# MBA PIONEER 2024

## Quantitative Aptitude

DPP: 04

## Maximum Power

**Q1** How many trailing zeros are at the end of 112!?
(A) 26 (B) 30
(C) 22 (D) 32

**Q2** What is the maximum value of $p$ if 158 ! is divisible by $5^{p}$ ?
(A) 32 (B) 35
(C) 38 (D) None of these

**Q3** Find the number of consecutive zeros at the end of
75! $\times$ 125!.
(A) 31 (B) 49
(C) 36 (D) 51

**Q4** How many trailing zeros will be at the end of expression (125! + 153!) ?
(A) 37 (B) 68
(C) 27 (D) 31

**Q5** The number of consecutive zeros at the end $(77!)^{46!}$ is
(A) 46 !
(B) $18 \times 45$ !
(C) $828 \times 45$ !
(D) $16 \times 46$ !

**Q6** Find the number of consecutive zeros at the end of $5^{2} \times 36$ !
(A) 8 (B) 6
(C) 12 (D) 15

**Q7** Find the number of consecutive zeros at the end of $75 \times 185 \times 320 \times 275$
(A) 2 (B) 3
(C) 4 (D) 6

**Q8** Find the remainder when $(0! + 1! + 2! + 3! + \ldots . + 716\,!)$ is divided by 24 .
(A) 10 (B) 0
(C) 17 (D) 23

**Q9** Find the number of trailing zeros at the end of $(1! \times 2! \times 3! \times 4! \times 5!)$
(A) 1 (B) 2
(C) 3 (D) 5

**Q10** Number of trailing zeros at the end of N! is 49. Maximum value N can take is
(A) 200 (B) 202
(C) 204 (D) 205

**Q11** If $a! + b! + c! = abc$ ( 3 digit number ). Find the number of trailing zeros at the end of abc! (Given, $c > b > a$)
(A) 35 (B) 32
(C) 28 (D) 25

**Q12** If $(1 \times 1! + 2 \times 2! + 3 \times 3! + \ldots\ldots + 10$ 1. $\times 10!) = n! -$
Then number of trailing zeros at the end of $n$ ! is
(A) 0 (B) 1
(C) 2 (D) 3

**Q13** Let $A = B^{2} + 7$ and $A < 300$. If $A$ and $B$ both are prime number, then find the number of trailing zeros at the end of $A$ !. (Assume A to be maximum possible prime number).
(A) 0 (B) 1

(C) 2 (D) 4

**Q14** Find the highest power of 14 available in 63!.

(A) 6 (B) 8

(C) 9 (D) 10

**Q15** The highest power of 63 that will exactly divide 117! is

(A) 15 (B) 18

(C) 21 (D) 28

**Q16** m! contains 32 consecutive zeros at the end. How many values m can assume?

**Q17** If 5040 = n!, then find the number of trailing zeros at the end of n!.

(A) 1 (B) 2

(C) 3 (D) 4

**Q18** Let 4! + a! + 5! + b! + 5! = 4a5b5 (5–digit number). Find the number of consecutive zeros at the end of (a! + b!)!

(A) 10000 (B) 1052

(C) 1072 (D) None of these

**Q19** Find the number of trailing zeros at the end of $(1^2 \times 2^2 \times 3^2 \times \ldots\ldots\ldots \times 99^2)$

(A) 32 (B) 44

(C) 46 (D) 50

**Q20** m! – n! = 600. Find the number of trailing zeros at the end of (m + n)!

**Q21** If a + b + c = (a x b x c) = c! (such that c > b > a). Which of the following can be the number of consecutive zeros at the end of [(c!)!]!

(A) 178 (B) 162

(C) 148 (D) None of these

**Q22** If $n^3 - 3n^2 + 2n - 6 = 0$, then find the number of zeros at the end of $n$ ! (Given $n \in Z^+$)

**Q23** Find the number of trailng zeros at the end of $(25!)^{4!}$

(A) 6 (B) 121

(C) 144 (D) 169

**Q24** What is the highest value of $\mathrm{m}$ for $\frac{129!}{11^{\mathrm{m}}}$ to be an integer?

(A) 12 (B) 11

(C) 10 (D) 8

**Q25** If n! = m!, such that m > n, then find the number of consecutive zeros at the end of (30$\times$m)!

(A) 5 (B) 7

(C) 8 (D) 10

**Q26** If $\left[\frac{\mathrm{n}}{5}\right] = 10$ where [ ] denoted greatest integer function and $\mathrm{n} \in \mathrm{Z}^+$ find the number of consecutive zeros at the end of $(\Sigma n)$ !

(A) 52 (B) 64

(C) 68 (D) 72

**Q27** Let $\mathrm{N} = (1!)^3 + (2!)^3 + \ldots\ldots + (5!)^3$. Find the number of trailing zeros at the end of $\mathrm{N}$.

**Q28** Number of trailing zeros at the end of n! ranges from 49 to 62. How many integer values can 'n' assume?

(A) 55 (B) 54

(C) 53 (D) 50

**Q29** 32! is divided by the largest number, having exactly 3 factors. If the largest such number is n, then find the number of consecutive zeros at the end of n!

(A) 2 (B) 3

(C) 4 (D) 0

**Q30** Find the number of consecutive zeros at the end of $(216!)^{10}$

(A) 62 (B) 42

(C) 520 (D) 5

# Answer Key

| | | | |
|---|---|---|---|
| Q1 | (A) | Q16 | 5 |
| Q2 | (C) | Q17 | (A) |
| Q3 | (B) | Q18 | (D) |
| Q4 | (D) | Q19 | (B) |
| Q5 | (C) | Q20 | 2 |
| Q6 | (B) | Q21 | (A) |
| Q7 | (D) | Q22 | 0 |
| Q8 | (A) | Q23 | (C) |
| Q9 | (A) | Q24 | (A) |
| Q10 | (C) | Q25 | (B) |
| Q11 | (A) | Q26 | (B) |
| Q12 | (C) | Q27 | 0 |
| Q13 | (C) | Q28 | (A) |
| Q14 | (D) | Q29 | (A) |
| Q15 | (B) | Q30 | (C) |

# Hints & Solutions

**Q1 Text Solution:**

Number of trailing zeros at the end of $n$ !

$$=\left[\frac{\mathrm{n}}{5}\right]+\left[\frac{\mathrm{n}}{25}\right] \text{ for } \mathrm{n}<125$$

Greatest Integer Function

So, number of trailing zeros at the end of 112 !

$$\begin{aligned} & =\left[\frac{112}{5}\right]+\left[\frac{112}{25}\right] \\ & =22+4 \\ & =26 \end{aligned}$$

Ans. a

**Q2 Text Solution:**

We have to basically, find the number of 5 's in 158 !

$$\begin{aligned} & \text{or }\left[\frac{158}{5}\right]+\left[\frac{158}{25}\right]+\left[\frac{158}{125}\right] \\ & =31+6+1 \\ & =38 \end{aligned}$$

Ans. c

**Q3 Text Solution:**

Number of consecutive zeros at the end of

$$\begin{aligned} & 75!=\left[\frac{75}{5}\right]+\left[\frac{75}{25}\right] \\ & =15+3 \\ & =18 \\ & \text{and } 125!=\left[\frac{125}{5}\right]+\left[\frac{125}{25}\right]+\left[\frac{125}{125}\right] \\ & =(25+5+1)=31 \end{aligned}$$

So, total consecutive zeros at the end of

$$75! \times 125!=(18+31)=49$$

(Note : In multiply case, we add the numbers of consecutive trailing zeros of each term)

Ans. b

**Q4 Text Solution:**

Number of trailing zeros at the end of 125 !

$$\begin{aligned} & =\left[\frac{125}{5}\right]+\left[\frac{125}{25}\right]+\left[\frac{125}{125}\right] \\ & =(25+5+1) \\ & =31 \end{aligned}$$

No. of trailing zeros of the expression will be the number of trailing zeros of least number. or it is 31

Ans. d

**Q5 Text Solution:**

We know that,

Number of consecutive zeros at the end of $(\mathrm{m}!)^{\mathrm{n}}$ ! $=($ Number of consecutive zeros at the end of $\mathrm{m}!) \times \mathrm{n}$ !

So number of trailing zeros at the end of 77 !

$$=\left[\frac{77}{5}\right]+\left[\frac{77}{25}\right]$$

$$\begin{aligned} & =15+3 \\ & =18 \end{aligned}$$

Therefore, total number of zeros at the end of

$$\begin{aligned} & (77!)^{46!}=(18 \times 46)! \\ & =828 \times 45! \end{aligned}$$

Ans. c

**Q6 Text Solution:**

Number of consecutive zeros at the end of 36 !

$$
\begin{aligned}
& =\left[\frac{36}{5}\right]+\left[\frac{36}{25}\right] \\
& =(7+1) \\
& =8
\end{aligned}
$$

Also, there's enough 2's for 5

So, number of consecutive zeros at the end of $5^2 \times$

$$
\begin{aligned}
& 36! \\
& =(2+8) \\
& =10
\end{aligned}
$$

Ans. b

**Q7 Text Solution:**

We have to find the number of $(2 \times 5)$ pair to get the number of trailing zeros of the given expression.

$$
\begin{aligned}
& \text{So, } 75 \times 185 \times 320 \times 275 \\
& =\left(5^2 \times 3\right) \times(5 \times 37) \times\left(2^6 \times 5\right) \\
& \qquad \times\left(5^2 \times 11\right) \\
& \text{Number of }(2 \times 5) \text{ pair }=6 \\
& \text{Ans. d}
\end{aligned}
$$

**Q8 Text Solution:**

$$
\begin{aligned}
& \frac{(0!+1!+2!+3!+\ldots\ldots+716!)}{24} \\
& \xrightarrow{R} \frac{0!+1!+2!+3!}{24}+\frac{4!+5!+\ldots.+716!}{24} \\
& \xrightarrow{R} \frac{10}{24}+0 \\
& \xrightarrow{R} 10
\end{aligned}
$$

Ans. a

**Q9 Text Solution:**

There are only one 5's available in the given expression.

So, number of trailing zeros at the end $=1$

Ans. a

**Q10 Text Solution:**

Number of trailing zeros at the end of 200 !

$$
\begin{aligned}
& =\left[\frac{200}{5}\right]+\left[\frac{200}{25}\right]+\left[\frac{200}{125}\right] \\
& =40+8+1 \\
& =49
\end{aligned}
$$

This will apply from 201 to 204 as well.

So, maximum value of $\mathrm{N}=204$

Ans. c

**Q11 Text Solution:**

Remember if

$$
a!+b!+c!=abc
$$

This means

$1!+4!+5!=145$ (As c $>$ b $>$ a) only possibility.

Number of trailing zeros at the end of 145 !

$$
\begin{aligned}
& =\left[\frac{145}{5}\right]+\left[\frac{145}{25}\right]+\left[\frac{145}{125}\right] \\
& =(29+5+1) \\
& =35
\end{aligned}
$$

Ans. a

**Q12 Text Solution:**

As,

$1 \times 1!+2 \times 2!+3 \times 3!+\ldots\ldots.+10 \times 10\ !$

$=n!-1$

this can be written as (2-1)×1! + (3-1)×2! + ....................(11-1)×10!

Now, 2!-1! + 3!-2! + 4!-3! +..............11!-10!

terms will be cancelled out and the remaining is 11!-1

So, $\mathrm{n}=11$

Now, number of trailing zeros at the end of 11 !

$$=\left[\frac{11}{5}\right]=2$$

Ans. c

**Q13 Text Solution:**

For $\mathrm{A}$ to be prime number, it should be an odd number (It's greater than 2) This is only possible, when $\mathrm{B}$ is an even number. Only even prime number $=2$ So, $\mathrm{A}=2^2+7=11$ Number of trailing zeros at the end of A!

$$\begin{aligned} & =\left[\frac{11}{5}\right] \\ & =2 \end{aligned}$$

Ans. c

**Q14 Text Solution:**

For 14 , we require pair of $(2,7)$

Now, $\left[\frac{63}{7}\right]+\left[\frac{63}{49}\right]$

$$\begin{aligned} & =9+1 \\ & =10 \end{aligned}$$

And we have enough 2's in the 63 !

So, highest power of $(2 \times 7)$ is 10

Ans. d

**Q15 Text Solution:**

$$63=3^2 \times 7$$

Number of 3 's $=39+13+4+1=57$

So, number of $3^2$'s = 28

Number of 7's $=16+2=18$

Least of two $=18$

Thus, answer is 18

Ans. b

**Q16 Text Solution:**

At $\mathrm{m}=125$,

Number of consecutive zeros at the end

$$\begin{aligned} & =\left[\frac{125}{5}\right]+\left[\frac{125}{25}\right]+\left[\frac{125}{125}\right] \\ & =(25+5+1) \\ & =31 \end{aligned}$$

So, $\mathrm{m}$ should be from 130 to 134 Number of values of $m$

= 5

5 is the correct answer.

**Q17 Text Solution:**

As $n!=5040$

So, $\mathrm{n}=7$

Number of trailing zeros at the end of 7 !

$$=1$$

Ans. a

**Q18 Text Solution:**

We know that,

41 + 0! + 5! + 8! + 5! = 40585 (Only Possibility)

Relating it to the given info in the question.

We get a = 0 and b = 8

Now (0! + 8!)!

= 40321!

Number of zeros at the end of (40321)!

$$= \left[\frac{40321}{5}\right] + \left[\frac{40321}{25}\right] + \left[\frac{40321}{125}\right] + \left[\frac{40321}{625}\right]$$

$$+ \left[\frac{40321}{3125}\right] + \left[\frac{40321}{15625}\right]$$

$$= (8064 + 1612 + 322 + 64 + 12 + 2)$$

$$= 10076$$

Ans. d

**Q19 Text Solution:**

Multiples of 5 in the given series

$$= 5^2, 10^2, 15^2, 20^2 \ldots\ldots\ldots 95^2$$

Number of 5 's in the given expression

$$(2 \times 16) + (4 \times 3)$$

$$= (32 + 12) = 44$$

Ans. b

**Q20 Text Solution:**

Using hit and trial,

m = 6 and n = 5

or 6! – 5! = 720 – 120 = 600

So, number of trailing zeros at the end of (6 + 5)!

= 11! = 2

Ans. 2

**Q21 Text Solution:**

**Topic - Number System**

**Sub - topic - Number of trailing zeroes**

At $c = 3, c! = 6$

and if $a = 1, b = 2$

then $1 + 2 + 3 = (1 \times 2 \times 3) = 3$ !

Now, [(3!)!]!

$$= (6!)!$$

$$= (720)!$$

Number of consecutive zeros at the end of (720)!

$$= \left[\frac{720}{5}\right] + \left[\frac{720}{25}\right] + \left[\frac{720}{125}\right] + \left[\frac{720}{625}\right]$$

$$= 144 + 28 + 5 + 1$$

$$= 178$$

Ans. a

**Q22 Text Solution:**

Given, $n^3 - 3n^2 + 2n - 6 = 0$

or $n^3 - 3n^2 + 2n = 6$

or $\mathrm{n}^2(\mathrm{n} - 2) - \mathrm{n}(\mathrm{n} - 2) = 6$

or $\left(\mathrm{n}^2 - \mathrm{n}\right)(\mathrm{n} - 2) = 6$

or $n(n - 1)(n - 2) = (3 \times 2 \times 1)$

So, $\mathrm{n} = 3$

This means, number of zeros at the end of $n$ ! or $3\,! = 0$

Ans. 0

**Q23 Text Solution:**

Number of trailing zeros at the end of 25 !

$$= \left[\frac{25}{5}\right] + \left[\frac{25}{25}\right] = (5 + 1) = 6$$

So, number of trailing zeros at the end of $(25!)^{4!}$

$$= 6 \times 4!$$

$$= 6 \times 24$$

$$= 144$$

Ans. c

**Q24 Text Solution:**

Highest value of $\mathrm{m}$

$$= \left[\frac{129}{11}\right] + \left[\frac{129}{121}\right]$$
$$= 11 + 1$$
$$= 12$$

Ans, a

**Q25 Text Solution:**

Given, n! = m! and m > n

This is possible when m = 1 and n = 0

So, 0! = 1!

Now, (30 × m)! = 30!

$$= \left[\frac{30}{5}\right] + \left[\frac{30}{25}\right]$$
$$= 6 + 1 = 7$$

Number of consecutive zeros at the end of $(30\ \mathrm{m})\,! = 7$

Ans, b

**Q26 Text Solution:**

Given, $\left[\frac{\mathrm{n}}{5}\right] = 10$ and $\mathrm{n} \in \mathrm{Z}^{+}$

This means $\mathrm{n}$ can take value from 50 to 54

$$\text{So, } \Sigma\mathrm{n} = (50 + 51 + \ldots\ldots. + 54)$$
$$= 260$$

Thus, number of zeros at the end of $(\Sigma n)! = (260)\,!$ is

$$\left[\frac{260}{5}\right] + \left[\frac{260}{25}\right] + \left[\frac{260}{125}\right]$$
$$= 52 + 10 + 2$$
$$= 64$$

Ans. b

**Q27 Text Solution:**

N = 1 + 8 + 216 + 13824 + 1728000

= 1742049

So, number of zeros at the end of N = 0

Ans. 0

**Q28 Text Solution:**

To find the factorial value (n!), multiply the trailing zero by 4, the factorial value will lie close to that number.

If we take $n = 200$ then $\left[\frac{200}{5}\right] + \left[\frac{200}{25}\right] + \left[\frac{200}{125}\right] = 40 + 8 + 1 = 49$ and for $\mathrm{n} = 254$,

$$\left[\frac{254}{5}\right] + \left[\frac{254}{25}\right] + \left[\frac{254}{125}\right]$$
$$= 50 + 10 + 2$$
$$= 62$$

So, number of integer value of $n$

$$= (254 - 200) + 1$$
$$= 54 + 1$$
$$= 55$$

Ans. a

**Q29 Text Solution:**

We know that,

a number which has exactly 3 factors will be square of prime.

Largest such number which divides $32! = 13^2$ (it will divide 13 and 26)

So, number of consecutive zeros at the end of 13 !

$$= \left[\frac{13}{5}\right]$$
$$= 2$$

Ans. 2

**Q30 Text Solution:**

The number of consecutive zeroes at the end of 216! will be

$$\left[\frac{216}{5}\right]+\left[\frac{216}{25}\right]+\left[\frac{216}{125}\right]$$
$$=(43+8+1)$$
$$=52$$

So, number of consecutive zeros at the end of

$$(216!)^{10}$$
$$=(52\times 10)$$
$$=520$$

Ans, c