

Pre-Calculus Notes

Name: Key

Applications with Sequences and Series

For each word problem, you will want to first decide if the scenario describes is a sequence or series, and then whether it is arithmetic or geometric.

1. An object with negligible air resistance falls from the top of the Sears Tower in Chicago at a height of 1454 feet. During the 1st second, it falls 16 ft.; during the 2nd second it falls 48 ft.; during the 3rd it falls 80 ft. If this arithmetic pattern continues, how many feet will the object fall in the 7th second?

Are we finding the term of a sequence or the sum of a series? term of a sequence

Is this arithmetic or geometric?

$$16, 48, 80 \quad \text{arithmetic}$$

$+32 \quad +32$

$$a_n = 16 + (n-1)32$$

$$a_7 = 16 + (7-1)32$$

$$a_7 = 208$$

$$\boxed{208 \text{ feet}}$$

2. Given the object described in Example 1, how many total feet will it fall in 7 seconds?

Are we finding the term of a sequence or the sum of a series? Sum of a series

Is this arithmetic or geometric?

$$16 + 48 + 80 + \dots \quad \text{arithmetic}$$

$$S_7 = \frac{7(2 \cdot 16 + (7-1) \cdot 32)}{2}$$

$$S_7 = 784$$

$$\boxed{784 \text{ feet}}$$

3. On the day she was born, Jesse's grandparents deposited \$1000 in a special account for her. The account earns 6% interest compounded quarterly. How much money is in the account the day after Jesse's tenth birthday? Assume that income taxes paid on the account are paid from another source.

Remember: $A = P \left(1 + \frac{r}{n}\right)^{nt}$

Are we finding the term of a sequence or the sum of a series? terms of a sequence

Is this arithmetic or geometric? geometric

What would be in the account if interest is compounded monthly?

$$A = 1000 \left(1 + \frac{0.06}{4}\right)^{4 \cdot 10}$$

$$\boxed{A \approx \$1814.02}$$

$$A = 1000 \left(1 + \frac{0.06}{12}\right)^{12 \cdot 10}$$

$$\boxed{A \approx \$1819.40}$$

4. A deposit of \$50 is made at the beginning of each month in an account that pays 8%, compounded monthly. The balance A in the account at the end of 5 years is...?

Lets look at the balance working backwards...

5 years =
60 months

$$A = 50 \left(1 + \frac{0.08}{12}\right)^1 + 50 \left(1 + \frac{0.08}{12}\right)^2 + \dots + 50 \left(1 + \frac{0.08}{12}\right)^{60}$$

Are we finding the term of a sequence or the sum of a series? Sum of a series

Is this arithmetic or geometric? geometric

$$A = \sum_{n=1}^{60} 50 \left(1 + \frac{0.08}{12}\right)^n$$

$$S_{60} = \frac{\frac{151}{3} \left(1 - \frac{151}{150}^{60}\right)}{1 - \frac{151}{150}}$$

$$\boxed{S_{60} \approx \$3698.34}$$

$a_1 = \frac{151}{3}$
 $a_2 = \frac{22801}{450}$
 $50r = \frac{151}{150}$