

Finding middle term, or NGC.

Q12. If p is a real number and the middle term in the expansion $\left(\frac{p}{2} + 2\right)^8$ is 1120, then find the value of p .

Sol. Given expansion is $\left(\frac{p}{2} + 2\right)^8$

Since index is $n = 8$, there is only one middle term, i.e., $\left(\frac{8}{2} + 1\right)$ th = 5th term

$$T_5 = T_{4+1} = {}^8C_4 \left(\frac{p}{2}\right)^{8-4} \cdot 2^4$$

$$\Rightarrow 1120 = {}^8C_4 p^4 \quad \Rightarrow 1120 = \frac{8 \times 7 \times 6 \times 5 \times 4!}{4! \times 4 \times 3 \times 2 \times 1} p^4$$

$$\Rightarrow 1120 = 7 \times 2 \times 5 \times p^4 \quad \Rightarrow p^4 = \frac{1120}{70}$$

$$\Rightarrow p^4 = 16 \quad \Rightarrow p^2 = 4 \quad \Rightarrow p = \pm 2$$