

1. What is the difference between an arithmetic and a geometric sequence?

2. Complete the chart:

Sequence	Find the: Common Difference or Common Ratio	Recursive Formula	Explicit Formula
25, 50, 100			
-12, -7, -2, 3, ...			

3. Consider the arithmetic sequence -4, 4, 12, 20 ...

- Write an explicit formula a_n for the sequence.
- Find the 12th term of the sequence.
- Is 164 a term in this sequence? If so, which term. If not, explain why. Justify your work.
- Is 130 a term in this sequence? If so, which term. If not, explain why. Justify your work.

4. Consider the geometric sequence 125, 25, 5, ...

- Write an explicit formula a_n for the sequence.
- Find the 7th term of the sequence as a fraction.
- Is $\frac{1}{5}$ a term in this sequence? If so, which term. If not, explain why. Justify your work.

5. A theater has 50 rows of seats. If there are 25 seats in the 1st row, 31 in the 2nd, 37 in the 3rd, and so on.

- Write an explicit formula to represent the situation.
- Find a_5 . Explain in the context of the problem.
- What row will have 175 seats? Explain in the context of the problem.
- How many seats are there in all in the theater?

6. In his first year, a teacher earned \$30,000. Each successive year he earned a 5% raise.

- Write a geometric formula to represent the situation.
- What will his salary be in his 20th year?
- How much money in total will he have earned after a total of 20 years?

7. Find the first three terms in the sequence: $a_n = 5n^2 - 1$

8. What are the first three terms of the sequence defined by the recursive formula $a_1 = 5$ and $a_n = 5(a_{n-1} - 2)$ when $n > 1$?

9. Find the next three terms of each sequence

a. 9, 16, 23, _____, _____, _____

b. 100, -200, 400, _____, _____, _____

c. $-8n, -5n, -2n, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}, \underline{\hspace{1cm}}$

10. Find the first three terms of each sequence where d is the common difference, and r is the common ratio.

a. $a_1 = 576, r = -\frac{1}{2}$ _____, _____, _____

b. $a_1 = 2, d = 13$ _____, _____, _____

c. $a_1 = \frac{5}{8}, d = \frac{3}{8}$ _____, _____, _____

11. Find a_8 in an arithmetic sequence with a first term of 4 and a common difference of 3.

12. Find a_1 in a geometric sequence with a first term of 12 and a common ratio of $\frac{1}{2}$.

13. Find a_2 for -17, -13, -9, ...

14. Find a_8 for 4, -12, 36, ...

15. Find a_4 if $a_1 = 3$ and the common difference is $d = 7$.

16. Find a_8 if $a_1 = \frac{1}{3}$ and the common ratio is $r = 3$.

17. Write the equation for the n th term for each sequence

a. 7, 16, 25, 34, ...

b. 36, 12, 4, ...

18. Find the 10th term of the arithmetic sequence given the following information:

$$a_3 = 55, a_7 = 115$$

19. Find the 7th term of the geometric sequence given the following information:

$$a_1 = 9, a_5 = 144$$

20. Find the sum of the first 28 terms of the series $3 + 6 + 9 + 12 + \dots$

21. Find the sum of the first 12 terms of the series, $-3 + 6 - 12 + 24 - 48 + \dots$

22. Find the sum of the sequence 4, 6, 8, 10, ... 80

23. Find the sum of the sequence -5, 15, -45, 135, ... 98415

24. Write the first 3 terms of each sequence described below with recursive equations:

a. $a_1 = 5$
 $a_n = a_{n-1} - n$

b. $a_1 = -3$
 $a_n = 3a_{n-1} + 10$

25. Find the value of each series below.

a. $\sum_{x=1}^3 (2x^2 - 6)$

b. $2 \sum_{n=1}^3 (4)^{n-1}$

c. $\sum_{n=1}^3 (n^2 - nx + 2)$

26. Write this series using sigma notation: $2 + 9 + 16$

27. Write this series using sigma notation: $3 + 12 + 48 + 192 + 768$

1. What is the difference between an arithmetic and a geometric sequence?

2. Complete the chart:

Sequence	Find the: Common Difference or Common Ratio	Recursive Formula	Explicit Formula
25, 50, 100, ... <i>geo</i>	$r = 2$	$a_1 = 25$ $a_n = a_{n-1} \cdot 2$	$a_n = 25(2)^{n-1}$
-12, -7, -2, 3, ... <i>arith</i>	$d = 5$	$a_1 = -12$ $a_n = a_{n-1} + 5$	$a_n = -12 + (n-1)(5)$ $= -12 + 5n - 5$ $a_n = 5n - 17$

3. Consider the arithmetic sequence -4, 4, 12, 20 ... $d = 8$

- a. Write an explicit formula a_n for the sequence.
 $a_n = -4 + (n-1)(8)$
 $= -4 + 8n - 8$
 $a_n = 8n - 12$
- b. Find the 12th term of the sequence.
 $a_{12} = 8(12) - 12$
 $a_{12} = 84$
- c. Is 164 a term in this sequence? If so, which term. If not, explain why. Justify your work.
 $164 = 8n - 12$
 $176 = 8n$
 $n = 22$, yes
- d. Is 130 a term in this sequence? If so, which term. If not, explain why. Justify your work.
 $130 = 8n - 12$
 $142 = 8n$
 $17.75 = n$, no

4. Consider the geometric sequence 125, 25, 5, ...

- a. Write an explicit formula a_n for the sequence.
 $a_n = 125 \left(\frac{1}{5}\right)^{n-1}$
- b. Find the 7th term of the sequence as a fraction.
 $a_7 = 125 \left(\frac{1}{5}\right)^{7-1}$
 $a_7 = 125 \left(\frac{1}{5}\right)^6$
 $\frac{1}{5} = 125 \left(\frac{1}{5}\right)^6$
 $1, 100k at table$
 $125, n = 5^{th} term$
- c. Is $\frac{1}{5}$ a term in this sequence? If so, which term. If not, explain why. Justify your work.
 $\frac{1}{5} = 125 \left(\frac{1}{5}\right)^{n-1}$

5. A theater has 50 rows of seats. If there are 25 seats in the 1st row, 31 in the 2nd, 37 in the 3rd, and so on. $d = 6$

- a. Write an explicit formula to represent the situation.
 $a_n = 25 + (n-1)(6)$
 $a_n = 6n + 19$
- b. Find a_5 . Explain in the context of the problem.
 $a_5 = 6(5) + 19 = 31$
- c. What row will have 175 seats? Explain in the context of the problem.
 $175 = 6n + 19$
 $156 = 6n$
 $n = 26$
- d. How many seats are there in all in the theater?
 $S_{50} = \frac{50}{2}(25 + 319)$
 $S_{50} = 25(50) + 19(49)$
 $S_{50} = 9000$

6. In his first year, a teacher earned \$30,000. Each successive year he earned a 5% raise. $r = 1.05$

- a. Write an explicit formula to represent the situation.
 $a_n = 30000(1.05)^{n-1}$
- b. What will his salary be in his 20th year?
 $a_{20} = 30000(1.05)^{20-1}$
 $a_{20} = 75868.51$
- c. How much money in total will he have earned after a total of 20 years?
 $S_{20} = 30000 - 30000(1.05)^{20}$
 $S_{20} = 991978.07$

7. Find the next three terms in the sequence: $a_n = 5n^2 - 1$

- $a_1 = 5(1)^2 - 1 = 4$
 $a_2 = 5(2)^2 - 1 = 19$
 $a_3 = 5(3)^2 - 1 = 44$

8. What are the first three terms of the sequence defined by the recursive formula $a_1 = 5$ and $a_n = 5(a_{n-1} - 2)$ when $n > 1$?

- $a_1 = 5$
 $a_2 = 5(5-2) = 15$
 $a_3 = 5(15-2) = 45$

9. Find the next three terms of each sequence
 a. 9, 16, 23, 30, 37, 44

b. 100, -200, 400, -800, 1600, -3200

c. $-8n, -5n, -2n, \underline{1n}, \underline{4n}, \underline{7n}$

10. Find the first three terms of each sequence where d is the common difference, and r is the common ratio.

a. $a_1 = 576, r = -\frac{1}{2}$
 $\underline{576}, \underline{-288}, \underline{144}$

b. $a_1 = 2, d = 13$
 $\underline{2}, \underline{15}, \underline{28}$

c. $a_1 = \frac{5}{8}, d = \frac{3}{8}$
 $\underline{\frac{5}{8}}, \underline{1}, \underline{\frac{13}{8}}$

11. Find a_8 in an arithmetic sequence with a first term of 4 and a common difference of 3.
 $a_8 = 4 + (8-1)(3)$
 $\underline{a_8 = 25}$

12. Find a_7 in a geometric sequence with a first term of 12 and a common ratio of $\frac{1}{2}$.
 $a_7 = 12 \left(\frac{1}{2}\right)^{7-1}$
 $\underline{a_7 = \frac{3}{16}}$

13. Find a_2 for $-17, -13, -9, \dots$ $d = 4$
 $a_2 = -17 + (2-1)(4)$
 $\underline{a_2 = -13}$

14. Find a_8 for 4, -12, 36, ... $r = -3$
 $a_8 = 4(-3)^{8-1}$
 $\underline{a_8 = -8748}$

15. Find a_4 if $a_1 = 3$ and the common difference is $d = 7$.
 $a_4 = 3 + (4-1)(7)$
 $\underline{a_4 = 24}$

16. Find a_8 if $a_1 = \frac{1}{3}$ and the common ratio is $r = 3$.
 $a_8 = \frac{1}{3}(3)^{8-1}$
 $\underline{a_8 = 729}$

17. Write the equation for the n th term for each sequence

a. 7, 16, 25, 34, ... $d = 9$
 $a_n = 7 + (n-1)(9)$
 $= 7 + 9n - 9$
 $\underline{a_n = 9n - 2}$

b. 36, 12, 4, ... $r = \frac{1}{3}$
 $a_n = 36\left(\frac{1}{3}\right)^{n-1}$

18. Find the 10th term of the arithmetic sequence given the following information:
 $a_3 = 55, a_7 = 115$
 $\frac{55}{13} \dots \frac{115}{17}$
 $115 - 55 = 60$
 $\frac{60}{4} = 15$
 $17 - 3 = 14$
 $15 \cdot 14 = 210$
 $55 + 210 = 265$
 $\underline{a_{10} = 265}$

19. Find the 7th term of the geometric sequence given the following information:
 $a_1 = 9, a_3 = 144$
 $\frac{9}{1} \dots \frac{144}{9}$
 $\frac{144}{9} = 16$
 $16 = r$
 $a_7 = 9(16)^{6}$
 $\underline{a_7 = 36864}$

20. Find the sum of the first 28 terms of the series $3 + 6 + 9 + 12 + \dots$ $d = 3$
 $S_{28} = 28 \left(\frac{3+84}{2}\right) = \underline{1218}$

21. Find the sum of the first 12 terms of the series, $-3 + 6 - 12 + 24 - 48 + \dots$ $r = -2$
 $S_{12} = \frac{-3(1-(-2)^{12})}{1-(-2)} = \underline{4095}$

22. Find the sum of the sequence 4, 6, 8, 10, ... 80 $d = 2$
 $S_{39} = \frac{4(1+80)}{2} = \underline{1638}$

23. Find the sum of the sequence $-5, 15, -45, 135, \dots$ 98415 $r = -3$
 $S_{10} = \frac{-5(1-(-3)^{10})}{1-(-3)} = \underline{-73810}$

24. Write the first 3 terms of each sequence described below with recursive equations:
 a. $a_1 = 5, a_2 = 5 - 2 = 3, a_3 = 3 - 3 = 0$
 $a_1 = -3, a_2 = 3(-3) + 10 = 1, a_3 = 3(1) + 10 = 13$

25. Find the value of each series below.
 a. $\sum_{x=1}^3 (2x^2 - 6) = 2(1) - 6 + 2(4) - 6 + 2(9) - 6 = 10$
 b. $2 \sum_{n=1}^3 (4)^{n-1} = 2(1 + 4 + 16) = 42$
 c. $\sum_{x=1}^3 (x^2 - nx + 2) = 1^2 - 1(1) + 2 + 2^2 - 2(2) + 2 + 3^2 - 3(3) + 2 = 6$

26. Write this series using sigma notation: $2 + 9 + 16$ $d = 7$
 $\sum_{n=1}^3 (n + (n-1)(7)) = \underline{\sum_{n=1}^3 (7n - 5)}$

27. Write this series using sigma notation: $3 + 12 + 48 + 192 + 768$ $r = 4$
 $\underline{\sum_{n=1}^5 3(4)^{n-1}}$