**Math Workshop Instructor Resources:**

# Volume

**Pyramid**

$$V = \frac{h}{3} \cdot (\text{Area of Base})$$

**Sphere**

$$V = \frac{4}{3}\pi r^3$$

**Cone**

$$V = \frac{h}{3} \cdot (\text{Area of Base})$$

# Binomial Theorem

$$a+b\ ^n = \sum_{k=0}^{n} \binom{n}{k} a^{n-k} b^k$$

# kth Term of the Binomial Expansion

$$\binom{n}{k-1} x^{n-(k-1)} y^{k-1}$$

# Summation Formulas

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}$$

## Arithmetic Sequences

$$d = a_n - a_{n-1}$$

$$a_n = d(n-1) + a_1$$

$$S_n = \frac{1}{2} n(a_1 + a_n)$$

## Geometric Sequences

$$a_n = a_1 r^{n-1}$$

$$S_n = \frac{a_1(1-r^n)}{1-r}, r \neq 1$$

$$r = \frac{a_{n+1}}{a_n}$$

## Work

$$W = d \cdot F$$

## Half-Angle Identity

$$\sin\frac{\alpha}{2} = \pm\sqrt{\frac{1-\cos\alpha}{2}}$$

$$\cos\frac{\alpha}{2} = \pm\sqrt{\frac{1+\cos\alpha}{2}}$$

## Product Theorem

$$[r_1(\cos\theta_1 + i\sin\theta_1)] \cdot [r_2(\cos\theta_2 + i\sin\theta_2)] = r_1 r_2 \text{cis}(\theta_1 + \theta_2)$$

## De Moivre's Theorem

$$[r(\cos\theta + i\sin\theta)]^n = r^n[\cos(n\theta) + i\sin(n\theta)]$$