d) 28

Answers & Solutions:

1) Answer (B)

Using Wilson's theorem, 96! + 1 is divisible by 97.
Let 96! + 1 be equal to 97k for some natural number k.
Note that 291 = 97*3.
Hence, 96! + 1 is either 291p or 291p + 97 or 291p + 194 for some natural number p. This is because 96! + 1 is a multiple of 97.
We know that 96! is divisible by 3. So, 96! + 1 leaves a remainder of 1 when divided by 3. Using this, we can conclude that 96! + 1 is of the form 291p + 96.
Hence, 96! leaves a remainder of 96 when divided by 291.

2) Answer (C)

The product of any five consecutive numbers is divisible by 5!
So, 1*2*3*4*5 is divisible by 120.
Similarly, 6*7*8*9*10 is also divisible by 120.
120! can be written as (1*2*3*4*5)*(6*7*8*9*10)*...*(116*117*118*119*120)
Each of the 24 terms is divisible by 120
Hence, the product is divisible by 120^{24}
So, the remainder when 120!120! is divided by 120^{24}
is 0.

3) Answer (B)

Number of zeros in 933! = $\left\lfloor \frac{933}{5} \right\rfloor + \left\lfloor \frac{933}{25} \right\rfloor + \left\lfloor \frac{933}{125} \right\rfloor + \left\lfloor \frac{933}{625} \right\rfloor + \left\lfloor \frac{933}{3125} \right\rfloor + ..$

where $\lfloor x \rfloor$ means greatest integer less than or equal to x

= 186 + 37 + 7 + 1 + 0
= 231
=> 232nd digit from right end is the first non-zero digit.

4) Answer (B)

Number of zeros = $\left\lfloor \frac{334}{5} \right\rfloor + \left\lfloor \frac{334}{25} \right\rfloor + \left\lfloor \frac{334}{125} \right\rfloor + \left\lfloor \frac{334}{625} \right\rfloor$
= 66 + 13 + 2 + 0
= 81
=> 82nd digit is the first non-zero digit

5) Answer (C)

Number of zeroes in 179! = $\left\lfloor \frac{179}{5} \right\rfloor + \left\lfloor \frac{179}{5^2} \right\rfloor + \left\lfloor \frac{179}{5^3} \right\rfloor + \left\lfloor \frac{179}{5^4} \right\rfloor$
= 35 + 7 + 1 + 0
= 43