



Practice Solutions – VIII

1. Determine if the following geometric series are convergent or divergent. Calculate the sum, where possible.

a. $1 + 3 + 9 + \dots$

First, calculate r :

$$r = \frac{t_n}{t_{n-1}}$$

$$r = \frac{3}{1} = 3$$

Because $r > 1$, this series is divergent; therefore, a sum cannot be determined.

b. $8 + 4 + 2 + \dots$

$$r = \frac{t_n}{t_{n-1}}$$

$$r = \frac{4}{8} = \frac{1}{2}$$

Because $-1 < r < 1$, this series is convergent; therefore, a sum can be determined.

$$S_{\infty} = \frac{t_1}{1 - r}$$

$$S_{\infty} = \frac{8}{1 - \frac{1}{2}}$$

$$S_{\infty} = 16$$

2. Andrea has rented a post pounder over the long weekend in order to put in the upright posts for her new fence. She noticed that on the first hit, the post moved 25 cm, and on the second hit, the post moved 10 cm. Assume the distance the post moves after each hit follows a geometric series.

- a. In total, how far has the post moved after the third hit?

The series is $25 + 10 + \dots$

To find the sum of the first three terms, start by finding r :

$$r = \frac{t_n}{t_{n-1}}$$

$$r = \frac{10}{25} = 0.4$$

Then, the sum of the first three terms can be found using a sum of a geometric series formula.

$$\begin{aligned}t_1 &= 25 & S_n &= \frac{t_1(r^n - 1)}{r - 1} \\r &= 0.4 & S_3 &= \frac{25((0.4)^3 - 1)}{0.4 - 1} \\n &= 3 & & \\S_3 &= ? & S_3 &= 39\end{aligned}$$

After three hits, the total distance the post has moved is 39 cm.

- b. If given an infinite number of hits, how far down would the post have moved?

$$\begin{aligned}S_\infty &= \frac{t_1}{1 - r} \\S_\infty &= \frac{25}{1 - 0.4} \\S_\infty &= 41.\overline{6}\end{aligned}$$

If Andrea continues to hit the post forever, theoretically the post will only move a total of 41.67 cm.

Please complete *Lesson 1.4 Explore Your Understanding Assignment*, *Final Review Assignment*, and *Check Point* located in *Workbook 1B*.