PASCAL'S THEOREM

Binomial Expansion

Try this …

- Calculate the following:

  ${}_3C_0$ ${}_3C_1$ ${}_3C_2$ ${}_3C_3$

- Does this look familiar?

  It is Row 3 of Pascal's Triangle.

Pascal's Triangle

						1						
					1		1					
				1		2		1				
			1		3		3		1			
		1		4		6		4		1		
	1		5		10		10		5		1	
1		6		15		20		15		6		1

Pascal's Triangle (Cont)

- Now that you are familiar with combinations, there is another important pattern that you can recognize.
- Each term in Pascal's triangle corresponds to a value of ${}_nC_r$.

Pascal's Triangle

We know that ${}_3C_1 + {}_3C_2 = {}_4C_2$.
Identify a new pattern.

$${}_0C_0$$

$${}_1C_0 \quad {}_1C_1$$

$${}_2C_0 \quad {}_2C_1 \quad {}_2C_2$$

$${}_3C_0 \quad {}_3C_1 \quad {}_3C_2 \quad {}_3C_3$$

$${}_4C_0 \quad {}_4C_1 \quad {}_4C_2 \quad {}_4C_3 \quad {}_4C_4$$

$${}_5C_0 \quad {}_5C_1 \quad {}_5C_2 \quad {}_5C_3 \quad {}_5C_4 \quad {}_5C_5$$

$${}_6C_0 \quad {}_6C_1 \quad {}_6C_2 \quad {}_6C_3 \quad {}_6C_4 \quad {}_6C_5 \quad {}_6C_6$$

Pascal's Theorem

- In general, we can say that

  $_{n}C_{r} + {_{n}C_{r+1}} = {_{n+1}C_{r+1}}$

- Example:

1. Rewrite the following using Pascal's Theorem:
   a) $_{19}C_{4}$ = ______ + ______
   b) $_{8}C_{7} + {_{8}C_{6}}$ = ______
   c) $_{13}C_{8} - {_{12}C_{8}}$ = ______
   d) $_{20}C_{6} - {_{19}C_{5}}$ = ______

Expanding Binomials

- Expand and simplify $(a + b)^2$.

- Expand and simplify $(a + b)^3$.

- Do these look familiar?

  The coefficients are found in Pascal's triangle.

Binomial Expansion

Examples

1. Use combinations to expand $(a + b)^6$.

Examples (continued)

2. Use Pascal's triangle to expand the following:

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

b) $(3x - 2y)^5$

Homework

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