$(a+b)^n$.

$(1+x)^{15}$.

$$\begin{array}{ccccccccc} & & & & 1 & & & & \\ & & & 1 & & 2 & 1 & & \\ & & 1 & & 3 & 3 & & 1 & \\ & 1 & 4 & & 6 & & 4 & & 1 \end{array}$$

$n=4$.

Find the first 4 terms of $(1+x)^{15}$.

Soln: $(1+x)^{15} = 1^{15} + 15(1)^{14}x + \frac{15\times 14}{2}1^{13}x^2 + \frac{15\times 14\times 13}{3!}1^{12}x^3 + \dots$

$= 1 + 15x + 105x^2 + 455x^3 + \dots$

$(5-x)^{10} = [5+(-x)]^{10}$.

Expand $a=5$ & $b=-x$, $n=10$.

$(5-x)^{10} = 5^{10} + 10\,5^9(-x) + \frac{10\times 9}{2}5^8(-x)^2 + \frac{10\times 9\times 8}{3!}5^7(-x)^3$

$=$

Expand $\frac{1}{1+x}$

Soln: $(1+x)^{-1}$. Substituting $n=-1$ into

$$(1+x)^n = 1+nx+\frac{n(n-1)}{2!}x^2+\frac{n(n-1)(n-2)}{3!}x^3+\cdots$$

$$(1+x)^{-1} = 1-x+\frac{(-1)(-2)}{2!}x^2+\frac{(-1)(-2)(-3)}{3!}x^3$$

$$+\frac{(-1)(-2)(-3)(-4)}{4!}x^4+\cdots$$

$$= 1-x+x^2-x^3+x^4-\cdots$$

Expand $(1+x)^{1/2}$.

Soln: $(1+x)^n = 1+nx+\frac{n(n-1)}{2!}x^2+\frac{n(n-1)(n-2)}{3!}x^3+\cdots$

$$(1+x)^{1/2} = 1+\frac{1}{2}x+\frac{\frac{1}{2}(\frac{1}{2}-1)}{2!}x^2+\frac{\frac{1}{2}(\frac{1}{2}-1)(\frac{1}{2}-2)}{3!}x^3+\cdots$$

$$= 1+\frac{1}{2}x+\frac{1}{2}\left(-\frac{1}{2}\right)\cdot\frac{1}{2}x^2+\frac{1}{2}\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)\frac{1}{\cancel{3!}\,2}x$$

$$= 1+\frac{1}{2}x - \frac{x^2}{8}+\frac{x^3}{16}-\cdots$$