Binomial Theorem Ex 18.1 Q5(ii)

We have,

$$(102)^5 = (100+2)^5$$
$$= {}^5C_0 \times 100^5 + {}^5C_1 \times 100^4 \times 2 + {}^5C_2 \times 100^3 \times 2^2 + {}^5C_3 \times 100^2 \times 2^3 + {}^5C_4 \times 100 \times 2^4 + {}^5C_5 \times 2^5$$
$$= 100^5 + 5 \times 100^4 \times 2 + 10 \times 100^3 \times 2^2 + 10 \times 100^2 \times 2^3 + 5 \times 100 \times 2^4 + 2^5$$
$$= 10000000000 + 1000000000 + 40000000 + 800000 + 8000 + 32$$
$$= 11040808032$$

$$\therefore \quad (102)^5 = 11040808032$$

Binomial Theorem Ex 18.1 Q5(iii)

We have,

$$(101)^4 = (100+1)^4$$
$$= {}^4C_0 \times 100^4 + {}^4C_1 \times 100^3 + {}^4C_2 \times 100^2 + {}^4C_3 \times 100 + {}^4C_4$$
$$= 100^4 + 4 \times 100^3 + 6 \times 100^2 + 4 \times 100 + 1$$
$$= 100000000 + 4000000 + 60000 + 400 + 1$$
$$= 104060401$$

$$\therefore \quad (101)^4 = 104060401$$

Binomial Theorem Ex 18.1 Q5(iv)

We have,

$$(98)^5 = (100-2)^5$$
$$= {}^5C_0 \times 100^5 + {}^5C_1 \times 100^4 \times (-2) + {}^5C_2 \times 100^3 \times (-2)^2 + {}^5C_3 \times 100^2 \times (-2)^3 + {}^5C_4 \times 100 \times (-2)^4 + {}^5C_5 \times (-2)^5$$
$$= {}^5C_0 \times 100^5 - {}^5C_1 \times 100^4 \times 2 + {}^5C_2 \times 100^3 \times 4 - {}^5C_3 \times 100^2 \times 8 + {}^5C_4 \times 100 \times 16 - {}^5C_5 \times 32$$
$$= 100^5 - 10 \times 100^4 + 40 \times 100^3 - 80 \times 100^2 + 80 \times 100 - 32$$
$$= 10000000000 - 1000000000 + 40000000 - 800000 + 8000 - 32$$
$$= 10040008000 - 1000800032$$
$$= 9039207968$$

$$\therefore \quad (98)^5 = 9039207968$$

Binomial Theorem Ex 18.1 Q6

$$2^{3n} - 7n - 1$$
$$= 2^{3(n)} - 7(n) - 1$$
$$= 8^n - 7n - 1$$
$$= (1+7)^n - 7n - 1$$
$$= \left({}^nC_0 + {}^nC_1 (7)^1 + {}^nC_2 (7)^2 + \ldots\ldots {}^nC_n (7)^n\right) - 7n - 1$$
$$= \left(1 + 7n + 49\,{}^nC_2 + \ldots\ldots + 49(7)^{n-2}\right) - 7n - 1$$
$$= 49\left({}^nC_2 + \ldots\ldots + 7^{n-2}\right)$$

$\therefore$ **$2^{3n} - 7n - 1$ is divisible by 49**

Hence, proved

Binomial Theorem Ex 18.1 Q7

$3^{2n+2}-8n-9$

$= 3^{2(n+1)}-8n-9$

$= 9^{n+1}-8n-9$

$= (1+8)^{n+1}-8n-9$

$= \left({}^{n+1}C_0+{}^{n+1}C_1 8^1+{}^{n+1}C_2 8^2+\ldots\ldots+{}^{n+1}C_{n+1}8^{n+1}\right)-8n-9$

$= \left(1+8(n+1)+64\,{}^{n+1}C_2+\ldots\ldots+64(8)^{n-1}\right)-8n-9$

$= 64\left({}^{n+1}C_2+\ldots\ldots+8^{n-1}\right)$

Thus, $3^{2n+2}-8n-9$ is divisible by 64.

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