

Geometric Series Worksheet — Worked Answer Key

Twenty finite, infinite, shifted-index, decimal, modeling, and error-analysis problems.

Revision: 2026-07-23 **Canonical page:** <https://bettergrades.net/subjects/math/calculus/worksheets/geometric-series/>

1. Find the common ratio of 3, 12, 48, ...

Answer: $r = 4$

- Divide either term by its predecessor: $12/3 = 4$ and $48/12 = 4$.
- The constant quotient is $r = 4$.

2. Find a_8 when $a_1=5$ and $r=2$.

Answer: $a_8 = 640$

- Use $a_n = a_1 r^{n-1}$.
- Thus $a_8 = 5(2)^7 = 640$.
- Therefore the result is $a_8 = 640$.

3. Evaluate $\sum_{k=0}^5 3(2)^k$.

Answer: 189

- There are six terms with first term 3 and ratio 2.
- Using $S_6 = 3(1 - 2^6)/(1 - 2)$ gives 189.

4. Evaluate $\sum_{k=0}^4 16(1/2)^k$.

Answer: 31

- There are five terms with first term 16 and ratio $1/2$.
- Using $S_5 = 16(1 - (1/2)^5)/(1 - 1/2)$ gives 31.

5. Evaluate $\sum_{k=0}^{\infty} 12(1/3)^k$.

Answer: 18

- Here $a = 12$, $r = 1/3$, and $|r| < 1$.
- Therefore $S = a/(1 - r) = 12/(1 - 1/3) = 18$.
- Therefore the result is 18.

6. Evaluate $\sum_{k=0}^{\infty} 8(-1/2)^k$.

Answer: $16/3$

- Here $a = 8$, $r = -1/2$, and $|r| < 1$.
- Therefore $S = 8/(1 + 1/2) = 16/3$.
- Therefore the result is $16/3$.

7. Decide whether $\sum_{k=0}^{\infty} 5(1.02)^k$ converges.

Answer: diverges

- a. The common ratio is $r = 1.02$, so $|r| > 1$.
- b. Its terms do not approach zero, and the infinite geometric series diverges.
- c. Therefore the result is diverges.

8. Evaluate $\sum_{n=3}^{\infty} 2(1/4)^n$.

Answer: $1/24$

- a. The first included term is $2(1/4)^3 = 1/32$, not 2.
- b. With ratio $1/4$, the sum is $(1/32)/(1 - 1/4) = 1/24$.
- c. Therefore the result is $1/24$.

9. Rewrite $\sum_{n=1}^{\infty} 3^{1-n}$ in ar^k form and sum it.

Answer: $3/2$

- a. At $n = 1$ the first term is 1, and each next term is multiplied by $1/3$.
- b. Thus the series is $\sum_{k=0}^{\infty} (1/3)^k$, whose sum is $1/(1 - 1/3) = 3/2$.
- c. Therefore the result is $3/2$.

10. Write 0.333... as a fraction.

Answer: $1/3$

- a. Write the decimal as $3/10 + 3/100 + \dots$.
- b. This has $a = 3/10$, $r = 1/10$, so its sum is $(3/10)/(9/10) = 1/3$.
- c. Therefore the result is $1/3$.

11. Write 0.272727... as a fraction.

Answer: $3/11$

- a. Write the decimal as $27/100 + 27/10000 + \dots$.
- b. This has $a = 27/100$, $r = 1/100$, so its sum is $27/99 = 3/11$.
- c. Therefore the result is $3/11$.

12. Write 0.145145... as a fraction.

Answer: $145/999$

- a. Write the decimal as $145/1000 + 145/1000000 + \dots$.
- b. This has ratio $1/1000$, so its sum is $145/999$.

13. A ball rebounds 70% of each previous height after a 10 m drop. Find total vertical distance.

Answer: $170/3$ m

- a. The initial drop contributes 10 m; each rebound height is traveled once up and once down.
- b. Thus $D = 10 + 2(7 + 7(0.7) + \dots) = 10 + 14/(1 - 0.7) = 170/3$ m.
- c. Therefore the result is $170/3$ m.

14. Deposit 100 dollars at the end of each year for four years at 5 percent. Find the value immediately after the fourth deposit.

Answer: 431.01 dollars

- a. Immediately after the fourth deposit, the four deposits have grown for three, two, one, and zero years.
- b. The value is $100(1.05^3 + 1.05^2 + 1.05 + 1) = 431.0125$, or 431.01 dollars to the nearest cent.
- c. Therefore the result is 431.01 dollars.

15. A square has area 1; each stage shades one fourth of the remaining area. Find total shaded area.

Answer: 1

- a. The shaded areas are $1/4, (3/4)(1/4), (3/4)^2(1/4), \dots$
- b. Their sum is $(1/4)/(1 - 3/4) = 1$.
- c. Therefore the result is 1.

16. Find S_n for $7+7(0.8)+7(0.8)$ to the power $2+\dots$

Answer: $35(1 - 0.8^n)$

- a. The first term is 7, the ratio is 0.8, and the first n terms end at exponent $n - 1$.
- b. Therefore $S_n = 7(1 - 0.8^n)/(1 - 0.8) = 35(1 - 0.8^n)$.
- c. Therefore the result is $35(1 - 0.8^n)$.

17. An infinite geometric series has first term 6 and sum 15. Find r .

Answer: $3/5$

- a. Use $15 = 6/(1 - r)$.
- b. Then $1 - r = 2/5$, so $r = 3/5$, which satisfies $|r| < 1$.
- c. Therefore the result is $3/5$.

18. An infinite geometric series has ratio $-1/4$ and sum 8. Find its first term.

Answer: 10

- a. Use $8 = a/(1 - (-1/4)) = a/(5/4)$.
- b. Thus $a = 10$.
- c. Therefore the result is 10.

19. A student uses $a/(1-r)$ for $r=2$. Diagnose the error.

Answer: $|r| \geq 1$, so the infinite series diverges

- a. The formula $a/(1 - r)$ requires $|r| < 1$.
- b. For $r = 2$, the terms do not approach zero, so the infinite series diverges.
- c. Therefore the result is $|r| \geq 1$, so the infinite series diverges.

20. Evaluate $\sum_{n=2}^6 5(3)^{n-2}$.

Answer: 605

- a. At $n = 2$ the first term is 5; there are five terms through $n = 6$, with ratio 3.
- b. Thus $S_5 = 5(1 - 3^5)/(1 - 3) = 605$.
- c. Therefore the result is 605.