

Infinite Geometric Series and Applications

Can you find sum of an infinite series?

Consider the infinite geometric series: $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \dots$

Find the sum of...
the first 2 terms:

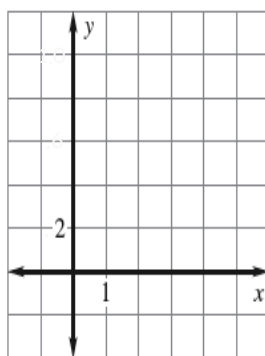
the first 3 terms:

the first 4 terms:

the first 5 terms:

the first 6 terms:

Graph the sums.



What happens to the sum as n increases??

The sum of an infinite geometric series with the first term u_1 and a common ratio r is:

$$S_{\infty} = \frac{u_1}{1-r}$$

This will only be true for a geometric series if $-1 < r < 1$

S_{∞} represents the sum as it goes to infinity!

Find the sum of the infinite geometric series.

a. $\sum_{i=1}^{\infty} 5(0.8)^{i-1}$

b. $1 - \frac{3}{4} + \frac{9}{16} - \frac{27}{64} + \dots$

c. $1 - 3 + 9 - 27 + 81 - 243 \dots$

d. $3 + \frac{3}{4} + \frac{3}{16} + \frac{3}{64} + \dots$

Find the sum of the infinite geometric series, if it exists.

3.
$$\sum_{i=1}^{\infty} 5\left(\frac{1}{2}\right)^{i-1}$$

4.
$$\sum_{i=1}^{\infty} \left(\frac{1}{5}\right)^{i-1}$$

5.
$$\sum_{i=1}^{\infty} 3\left(-\frac{2}{5}\right)^{i-1}$$

6.
$$\sum_{i=0}^{\infty} 2(6)^{i-1}$$

7.
$$\sum_{i=1}^{\infty} 6\left(\frac{2}{3}\right)^{i-1}$$

8.
$$\sum_{i=1}^{\infty} 8\left(\frac{1}{3}\right)^{i-1}$$

For the series $18 + 6 + 2 + \dots$, find S_{10} , S_{15} and S_{∞} .

The sum of the first three terms of a geometric series is 148, and the sum to infinity is 256.
Find the first term and the common ratio of the series.

Applications of geometric and arithmetic patterns



You want to earn some money, so you ask your parents if they will pay you to keep your room clean every day for the month of March. You explain to your parents that you are not asking for much money, just a penny the first day, 2 pennies the second day, double that to 4 cents the next day, then 8 cents on the 4th day on so on. I'm sure your parents would love to see your room clean!

If they say yes, how much would they pay you on March 10th,
how much on March 30th?

A health club rolls its towels and stacks them in layers on a shelf. Each layer of towels has one less towel than the layer below it.

Use correct math notation when you do the work.



a. If there are 20 towels on the first row, how many towels are on the 6th row? Does this represent a series or a sequence?

b. How many towels are there if the stack has 12 rows? Does this represent a series or a sequence?

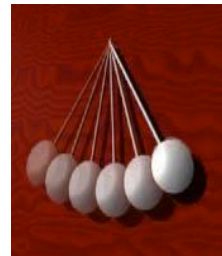
A person deposits \$1000 in an account which pays interest at 4% APR, compounded quarterly. Assuming the person makes no additional withdrawals or deposits, how much will be in the account after ten years?

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

The population of a small town increases by 2% per year. If the population at the start of 1980 was 12 500, what is the predicted population at the start of 2020?

(n represents the # of years)

PENDULUMS On its first swing, a pendulum travels 8 feet. On each successive swing, the pendulum travels $\frac{4}{5}$ the distance of its previous swing. What is the total distance traveled by the pendulum when it stops swinging?



Homework

Chapter 6.7

6K: 1, 2(d), 3, 4, 6

Chapter 6.8

6L: 2, 3, 4, 7, 10, 11

Need Extra Practice?

Series & Sequence Application WS

Haese and Harris Chapter 2:

Infinite Series - Ch 2 E.4

Applications - Ch 2 D.2, D.3