Concepts and Examples
Applications of Geometric Sequences and Series

Based on power point presentations by Pearson Education, Inc.
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Learning Objective

Solve application problems involving geometric sequences and series.

Solve Applications involving Geometric Sequences and Series

We will use the following formulas when solving applications involving geometric sequences and series.

Any term of a *geometric sequence* with first term a_1 and common ratio r can be found by using the following formula:

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

We can evaluate the sum of a finite geometric series using the following formula:

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

We can evaluate the sum of an infinite geometric series using the following formula:

$$S = \frac{a_1}{1-r}$$

Example 1: Solve Applications Involving Geometric Sequences and Series (1 of 2)

You are going on a vacation to Hawaii in a few months. You already paid for your flight and hotel. To have spending money you decide to save your pennies next month from the 1st until your birthday on the 16th (you are hoping for some money gifts).

Here is what you want to do: on the 1st you will put 1 cent in your money jar, on the 2nd you will add 2 cents, on the 3rd you will add 4 cents, on the 4th you will add 8 cents, on the 5th you will add 16 cents, and so on.

Find the amount of money you add to your money jar on the 16th and find the total amount of money in your money jar on the 16th.

To find the amount of money you add to your money jar on the 16th, we will use the formula $\mathbf{a_n = a_1 r^{n-1}}$.

We know that $a_1 = 1$, $n = 16$, and $r = 2$. Then $a_{16} = 1(2)^{16-1} = (2)^{15} = 32768$.

You must add 32768 cents or \$327.68 to your money jar on the 16th.

Example 1: Solve Applications Involving Geometric Sequences and Series (2 of 2)

To find the total amount of money in your money jar on the 16th , we will use the sum formula

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

We know that $a_1 = 1$, $n = 16$, and $r = 2$.

Then $S_{16} = \frac{1(1-2^{16})}{1-2} = \frac{-65535}{-1} = 65535$

The total amount of money in your money jar on the 16th are 65,535 pennies or $655.35.

Example 2: Solve Applications Involving Geometric Sequences and Series (1 of 2)

A ball is dropped from a height of 16 feet. Each time it drops, it rebounds 80% of the height from which it is falling. Find the distance traveled on the 15^{th} bounce and the total distance traveled in 15 bounces. Round your answers to one decimal place.

To find the distance of the ball traveled on the 15^{th} bounce, we will use the formula

$\mathbf{a_n = a_1 r^{n-1}}$.

We know that $a_1 = 16$, $n = 15$, and $r = 80\% = 0.8$.

Then $a_{15} = 16(0.8)^{15-1} = 16(0.8)^{14} \approx 0.7$.

The distance of the ball traveled on the 15^{th} bounce is approx. 0.7 feet.

Example 2: Solve Applications Involving Geometric Sequences and Series (2 of 2)

To find the total distance of the ball traveled in 15 bounces, we will use the sum formula

$\mathbf{S_n = \frac{a_1(1-r^n)}{1-r}}$.

We know that a_1 = 16, n = 15, and r = 80% = 0.8.

Then $S_{15} = \frac{16(1-0.8^{15})}{1-0.8} \approx 77.2$

The total distance of the ball traveled in 15 bounces is approx. 77.2 feet.