12-2 Pascal's Triangle and Binomial Theorem

Expand $(a+b)^n$ = n+1 terms

Pascal's △

$(a+b)^0 = 1$

$(a+b)^1 = 1a^1 + 1b^1$

$(a+b)^2 = 1a^2 + 2a^1b^1 + 1b^2$

$(a+b)^3 = 1a^3 + 3a^2b^1 + 3a^1b^2 + 1b^3$

$(a+b)^4 = 1a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + 1b^4$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1

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① Expand $(x - 2y)^5$ (a = x, b = −2y)

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1

$1(x)^5 + 5(x)^4(-2y)^1 + 10(x)^3(-2y)^2 + 10(x)^2(-2y)^3 + 5(x)^1(-2y)^4 + 1(-2y)^5$

$x^5 - 10x^4y + 40x^3y^2 - 80x^2y^3 + 80xy^4 - 32y^5$

BINOMIAL THEOREM

$$(a+b)^n = \sum_{r=0}^{n} {}_nC_r\, a^{n-r} b^r$$

n+1 terms; ${}_nC_r$ = Pascal # = $\frac{n!}{r!(n-r)!}$

② Find the coefficient of x^7 in $(2 - 3x)^{10}$

$\frac{10!}{7!3!}(2)^3(-3x)^7 = 120(8)(-2187x^7) = -2,099,520x^7$

$\frac{10\cdot 9\cdot 8}{6} = 120$

$$(a+b)^n = \sum_{r=0}^{n} {}_nC_r\, a^{n-r} b^r$$

③ Find the 5th term of $(2 - 3x)^{10}$

r = 0 1 2 3 ④

$\frac{10!}{6!4!}(2)^6(-3x)^4$

$\frac{10\cdot 9\cdot 8\cdot 7}{4\cdot 3\cdot 2\cdot 1}$

$210(64)(81x^4)$

$1,088,640x^4$