

Binomial Theorem Ex 18.2 Q13(i)

$$\left(\frac{2}{3}x - \frac{3}{2x}\right)^{2x}$$

Here, n = 20 which is an even number so,  $\left(\frac{20}{2} + 1\right)^{\frac{1}{10}}$  i.e., 11<sup>th</sup> term is the middle term.

We know that,

$$T_{n} = T_{r+1} = \left(-1\right)^{r} {}^{n}C_{r}x^{n-r}y^{r}$$

$$n = 20, \ r = 10, \ x = \frac{2}{3}x, \ Y = \frac{2}{3X}$$

$$T_{11} = T_{10+1} = \left(-1\right)^{10} {}^{20}C_{10} \left(\frac{2}{3}x\right)^{10} \left(\frac{3}{2x}\right)^{10}$$

$$= \frac{20}{310} \times \frac{2^{10}}{3^{10}} \times \frac{3^{10}}{x^{10}} \times \frac{x^{10}}{x^{10}}$$

$$= \frac{20}{310} C_{10} \left(\frac{2^{10}}{3^{10}} \times \frac{3^{10}}{x^{10}} \times \frac{x^{10}}{x^{10}} \times \frac{x^{10}}{x^{10}}$$

Binomial Theorem Ex 18.2 Q13(ii)

Here, n = 12, which is even number.

SO,  $\left(\frac{12}{2}+1\right)$ th term i.e., 7th term is the middle term.

Hence, the middle term =  $T_7 = T_{6+1}$ 

$$7_7 = 7_{6+1} = {}^{12}C_6 \times \left(\frac{a}{x}\right)^{12-6} \times (bx)^6$$

$$= {}^{12}C_6 \left(\frac{a}{x}\right)^6 \times (bx)^6$$

$$= \frac{12!}{(12-6)!6!} \times \frac{a^6}{x^6} \times b^6 x^6$$

$$= \frac{12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6!}{(6 \times 5 \times 4 \times 3 \times 2 \times 1)} \times a^6 b^6$$

$$= 924 \times a^6 b^6$$

∴ The middle term =  $924 \times a^6b^6$ .

Binomial Theorem Ex 18.2 Q13(iii)

$$\left(x^2 - \frac{2}{x}\right)^{10}$$
Here,  $n = 10$ 

$$\therefore \left(\frac{n}{2} + 1\right)^{\frac{1}{4}} = \left(\frac{10}{2} + 1\right)^{\frac{1}{4}} = 6^{\frac{1}{4}}$$
 term is the middle term.

The term formula is

$$T_{n-}T_{r+1} = (-1)^{r} {}^{n}C_{r}x^{r-n}y^{r}$$

$$T_{6} = T_{5+1} = (-1)^{5} {}^{10}C_{5}(x^{2})^{10-5}(\frac{2}{x})^{5}$$

$$= -\frac{{}^{10}C_{5}x^{20-10}}{x^{5}}\frac{2^{5}}{x^{5}}$$

$$= \frac{-10 \times 9 \times 8 \times 7 \times 6}{5 \times 4 \times 3 \times 2} \times 2^{5}x^{5}$$

$$= -8064x^{5}$$

Binomial Theorem Ex 18.2 Q13(iv)

$$\left(\frac{x}{a} - \frac{a}{x}\right)^{10}$$

Here n=10, which is even, therefore it has 11 terms

∴ middle term is 
$$\left(\frac{n}{2}+1\right) = 6^{\frac{1}{6}}$$
 term
$$T_{n} = T_{n+1} = (-1)^{n} C_{n} x^{n-n} y^{n}$$

$$T_{n} = T_{n+1} = (-1)^{n} C_{n} \left(\frac{x}{a}\right)^{10-5} \left(\frac{a}{x}\right)^{5}$$

$$= -\frac{10!}{5!5!} \times \frac{x^{5}}{a^{5}} \times a^{5} \times x^{-5}$$

$$= -252$$

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