

Example 1. Find the series $\sum a_n$, where $a_n = \frac{3}{10^n}$.

Example 2. Find the series $\sum b_n$, where $b_n = \frac{1}{2^{n-1}}$.

Example 3 The **Geometric Series** $\sum ar^{n-1}$, where $|r| \leq 1$.

Example 4. Whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} 3^n (-4)^{1-n}$$

Example 5. Express $2.\overline{45}$ as a ratio of integers.

Example 6. Find the sum of the series

$$2 - \frac{2}{3} + \frac{2}{9} - \frac{2}{27} + \frac{2}{81} - \frac{2}{243} + \cdots$$

Example 7. Whether the following series converges or diverges.

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

Example 8. Whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} 3^n (2)^{1-n}$$

Example 9. Express $1.\overline{56}$ as a fraction.

Example 10. Whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{3^{2n}}{7^n}$$

Example 11. Whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{2n^2 - 1}{3n^2 - 5}$$

Example 12. Whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} (-1)^n$$

Example 13. Whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} 2^{1/n}$$

Example 14. The **Harmonic Series** $\sum_{n=1}^{\infty} \frac{1}{n}$ diverges.

Example 15. Find the sum of the series

$$\sum_{n=1}^{\infty} \left(\frac{2}{n(n+1)} + \frac{1}{3^n} \right)$$