Binomial Theorem Ex 18.2 Q13(i)

$\left(\frac{2}{3}x-\frac{3}{2x}\right)^{20}$

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

We know that,

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

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

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

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

$= {}^{20}C_{10}$

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 = $T_7 = T_{6+1}$

$\therefore \quad T_7 = T_{6+1} = {}^{12}C_6 \times \left(\frac{a}{x}\right)^{12-6} \times (bx)^6$

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

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

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

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

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

Binomial Theorem Ex 18.2 Q13(iii)

$\left(x^2-\frac{2}{x}\right)^{10}$

Here, $n = 10$

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

The term formula is

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

$T_6 = T_{5+1} = (-1)^5 {}^{10}C_5\left(x^2\right)^{10-5}\left(\frac{2}{x}\right)^5$

$= -{}^{10}C_5 x^{20-10}\frac{2^5}{x^5}$

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

$= -8064x^5$

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

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

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

$$T_6 = T_{5+1} = (-1)^5 {}^{10}C_5 \left(\frac{x}{a}\right)^{10-5} \left(\frac{a}{x}\right)^5$$

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

$$= -252$$

********** END **********