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		
	1		7		21		35		35		21		7		1	
1		8		28		56		70		56		28		8		1

The coefficients of $(x+y)^n$ can be obtained from the $(n+1)^{\text{st}}$ row of Pascal's Triangle.

For example:

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

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

Quadratic Formula

$$ax^2 + bx + c = 0 \iff x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Completing the Square

$$ax^2 + bx + c = a\left(x + \frac{b}{2a}\right)^2 + \left(c - \frac{b^2}{4a}\right)$$

Special Factors

$$A^2 - B^2 = (A-B)(A+B)$$

$$A^3 - B^3 = (A-B)(A^2 + AB + B^2)$$

$$A^3 + B^3 = (A+B)(A^2 - AB + B^2)$$

$$A^4 - B^4 = (A+B)(A-B)(A^2 + B^2)$$

Logarithms

$$\log_a 1 = 0$$

$$\log_a a^x = x$$

$$\log_a xy = \log_a x + \log_a y$$

$$\log_a \frac{x}{y} = \log_a x - \log_a y$$

$$\log_a x^y = y \log_a x$$

$$\log_a x = \frac{\log_b x}{\log_b a}$$

Absolute Value

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

$$|-x| = |x|$$

$$|xy| = |x| \cdot |y|$$

$$\left|\frac{x}{y}\right| = \frac{|x|}{|y|}$$

$$|x|^2 = x^2$$

$$\sqrt{x^2} = |x|$$

$$|x| = p \iff x = -p \text{ or } x = p$$

$$|x| < p \iff -p < x < p$$

$$|x| > p \iff x < -p \text{ or } x > p$$

Triangle Inequality

$$|x+y| \leq |x| + |y|$$

Lines

Slope: $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Point-Slope Form: $y - y_1 = m(x - x_1)$

Slope-Intercept Form: $y = mx + b$

Standard Form: $Ax + By = C$

Vertical Lines: $x = a$

Horizontal Lines: $y = b$

Distance Formula

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Midpoint Formula

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Inverse Functions

$$y = f(x) \iff x = f^{-1}(y)$$

Compound Interest

n times per year: $A = P\left(1 + \dfrac{i}{n}\right)^{nt}$

Continuously: $A = Pe^{it}$