Ex-11.2

Binomial theorem:

$(a+x)^n = a^n + {}^nC_1 \cdot a^{n-1} \cdot x^1 + {}^nC_2 \cdot a^{n-2} \cdot x^2 + \cdots$

* The number of terms will be 1 more than the power in the question.

$(a-x)^n = a^n - {}^nC_1 \cdot a^{n-1} \cdot x^1 + {}^nC_2 \cdot a^{n-2} \cdot x^2 - \cdots$

* One plus and one minus
* No of terms in answer will be 1 more than power in question.

2) a) $(1+x)^4$

$\Rightarrow 1^4 + {}^4C_1 \cdot 1^{4-1} \cdot x + {}^4C_2 \cdot 1^{4-2} \cdot x^2 + {}^4C_3 \cdot 1^{4-3} \cdot x^3 + {}^4C_4 \cdot 1^{4-4} \cdot x^4$

$\Rightarrow 1 + 4x + 6x^2 + 4x^3 + x^4$

f) $(2-x)^5$

$\Rightarrow 2^5 - {}^5C_1 \cdot 2^{5-1} \cdot x^1 + {}^5C_2 \cdot 2^{5-2} \cdot x^2 - {}^5C_3 \cdot 2^{5-3} \cdot x^3 + {}^5C_4 \cdot 2^{5-4} \cdot x^4 - {}^5C_5 \cdot 2^{5-5} \cdot x^5$

$\Rightarrow \cancel{16 - 80x}\ 32 - 80x + 80x^2 - 40x^3 + 10x^4 - x^5$

l) $\left(x^2 + \frac{1}{2x^2}\right)^6$

$\Rightarrow (x^2)^6 + {}^6C_1 \cdot x^{2(6-1)} \cdot \left(\frac{1}{2x^2}\right)^1 + {}^6C_2 \cdot x^{2(6-2)} \left(\frac{1}{2x^2}\right)^2 + {}^6C_3 \cdot x^{2(6-3)} \cdot \left(\frac{1}{2x^2}\right)^3 + {}^6C_4 \cdot x^{2(6-4)} \cdot \left(\frac{1}{2x^2}\right)^4 + {}^6C_5 \cdot x^{2(6-5)} \cdot \left(\frac{1}{2x^2}\right)^5 + {}^6C_6 \cdot x^{2(6-6)} \cdot \left(\frac{1}{2x^2}\right)^6$

$\Rightarrow x^{12} + \left(6x^{10} \times \frac{1}{2x^2}\right) + \left(15x^8 \times \frac{1}{4x^4}\right) + \left(20x^6 \times \frac{1}{8x^6}\right) + \left(15x^4 \times \frac{1}{16x^8}\right) + \left(6x^2 \times \frac{1}{32x^{10}}\right) + \frac{1}{64x^{12}}$

$\Rightarrow x^{12} + 3x^8 + \frac{15}{4}x^4 + \frac{5}{2} + \frac{15}{16x^4} + \frac{3}{16x^8} + \frac{1}{64x}$

3 d) $(3+2x)^5$

3rd term: ${}^5C_3 \cdot 3^{5-3} \cdot (2x)^3$

$= 10 \times 9 \times 2x^3$

$= 720x^3$

h) $(4-5x)^{15}$

3rd term: $-{}^{15}C_3 \cdot 4^{(15-3)} \cdot (5x)^3$

$= (455 \times 16777216 \times 125x^3)$

$= -954204160000x^3$

4 h) $(4x-5y)^{10}$

$\Rightarrow (4x)^{10} - {}^{10}C_1 \cdot 4x^{10-1} \cdot (5y)^1 + {}^{10}C_2 \cdot 4x^{10-2} \cdot (5y)^2$

$\Rightarrow 1048576x^{10} - 13107200x^9y + 73728000x^8y^2$

8 a) $(1+2x)^7$

$\Rightarrow 1^7 + {}^7C_1 \cdot 1^{7-1} \cdot (2x)^1 + {}^7C_2 \cdot 1^{7-2} \cdot (2x)^2 + {}^7$

$\Rightarrow 1 + 14x + 84x^2$

b) $(1+14x+84x^2)(1-3x+5x^2)$

$\Rightarrow 1 + 14x + 84x^2 - 3x - 42x^2 - 252x^3 + 5x^2$
$+ 70x^3 + 420x^4$

$\Rightarrow x^2$ term: $84x^2 - 42x^2 + 5x^2$

$= 47x^2$

coefficient $= 47$

a) $(1+x)^7$

$\Rightarrow 1^7 + {}^7C_1 \cdot 1^{7-1} \cdot x^1 + {}^7C_2 \cdot 1^{7-2} \cdot x^2 + {}^7C_3 \cdot 1^{7-3} \cdot x^2$

$\Rightarrow 1 + 7x + 21x^2 + 35x^3$

b) $(1+y-y^2)^7$

$\Rightarrow 1^7 + {}^7C_1 \cdot 1^{7-1} \cdot (y-y^2)^1 + {}^7C_2 \cdot 1^{7-2} \cdot (y-y^2)^2$
$+ {}^7C_3 \cdot 1^{7-3} \cdot (y-y^2)^3$

$\Rightarrow 1 + 7(y-y^2) + 21(y-y^2)^2 + 35(y-y^2)^3$

$\Rightarrow 1 + 7(y-y^2) + 21(y^2 - 2y^3 + y^4)$
$+ 35(y^3 - {}^3C_1 \cdot y^{3-1} \cdot (y^2)^1 + {}^3C_2 \cdot y^{3-2} \cdot (y^2)^2 - {}^3C_3 \cdot y^{3-3} \cdot (y^2)^3)$

$\Rightarrow 1 + 7y - 7y^2 + 21y^2 - 42y^3 + 21y^4$
$+ 35(y^3 - 3y^4 + 3y^5 - y^6)$

$\Rightarrow 1 + 7y - 7y^2 + 21y^2 - 42y^3 + 21y^4 + 35y^3 - 105y^4$
$+ 105y^5 - 35y^6$

coeffiecient of $y^3 = 35y^3 - 42y^3$
$= -7$