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A Series of Fortunate Events

Applications of Arithmetic and Geometric Series

LEARNING GOALS

In this lesson, you will:

- Apply your understanding of series to problem situations.
- Determine whether a situation is best modeled by a geometric or arithmetic series.

Have you ever heard the expression "money can't buy happiness"? Do you think it's true? People spend a lot of time and mental energy dreaming about having a lot of money or material possessions. It's interesting to think about whether winning the lottery or suddenly acquiring a lot of fancy things would actually make you a happier person. Researchers at universities across the globe have studied this question, and some of the results of the studies may surprise you.

- Lottery winners often become less satisfied with life's simple pleasures over time.
- Once earnings surpass the ability to purchase essential items (food, clothing, shelter, etc.), additional money generally doesn't lead to an increase in happiness.
- Wealthy people tend to relish positive life experiences much less than people who aren't wealthy.

That isn't to say that money isn't important. Making sound financial decisions can save you a lot of headaches and put you in a position where you aren't worrying about money. However, research says that having a lot of money won't necessarily make you a happier person.

What financial decisions have you made so far in your life? What important financial decisions are coming up?

PROBLEM 1 A Time of Serious Financial Decisions

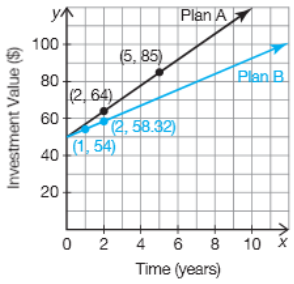
Some of the most important financial decisions often occur during the years following the completion of high school or college. This is a time when young adults usually face their first serious choices about things such as a career, buying a car, assuming a mortgage for a house, or investing money in the bank.

1. Benjamin is anxious. After finishing his undergraduate degree he must take the GRE in order to get into graduate school, but the amount of information that he needs to cover is overwhelming. "I only have a month to prepare!" he exclaims. Sally tells him to calm down and start slowly. She recommends studying just 15 minutes the first day, but adding 3 minutes every day to his study time.

   "But a friend told me that you have to study at least 20 hours to get ready for this thing! I think I need a different plan."

   Will Sally's plan lead to enough study time? Show all work and explain your reasoning.

2. Carlos meets up with Jake after a visit to the bank. He has a confused look. Carlos said, "I wanted to determine the best way to invest my money, but everybody at the bank was busy. I found this graph showing how $50 increases over time from two of their investment options."



"So what's the problem?" Jake asks.

Carlos explains his dilemma: "I want to invest my money in a plan and keep it there for 20 years. This brochure was ripped and only shows the first few years. I need to know which plan is a better long-term investment.

a. Are the investment plans arithmetic or geometric? Explain your reasoning.

b. Determine the better investment for Carlos. Show all work and explain your reasoning.

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3. Rhonda is considering two different physical therapist positions.

- Range of Motion offers an initial salary of $50,000 per year with annual increases of $1,500 per year.
- Mobility, Inc. offers an initial salary of $42,000 with a guaranteed 4% increase in salary every year.

a. Is this situation arithmetic or geometric? Explain your reasoning.

b. Determine the years for which Range of Motion pays more than Mobility, Inc. Show all work and explain your reasoning.

c. Determine which company pays more salary over a 30-year career. Show all work and explain your reasoning.

PROBLEM 2 If This Wordplay Doesn't End, I Might "Series-ly" Get Sick!

1. A stomach virus spreads rapidly through a town. Initially only 12 people were infected, but the virus spreads quickly, increasing the number of people infected by 15% every day.
   a. How many new people are infected on the 10th day? Show all work and explain your reasoning.

   b. How many total people were infected on the 10th day? Show all work and explain your reasoning.

2. A total of 123,000 cases of a different cold virus were reported throughout the country in a particular year. The production and distribution of a vaccine is projected to decrease the number of reported cases by 26% every year.
   a. Approximately how many new cases will be reported in 15 years? Show all work and explain your reasoning.

   b. A company reports that vaccine production will cost approximately $9 per person. Estimate the total cost of production for the next 15 years.

   c. Will the virus be eliminated? If so, when? Show all work and explain your reasoning.

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Be prepared to share your solutions and methods.