



Binomial Theorem Ex 18.2 Q32

It is given that

$$T_1 = 729$$

$$T_2 = 7290$$

and, $T_3 = 30375$

$$\therefore T_1 = {}^nC_0 \times a^n = 729$$

$$T_2 = {}^nC_{n-1} \times a^{n-1} \times b = 7290$$

and, $T_3 = {}^nC_{n-2} \times a^{n-2} \times b^2 = 30375$

Now,

$$\frac{T_2}{T_1} = \frac{{}^nC_{n-1} \times a^{n-1} \times b}{{}^nC_0 \times a^n} = \frac{7290}{729}$$

$$\Rightarrow \frac{{}^nC_{n-1} \times a^{n-1} \times b}{{}^nC_0 \times a^n} = 10$$

$$\Rightarrow \frac{{}^nC_{n-1} \times b}{a} = 10$$

$$\Rightarrow \frac{n!}{(n-n+1)! (n-1)!} \times \frac{b}{a} = 10$$

$$\Rightarrow \frac{n!}{(n-1)!} \times \frac{b}{a} = 10$$

$$\Rightarrow \frac{n(n-1)!}{(n-1)!} \times \frac{b}{a} = 10$$

$$\Rightarrow \frac{b}{a} = \frac{10}{n} \quad \text{--- (i)}$$

and,

$$\frac{T_3}{T_2} = \frac{{}^nC_{n-2} \times a^{n-2} \times b^2}{{}^nC_{n-1} \times a^{n-1} \times b} = \frac{30375}{7290}$$

$$\Rightarrow \frac{{}^nC_{n-2} \times b}{{}^nC_{n-1} \times a} = \frac{25}{6}$$

$$\Rightarrow \frac{n-2+1}{n-(n-1)+1} \times \frac{b}{a} = \frac{25}{6}$$

$$\Rightarrow \frac{n-1}{2} \times \frac{b}{a} = \frac{25}{6}$$

$$\Rightarrow \frac{b}{a} = \frac{25}{6} \times \frac{2}{(n-1)}$$

$$\Rightarrow \frac{b}{a} = \frac{25}{6} \times \frac{2}{(n-1)}$$

$$\Rightarrow \frac{b}{a} = \frac{25}{3(n-1)} \quad \text{--- (ii)}$$

Comparing equation (i) and equation (ii), we get

$$\frac{10}{n} = \frac{25}{3(n-1)}$$

$$\Rightarrow 30(n-1) = 25n$$

$$\Rightarrow 30n - 30 = 25n$$

$$\Rightarrow 5n = 30$$

$$\Rightarrow n = 6$$

Now,

$$T_1 = {}^nC_0 \times a^n = 729$$

$$\Rightarrow a^n = 729$$

$$\Rightarrow a^6 = 729$$

$$\Rightarrow a^6 = 3^6$$

$$\Rightarrow a = 3$$

Putting $a = 3$ in $n = 6$ in equation (i), we get

$$\frac{b}{3} = \frac{10}{6}$$

$$\Rightarrow b = \frac{10}{2} = 5$$

Hence, $a = 3$, $b = 5$ and $n = 6$.

Binomial Theorem Ex 18.2 Q33

We have,

$$(3+ax)^9 = {}^9C_0 \times 3^9 + {}^9C_1 \times 3^8 \times (ax)^1 + {}^9C_2 \times 3^7 \times (ax)^2 + {}^9C_3 \times 3^6 \times (ax)^3 + \dots$$

$$\therefore \text{Coefficient of } x^2 = {}^9C_2 \times 3^7 \times a^2$$

$$\text{and, Coefficient of } x^3 = {}^9C_3 \times 3^6 \times a^3$$

$$\text{Now, Coefficient of } x^2 = \text{Coefficient of } x^3$$

$$\Rightarrow {}^9C_2 \times 3^7 \times a^2 = {}^9C_3 \times 3^6 \times a^3$$

$$\Rightarrow 36 \times 3^7 \times a^2 = 84 \times 3^6 \times a^3$$

$$\Rightarrow a = \frac{36 \times 3^7}{84 \times 3^6} = \frac{9}{7}$$

***** END *****