

Section 3.1: Sequences and Series

Exercises

Predict the next three terms of the following sequences.

1. 18, 16, 14, ...
2. 1, 4, 9, 16, ...
3. 12, 24, 48, 96, ...
4. 144, 36, 9, ...
5. $1, \sqrt{2}, \sqrt{3}, 2, \sqrt{5}, \sqrt{6}, \dots$
6. 5, -10, 20, ...
7. 13, 25, 37, 49, ...
8. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \dots$

Predict the general term (or n^{th} term a_n) of the following sequences.

9. 1, 4, 9, 16, ...
10. $1, \sqrt{2}, \sqrt{3}, 2, \sqrt{5}, \sqrt{6}, \dots$
11. 2, 4, 6, 8, ...
12. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \dots$

Find the first four terms of the following recursively defined sequences.

$$13. \begin{cases} a_1 = 2 \\ a_n = a_{n-1} + 5 \end{cases}$$

$$14. \begin{cases} a_1 = 10 \\ a_n = 3a_{n-1} \end{cases}$$

$$15. \begin{cases} a_1 = 2 \\ a_2 = 3 \\ a_n = a_{n-1} \times a_{n-2} \end{cases}$$

$$16. \begin{cases} a_1 = 2 \\ a_n = \frac{1}{a_{n-1}} + 1 \end{cases}$$

In each of the following, the general formula for the n th term of a sequence is given. Find the first four terms.

$$17. a_n = 3n - 5$$

$$18. a_n = 3^{n-2}$$

$$19. a_n = n!$$

$$20. a_n = \frac{1}{n^2}$$

In each of the following, the general formula for the n th term of a sequence is given. Calculate the specified terms.

$$21. a_n = 5(2^{n+1}); a_7$$

$$22. a_n = 4n + 15; a_{100}$$

$$23. a_n = \frac{n+2}{n+1}; a_{2500}$$

$$24. a_n = 2n^3; a_{10}$$

Calculate S_3 and S_6 for the following series.

$$25. 3 + 6 + 9 + \dots$$

$$26. 1 + 4 + 9 + 16 + \dots$$

$$27. 5 - 10 + 20 - 40 + \dots$$

$$28. 5 + 3 + 1 + \dots$$

Write out each sum in full and then evaluate.

$$29. \sum_{n=3}^7 n$$

$$30. \sum_{j=4}^{10} (-1)^j$$

$$31. \sum_{i=0}^4 2^i$$

$$32. \sum_{k=20}^{25} (3k - 10)$$

Write each series in sigma notation.

$$33. 1 + 8 + 27 + 64 + \dots + 1000$$

$$34. \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \dots$$

$$35. 2 + 4 + 6 + 8 + \dots$$

$$36. 2 + 4 + 6 + 8$$

Evil alert!

37. (nasty) Write the sequence 1, 4, 9, 16, ... using a **recursive** definition.

38. (tricksy) Write the sequence 1, 2, 6, 24, ... using a **general** formula.

39. (challenging) What's the next term in the sequence 4, 5, 20, 100, 2000 ... ? What's the recursive formula for this sequence?