ALBERT

Name _____ Date _____

Geometric Series Worksheet

Algebra 2 · Common Core HSA-SSE.B.4

> Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.

Practice

Builds the skill step by step.

1. Find the sum: $2 + 4 + 8 + 16 + 32$.

2. What is the common ratio of 3, 6, 12, 24, ...?

3. Find the sum: $1 + 3 + 9 + 27$.

4. Which is the sum of the first n terms of a geometric series with first term a and ratio $r \neq 1$?

   A. $a(1 - r) \div (1 - r^n)$

   B. $a(1 - r^n) \div (1 - r)$

   C. na

   D. $a + (n - 1)r$

5. A geometric series has first term 5 and ratio 2. What is the sum of its first 4 terms?

6. Find the sum: $100 + 50 + 25 + 12.5$.

7. How many terms are in 3 + 6 + 12 + … + 96?

8. Use the formula to find the sum of the first 10 terms of 1 + 2 + 4 + 8 + ….

9. Which series is geometric?

   A. 4 + 8 + 12 + 16

   B. 4 + 5 + 7 + 10

   C. 4 + 12 + 36 + 108

   D. 4 + 16 + 64 + 128

10. A geometric series has a = 2 and r = 3. What is the sum of its first 5 terms?

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On Level

Grade-level practice.

1. Find the sum: $3 - 6 + 12 - 24 + 48$.

2. What is the sum of the first 8 terms of $1 + \frac{1}{2} + \frac{1}{4} + \ldots$?

3. Lena saves 1 dollar on day 1 and doubles the amount each day. How many dollars has she saved in all after 10 days?

4. A job pays 40,000 dollars the first year and the pay rises 3% each year. Using $1.03^5 \approx 1.1593$, what is the total pay over the first 5 years?

5. Explain how to derive the formula for $S = a + ar + ar^2 + \ldots + ar^{n-1}$.

6. Find the sum of the first 7 terms of $2 + 6 + 18 + \ldots$.

7. Why does the formula $a(1 - r^n) \div (1 - r)$ need $r \neq 1$?

   A. When r = 1 the terms get larger.

   B. When r = 1 the series is negative.

   C. It doesn't need it.

   D. When r = 1 the denominator is 0.

8. Find the sum: 1000 + 1100 + 1210 + 1331.

9. A ball is dropped from 16 feet, and each bounce reaches half the previous height. What total distance does it fall over its first 5 drops?

10. Find the sum of the first 5 terms of 81 + 27 + 9 + ….

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Challenge

Multi-step and word problems that stretch it.

1. Sam deposits 200 dollars at the end of each month into an account that grows 1% per month. The value after 12 deposits is $200 + 200(1.01) + \ldots + 200(1.01)^{11}$. Using $1.01^{12} \approx 1.1268$, what is it worth?

2. A 100,000-dollar loan at 0.5% per month for 360 months has payment $M = 100{,}000(0.005) \div (1 - 1.005^{-360})$. Using $1.005^{-360} \approx 0.166$, what is M to the nearest dollar?

3. The sum $5 + 10 + 20 + \ldots$ has n terms and equals 315. What is n?

4. A geometric series has first term 2, a positive ratio r, and the sum of its first 3 terms is 26. What is r?

5. Find $1 + 2 + 4 + \ldots + 2^{19}$.

6. A chessboard gets 1 grain on the first square, 2 on the second, 4 on the third, and so on for all 64 squares. How many grains are there in all?

   A. $2^{64} - 1$

   B. 2^{64}

   C. 2^{63}

   D. 64^2

7. Find the sum: $64 - 32 + 16 - 8 + 4 - 2$.

8. Explain how to use the formula to find $5 + 15 + 45 + \ldots + 1215$.

9. Find the sum: $0.9 + 0.09 + 0.009 + 0.0009$.

10. What is the sum of the first 7 terms of $1 - 1 + 1 - 1 + \ldots$?