

8. FACTORIALS

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Class: VII, MATHEMATICS

FOUNDATION⁺ SOLUTIONS

(2025/26)

TEACHING TASK

JEE MAINS LEVEL

01 $\frac{4!}{0!} = \frac{24}{1} = 24$

Ans. C

02 $\frac{(n+2)!}{n!} = \frac{(n+2)(n+1)n!}{n!} = (n+1)(n+2)$

Ans. A

03 $\frac{(n-1)!}{(n+1)!} = \frac{(n-1)!}{(n+1) \cdot n \cdot (n-1)!} = \frac{1}{n(n+1)}$

Ans. B

04 $(n+1)! = 6n!$
 $\Rightarrow (n+1)n! = 6n!$

$\Rightarrow n+1=6$
 $\Rightarrow n=5$

Ans. B

05 $x^2 - 4x + 4 = 0$

$\Rightarrow (x-2)^2 = 0$

$\Rightarrow x-2=0 \Rightarrow x=2$

Ans. C

06 $|3! - 5!| = |6 - 120| = |-114| = 114$

Ans. C

07 $4! + 5! = 24 + 120 = 144$

Ans. C

08 $x + 0! = 5! \Rightarrow x+1 = 120 \Rightarrow x = 119$

Ans. A

~~09~~

09 $1! + 2! + 3! + 4! + 5! + \dots + 100!$ (2)

$$= 1 + 2 + 6 + 24 + 120 + \dots + 100!$$

$$= 33 + (120 + 720 + \dots + 100!)$$

These numbers are divisible by 120
 $\Rightarrow$ hence Remainder = 0

$\therefore$ Total remainder = $33 + 0 = 33$ Ans: D

10 $152! = 2^\alpha \cdot 5^\beta \cdot 7^{\gamma} \dots$

$$\alpha = \left[\frac{152}{2} \right] + \left[\frac{152}{4} \right] + \left[\frac{152}{8} \right] + \left[\frac{152}{16} \right]$$

$$\beta = \left[\frac{152}{5} \right] + \left[\frac{152}{25} \right] + \left[\frac{152}{125} \right]$$

$$= 30 + 6 + 1$$

$$= 37$$

here $[.]$ is the greatest integer function

Ans: B

JEE ADVANCED LEVEL

01 $576 = 4! \times 4! = (4!)^2$

Ans: A, B

02 Conceptual

03 Statement I: Conceptual (True)

Statement II: Conceptual (True)

Ans: A

04 Statement I: Conceptual (False)

Statement II: Conceptual (True)

Ans: D

05 Assertion: Conceptual (True)

Reason: Conceptual (True)

Ans: A



06. Assertion: Conceptual (True) (3)
Reason: mathematically (False) Ans: C

07 $\frac{6!}{4!} = \frac{720}{24} = 30$ Ans: A

08 $\frac{(n+1)!}{n!} = \frac{(n+1)n!}{n!} = n+1$ Ans: C

09 $7! = 5040, n=7$ Ans: B

10. Conceptual Ans: B

11. $\frac{4!}{3!(4-3)!} = \frac{24}{6 \times 1} = 4$ Ans: 4

12 $200! = 2^\alpha \cdot 5^\beta \cdot 7^\gamma \dots$
 $\beta = \left\lfloor \frac{200}{5} \right\rfloor + \left\lfloor \frac{200}{25} \right\rfloor + \left\lfloor \frac{200}{125} \right\rfloor + \dots$
 $= 40 + 8 + 1$
 $= 49$ Ans: 49

13 a) $2! \times 3! = 2 \times 6 = 12 (P)$

b) $1 (r)$

c) $|6-24| = 18 (S)$

d) $\frac{10!}{8! \times 0!} = \frac{10 \times 9 \times 8!}{8! \times 1} = 90 (Q)$

Ans: P, r, S, Q

14. a) $10! = 2^\alpha \cdot 5^\beta \cdot 7^\gamma \dots$

(4)

$$\beta = \left\lfloor \frac{10}{5} \right\rfloor + \left\lfloor \frac{10}{25} \right\rfloor$$

$$= 2 + 0$$

$$= 2 \quad (P)$$

b) $25! = 2^\alpha \cdot 5^\beta \cdot 7^\gamma \dots$

$$\beta = \left\lfloor \frac{25}{5} \right\rfloor + \left\lfloor \frac{25}{25} \right\rfloor$$

$$= 5 + 1$$

$$= 6 \quad (Q)$$

c) $5! = 2^\alpha \cdot 5^\beta \cdot 7^\gamma \dots$

$$\beta = \left\lfloor \frac{5}{5} \right\rfloor + \left\lfloor \frac{5}{25} \right\rfloor$$

$$= 1 + 0$$

$$= 1 \quad (R)$$

d) $4! = 2^\alpha \cdot 5^\beta \cdot 7^\gamma \dots$

$$\beta = \left\lfloor \frac{4}{5} \right\rfloor$$

$$= 0 \quad (S)$$

Ans: P, Q, R, S

LEARNERS TASK (CUE'S)

01. $n! = 1 \times 2 \times 3 \times \dots \times n$

Ans: A

02. Conceptual

Ans: C

03. Conceptual

Ans: C

04. 24

Ans: C

05 $3! \times 0! = 6 \times 1 = 6$ Ans: C

06 $\frac{n!}{(n-1)!} = \frac{n(n-1)!}{(n-1)!} = n$ Ans: A

07 120 Ans: B

08 $\frac{10!}{6!} = \frac{10 \times 9 \times 8 \times 7 \times 6!}{6!} = 5040$ Ans: B

09 $\frac{(n+1)!}{(n-1)!} = \frac{(n+1) \cdot n(n-1)!}{(n-1)!} = n(n+1)$ Ans: A

10 Conceptual Ans: A

JEE MAINS LEVEL

01. $(n+1)! = 5n!$ $\Rightarrow n+1=5$
 $\Rightarrow (n+1)n! = 5n!$ $\Rightarrow n=4$ Ans: D

02 $\frac{9 \times 8 \times 7! \times 8 \times 6 \times 7 \times 6!}{7! \times 6!} = 4032$ Ans: B

03 $\frac{9!}{(9-8)! 8!} = 9$ Ans: C

04 $n! = 24 \Rightarrow n=4$ Ans: C

05 $x^2 - 36 = 0 \Rightarrow x = 6 = 3!$ Ans: B

06 $\frac{7!}{6! \times 4!} = \frac{7 \times 6 \times 5 \times 4!}{4!} = 210$ Ans: B

07 $4! + 6! = 744$ Ans: C

~~08~~

08 $1! + 2! + 3! + \dots + 95!$ (6)

$= \{1 + 2 + 6 + 24 + 120\} + \{720 + 5040 + \dots + 95!\}$

Each no. Not divisible by 9 Each no. is divisible by 9.

Sum = $1 + 2 + 6 + 24 + 120 = 153$

153 is divisible by 9

Hence, remainder = 0

Ans. A

09 $6! \div 4! = 30$

Ans. D

10 $100! = 2^{\alpha} \cdot 5^{\beta} \cdot 7^{\gamma} \cdot 11^{\delta} \dots$

$\beta = \left\lfloor \frac{100}{5} \right\rfloor + \left\lfloor \frac{100}{25} \right\rfloor + \left\lfloor \frac{100}{125} \right\rfloor + \dots$

$= 20 + 4 + 0$

$= 24$

Ans. A

JEE ADVANCED LEVEL

01. $x^2 - 12x + 36 = 0$

$\Rightarrow (x-6)^2 = 0 \Rightarrow x = 6 \text{ or } 3!$

Ans: C, D

02 options only A & B are correct

Ans A, B

03 Statement I: Mathematically (True)

Statement II: Conceptual (False)

Ans: C

04 Statement I: $6 + 24 = 30$ (True)

Statement II: Mathematically (True)

Ans: A

05 Assertion: $\frac{9!}{6!} = \frac{9 \times 8 \times 7 \times 6!}{6!} = 504$ (True) ⑦

Reason: mathematically (True) Ans. A

06 Assertion: $\frac{6!}{4!} = \frac{6 \times 5 \times 4!}{4!} = 6 \times 5 = 30$ (True)

Reason: mathematically (True) Ans. A

07 8!

Ans. C

08 $\frac{(n+1)! (n-1)!}{n! (n-2)!}$

$$= \frac{(n+1)n! \cdot (n-1)(n-2)!}{n! (n-2)!} = (n+1)(n-1) = n^2 - 1$$

Ans. D

09 $\frac{6! + 5!}{5!} = \frac{6 \times 5! + 5!}{5!} = \frac{5! (6+1)}{5!} = 7$

Ans. C

10 Conceptual

Ans. C

11. $2! \times 5 - 10 = 2 \times 5 - 10 = 0$

Ans. 0

12 $50! = 2^x \cdot 5^y \cdot 7^z + \dots$

$$y = \left[\frac{50}{5} \right] + \left[\frac{50}{25} \right] + \left[\frac{50}{125} \right]$$

$$= 10 + 2 + 0$$

$$= 12$$

Ans. 12

(2)

$$13 \ a) \frac{55!}{53!} = 55 \times 54 = 2970 (r)$$

$$b) \frac{(2+3)!}{3!} = \frac{5!}{3!} = 120$$

$$b) \frac{(2-3)!}{3!} = \frac{-1!}{3!} \rightarrow \text{not defined ()}$$

$$c) \frac{10!}{8! 2!} = \frac{10 \times 9 \times 8!}{8! \times 2} = 45 (s)$$

$$d) (3!)^2 = (6)^2 = 36 (v)$$

Ans: 8, 1, 5, 2

$$14 \ a) 15! = 2^\alpha \cdot 5^\beta \cdot 7^\gamma \cdot \dots$$

$$\beta = \left\lfloor \frac{15}{5} \right\rfloor + \left\lfloor \frac{15}{25} \right\rfloor + \dots$$

$$= 3 + 0 = 3 (v)$$

$$b) 30! = 2^\alpha \cdot 5^\beta \cdot 7^\gamma \cdot \dots$$

$$\beta = \left\lfloor \frac{30}{5} \right\rfloor + \left\lfloor \frac{30}{25} \right\rfloor + \left\lfloor \frac{30}{125} \right\rfloor$$

$$= 6 + 1 + 0 = 7 (p)$$

$$c) 75! = 2^\alpha \cdot 5^\beta \cdot 7^\gamma \cdot \dots$$

$$\beta = \left\lfloor \frac{75}{5} \right\rfloor + \left\lfloor \frac{75}{25} \right\rfloor + \left\lfloor \frac{75}{125} \right\rfloor$$

$$= 15 + 3 + 0 = 18 (s)$$

$$d) \beta = \left\lfloor \frac{80}{5} \right\rfloor + \left\lfloor \frac{80}{25} \right\rfloor + \left\lfloor \frac{80}{125} \right\rfloor$$

$$= 16 + 3 + 0 = 19 (r)$$

Ans: 2, 1, 5, 8