

## Binomial Theorem - Class XI

### Past Year JEE Questions

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#### Questions

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##### Question: 01

If the coefficients of  $r^{\text{th}}$ ,  $(r+1)^{\text{th}}$ , and  $(r+2)^{\text{th}}$  terms in the binomial expansion of  $(1+y)^m$  are in A.P., then  $m$  and  $r$  satisfy the equation

- A.  $m^2 - m(4r - 1) + 4r^2 - 2 = 0$   
B.  $m^2 - m(4r + 1) + 4r^2 + 2 = 0$   
C.  $m^2 - m(4r + 1) + 4r^2 - 2 = 0$   
D.  $m^2 - m(4r - 1) + 4r^2 + 2 = 0$

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#### Solutions

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##### Solution: 01

#### Explanation

Let  $r = 2$

$\therefore$  2nd, 3rd and 4th terms are in AP.

$$\text{2nd term} = T_2 = {}^m C_1 \cdot y$$

$$\text{Coefficient of } T_2 = {}^m C_1$$

$$\text{3rd term} = T_3 = {}^m C_2 \cdot y^2$$

$$\text{Coefficient of } T_3 = {}^m C_2$$

$$\text{4th term} = T_4 = {}^m C_3 \cdot y^3$$

$$\text{Coefficient of } T_4 = {}^m C_3$$

$$\therefore 2 \cdot {}^m C_2 = {}^m C_1 + {}^m C_3$$

$$\Rightarrow 2 \cdot \frac{m(m-1)}{1 \cdot 2} = \frac{m}{1} + \frac{m(m-1)(m-2)}{1 \cdot 2 \cdot 3}$$

$$\Rightarrow 6m^2 - 6m = 6m + m(m^2 - 3m + 2)$$

$$\Rightarrow 6m^2 - 6m = 6m + m^3 - 3m^2 + 2m$$

$$\Rightarrow 6m - 6 = 6 + m^2 - 3m + 2$$

$$\Rightarrow m^2 - 9m + 14 = 0$$

Now put  $r = 2$  at each option and find answer.

In option C,  $m^2 - m(4r + 1) + 4r^2 - 2 = 0$  putting  $r = 2$  we get

$m^2 - 9m + 14 = 0$ . So Option C is correct.