LESSON MAKER PRO

Series Sum Sprint

Use geometric-series formulas for finite and infinite sums.

HIGH SCHOOL · MA.912.AR.10.4

MA.912.AR.10.4 "Recognize and apply the formula for the sum of a finite or an infinite geometric series to solve mathematical and real-world problems."

NAME _____ DATE _____

SUM IT UP

For a finite geometric series with first term a_1, common ratio r, and n terms, use $S_n = a_1(1-r^n)/(1-r)$. For an infinite geometric series, use $S = a_1/(1-r)$ only when $|r| < 1$.

WORKED EXAMPLE

Find the sum of the first 4 terms of a geometric series with $a_1 = 9$ and $r = -1/3$.

1. Identify $a_1 = 9$, $r = -1/3$, and $n = 4$.
2. $S_4 = 9[1-(-1/3)^4]/[1-(-1/3)]$.
3. $S_4 = 9(1-1/81)/(4/3) = 20/3$.

Answer: 20/3

PRACTICE 6 problems

1 Find the sum of the first 6 terms of a geometric series with $a_1 = 5$ and $r = 1/2$.

ANSWER _____

2 Find the sum of the first 5 terms of a geometric series with $a_1 = 7$ and $r = -2$.

ANSWER _____

3 Find the sum of the infinite geometric series with $a_1 = 12$ and $r = 1/6$.

ANSWER _____

4 Find the sum of the first 2 terms of the series $150 + 30 + 6 + \ldots$

ANSWER _____

5 An infinite geometric series has sum 30 and common ratio 1/5. Find its first term.

ANSWER _____

6 Find the sum of the first 7 terms of a geometric series with $a_1 = 2$ and $r = -1/2$.

ANSWER _____

APPLY IT Show your work

1 A student earns $160 from a design job in the first month. Each following month, the student earns half as much as the month before. How much will the student earn during the first 6 months?

WORK SPACE

ANSWER _____

2 A music app gives 60 bonus points on the first day of a promotion. Each new day's bonus is 2/3 of the previous day's bonus. If the pattern continues forever, how many total bonus points will the app give?

WORK SPACE

ANSWER _____

CHALLENGE One step up

The sum of the first n terms of the geometric series 2 + 6 + 18 + ... is 728. Find n.

WORK SPACE AND ANSWER

ANSWER KEY

Series Sum Sprint

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the sum of the first 6 terms of a geometric series with $a_1 = 5$ and $r = 1/2$.	**315/32**
2	Find the sum of the first 5 terms of a geometric series with $a_1 = 7$ and $r = -2$.	**77**
3	Find the sum of the infinite geometric series with $a_1 = 12$ and $r = 1/6$.	**72/5**
4	Find the sum of the first 2 terms of the series 150 + 30 + 6 + ...	**180**
5	An infinite geometric series has sum 30 and common ratio 1/5. Find its first term.	**24**
6	Find the sum of the first 7 terms of a geometric series with $a_1 = 2$ and $r = -1/2$.	**43/32**

PART 2 · APPLY IT

1. **$315** Use $a_1 = 160$, $r = 1/2$, and $n = 6$ in the finite geometric-series formula. The sum is $160(1-(1/2)^6)/(1-1/2) = 315$.
2. **180 points** Because $|2/3| < 1$, use the infinite geometric-series formula. The sum is $60/(1-2/3) = 180$.

CHALLENGE

n=6

Accept equivalent fraction forms and mixed numbers where appropriate. For infinite-series items, students should use the formula only when the common ratio has absolute value less than 1.