March 29, 2022

Binomial Expansion Theorem

$(x+y)^0 = 1$

$(x+y)^1 = 1x + 1y$

$(x+y)^2 = x^2 + 2xy + y^2$

$(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$

$(x+y)^4 = x^4y^0 + 4x^3y + 6x^2y^2 + 4xy^3 + 1y^4$

$(x+y)^5 = 1x^5y^0 + 5x^4y^1 + 10x^3y^2 + 10x^2y^3 + 5x^1y^4 + 1x^0y^5$

Pascal's Δ

Row 0	1					
Row 1	1	1				
Row 2	1	2	1			
	1	3	3	1		
	1	4	6	4	1	
	1	5	10	10	5	1
	$_5C_0$	$_5C_1$	$_5C_2$	$_5C_3$	$_5C_4$	$_5C_5$

$(3x-2y)^4 = 1(3x)^4\cancel{(-2y)^0} + 4(3x)^3(-2y)^1 + 6(3x)^2(-2y)^2 + \boxed{4(3x)^1(-2y)^3} + 1\cancel{(3x)^0}(-2y)^4$

1st 2nd 3rd

$(3x)^4 - 4(3x)^3(2y) + 6(3x)^2(2y)^2 - 4(3x)(2y)^3 + (2y)^4$

$4 \cdot 3^3 \cdot 2 \quad 6 \cdot 3^2 \cdot 2^2 \quad 4 \cdot 3 \cdot 2^3$

$81x^4 - 216x^3y + 216x^2y^2 - 96xy^3 + 16y^4$

Find the 4th term of $(3x-2y)^4$.

${}_4C_3\,(3x)^1(-2y)^3$

← power on y is one less than number of term.

Calculate: ${}_4C_3 \cdot 3^1 \cdot (-2)^3 = -96$

$= \boxed{-96x^1y^3}$

Find the 7th term of $(5x-4y)^{10}$

${}_{10}C_6\,(5x)^4(-4y)^6$

${}_{10}C_6 \cdot 5^4 \cdot (-4)^6$

$= \boxed{537{,}600{,}000\,x^4y^6}$

BINOMIAL PROBABILITY

1) 2 possible outcomes
2) Independent Events — same chance every time the action is performed

Kirby Kicker — makes 65% of field goals under 40 yards.

What is the probability hits exactly 5 of his next 7 attempts?

$${}_7C_2 S^5 F^2$$

$${}_7C_2 (0.65)^5 (0.35)^2 \approx 0.298$$

10 Questions - Mult. Choice
A, B, C, D

What is prob. of exactly 8 right?

$${}_{10}C_2 R^8 W^2$$

$${}_{10}C_2 (0.25)(0.75)^2 = 0.000386$$