



### Binomial Theorem Ex 18.1 Q3

We have,

$$\begin{aligned}
 (a+b)^4 - (a-b)^4 &= [{}^4C_0a^4b^0 + {}^4C_1a^3b^1 + {}^4C_2a^2b^2 + {}^4C_3a^1b^3 + {}^4C_4a^0b^4] \\
 &\quad - [{}^4C_0a^4b^0 - {}^4C_1a^3b^1 + {}^4C_2a^2b^2 - {}^4C_3a^1b^3 + {}^4C_4a^0b^4] \\
 &= [{}^4C_0a^4(-b)^0 + {}^4C_1a^3(-b)^1 + {}^4C_2a^2(-b)^2 + {}^4C_3a^1(-b)^3 + {}^4C_4a^0(-b)^4] \\
 &\quad - [{}^4C_0a^4(-b)^0 + {}^4C_1a^3(-b)^1 + {}^4C_2a^2(-b)^2 + {}^4C_3a^1(-b)^3 + {}^4C_4a^0(-b)^4] \\
 &= [{}^4C_0a^4 + {}^4C_1a^3b + {}^4C_2a^2b^2 + {}^4C_3ab^3 + {}^4C_4b^4] - [{}^4C_0a^4 - {}^4C_1a^3b + {}^4C_2a^2b^2 - {}^4C_3ab^3 + {}^4C_4b^4] \\
 &= {}^4C_0a^4 + {}^4C_1a^3b + {}^4C_2a^2b^2 + {}^4C_3ab^3 + {}^4C_4b^4 - {}^4C_0a^4 + {}^4C_1a^3b - {}^4C_2a^2b^2 + {}^4C_3ab^3 - {}^4C_4b^4 \\
 &= 2[{}^4C_1a^3b + {}^4C_3ab^3] \\
 &= 2[4a^3b + 4ab^3] \\
 &= 8[a^3b + ab^3]
 \end{aligned}$$

$$\therefore (a+b)^4 - (a-b)^4 = 8(a^3b + ab^3) \quad \text{---(i)}$$

Putting  $a = \sqrt{3}$  and  $b = \sqrt{2}$  in equation (i), we get

$$\begin{aligned}
 (\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4 &= 8[(\sqrt{3})^3 \times \sqrt{2} + (\sqrt{3}) \times (\sqrt{2})^3] \\
 &= 8[3\sqrt{6} + 2\sqrt{6}] \\
 &= 8 \times 5\sqrt{6} \\
 &= 40\sqrt{6}
 \end{aligned}$$

$$\therefore (\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4 = 40\sqrt{6}.$$

### Binomial Theorem Ex 18.1 Q4

We have,

$$\begin{aligned}
 (x+1)^6 - (x-1)^6 &= [{}^6C_0x^6 + {}^6C_1x^5 + {}^6C_2x^4 + {}^6C_3x^3 + {}^6C_4x^2 + {}^6C_5x^1 + {}^6C_6x^0] \\
 &\quad + [{}^6C_0x^6(-1)^0 + {}^6C_1x^5(-1)^1 + {}^6C_2x^4(-1)^2 + {}^6C_3x^3(-1)^3 + {}^6C_4x^2(-1)^4 + {}^6C_5x^1(-1)^5 + {}^6C_6x^0(-1)^6] \\
 &= [{}^6C_0x^6 + {}^6C_1x^5 + {}^6C_2x^4 + {}^6C_3x^3 + {}^6C_4x^2 + {}^6C_5x + {}^6C_6 - {}^6C_1x^5 + {}^6C_2x^4 - {}^6C_3x^3 + {}^6C_4x^2 - {}^6C_5x + {}^6C_6] \\
 &= 2[{}^6C_0x^6 + {}^6C_2x^4 + {}^6C_4x^2 + {}^6C_6] \\
 &= 2[x^6 + 15x^4 + 15x^2 + 1]
 \end{aligned}$$

$$\therefore (x+1)^6 + (x-1)^6 = 2[x^6 + 15x^4 + 15x^2 + 1] \quad \text{---(i)}$$

Putting  $x = \sqrt{2}$  in equation (i), we get

$$\begin{aligned}
 (x+1)^6 + (x-1)^6 &= 2[(\sqrt{2})^6 + 15(\sqrt{2})^4 + 15(\sqrt{2})^2 + 1] \\
 &= 2[8 + 60 + 30 + 1] \\
 &= 2[99] \\
 &= 198
 \end{aligned}$$

$$\therefore (x+1)^6 + (x-1)^6 = 198$$

### Binomial Theorem Ex 18.1 Q5(i)

We have,

$$\begin{aligned}
 (96)^3 &= (100 - 4)^3 \\
 &= {}^3C_0 \times 100^3 + {}^3C_1 \times 100^2 \times (-4) + {}^3C_2 \times 100 \times (-4)^2 + {}^3C_3 \times (-4)^3 \\
 &= 100^3 - 3 \times 100^2 \times 4 + 3 \times 100 \times 4^2 - 4^3 \\
 &= 1000000 - 120000 + 4800 - 64 \\
 &= 1004800 - 120064 \\
 &= 884736
 \end{aligned}$$

$$\therefore (96)^3 = 884736$$

\*\*\*\*\* END \*\*\*\*\*

