Sigma Notation

Write the sum in expanded form.

- $\sum_{i=1}^{5} \sqrt{i}$
- $\sum_{i=1}^{n} i^{10}$
- $\sum_{i=4}^{6} 3^{i}$
- $\sum_{j=0}^{n-1} (-1)^{j}$

Write the sum in sigma notation.

- $\frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \frac{4}{5} + \ldots + \frac{19}{20}$
- $x + x^2 + x^3 + \ldots + x^n$

Find the value of the sum.

- $\displaystyle\sum_{i=4}^{8}(3i-2)$

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

Important Formulas

- $\displaystyle\sum_{i=1}^{n} 1 = n$
- $\displaystyle\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$
- $\displaystyle\sum_{i=1}^{n} i^3 = \left[\frac{n(n+1)}{2}\right]^2$
- $\displaystyle\sum_{i=1}^{n} c = nc$
- $\displaystyle\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$

1. $\frac{1}{j(j+1)}$ can be written as $\frac{A}{j} + \frac{B}{j+1}$, where A and B are numbers. What are A and B?

2. Evaluate $\displaystyle\sum_{j=1}^{n} \frac{1}{j(j+1)}$.

3. Evaluate $\displaystyle\lim_{n\to\infty} \sum_{j=1}^{n} \frac{1}{j(j+1)}$.

- Evaluate $\displaystyle\lim_{n\to\infty} \sum_{i=1}^{n} \frac{1}{n} \left(\frac{i}{n}\right)^2$.

1. Let A_n be the area of a polygon with n equal sides inscribed in a circle with radius r. By dividing the polygon into n congruent triangles with central angle $\frac{2\pi}{n}$, show that:

$$A_n = \frac{1}{2} n r^2 \sin\left(\frac{2\pi}{n}\right)$$

2. Show that $\lim_{n\to\infty} A_n = \pi r^2$. (Recall: $\lim_{\theta\to 0} \frac{\sin\theta}{\theta} = 1$)