


We find this sum using the formula for the sum of the first n terms of an arithmetic sequence. We are adding 6 terms: $n = 6$. The first term is 65,930: $a_1 = 65,930$. The last term—that is, the sixth term—is 74,930: $a_6 = 74,930$.

$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$S_6 = \frac{6}{2}(65,930 + 74,930) = 3(140,860) = 422,580$$

Total adult residential community costs for your grandmother are predicted to be \$422,580. Because your grandmother's assets are \$500,000, she has enough to pay for the facility for the six-year period.

 **Check Point 6** In Example 6, how much would it cost for the adult residential community for a ten-year period beginning in 2009?

Exercise Set 11.2

Practice Exercises

In Exercises 1–14, write the first six terms of each arithmetic sequence.

1. $a_1 = 200, d = 20$
2. $a_1 = 300, d = 50$
3. $a_1 = -7, d = 4$
4. $a_1 = -8, d = 5$
5. $a_1 = 300, d = -90$
6. $a_1 = 200, d = -60$
7. $a_1 = \frac{5}{2}, d = -\frac{1}{2}$
8. $a_1 = \frac{3}{4}, d = -\frac{1}{4}$
9. $a_n = a_{n-1} + 6, a_1 = -9$
10. $a_n = a_{n-1} + 4, a_1 = -7$
11. $a_n = a_{n-1} - 10, a_1 = 30$
12. $a_n = a_{n-1} - 20, a_1 = 50$
13. $a_n = a_{n-1} - 0.4, a_1 = 1.6$
14. $a_n = a_{n-1} - 0.3, a_1 = -1.7$

In Exercises 15–22, find the indicated term of the arithmetic sequence with first term, a_1 , and common difference, d .

15. Find a_6 when $a_1 = 13, d = 4$.
16. Find a_{16} when $a_1 = 9, d = 2$.
17. Find a_{50} when $a_1 = 7, d = 5$.
18. Find a_{60} when $a_1 = 8, d = 6$.
19. Find a_{200} when $a_1 = -40, d = 5$.
20. Find a_{150} when $a_1 = -60, d = 5$.
21. Find a_{60} when $a_1 = 35, d = -3$.
22. Find a_{70} when $a_1 = -32, d = 4$.

In Exercises 23–34, write a formula for the general term (the n th term) of each arithmetic sequence. Do not use a recursion formula. Then use the formula for a_n to find a_{20} , the 20th term of the sequence.

23. 1, 5, 9, 13, ...
24. 2, 7, 12, 17, ...
25. 7, 3, -1, -5, ...
26. 6, 1, -4, -9, ...
27. $a_1 = 9, d = 2$
28. $a_1 = 6, d = 3$

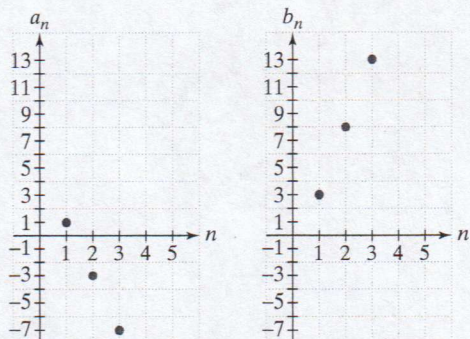
29. $a_1 = -20, d = -4$
30. $a_1 = -70, d = -5$
31. $a_n = a_{n-1} + 3, a_1 = 4$
32. $a_n = a_{n-1} + 5, a_1 = 6$
33. $a_n = a_{n-1} - 10, a_1 = 30$
34. $a_n = a_{n-1} - 12, a_1 = 24$
35. Find the sum of the first 20 terms of the arithmetic sequence: 4, 10, 16, 22, ...
36. Find the sum of the first 25 terms of the arithmetic sequence: 7, 19, 31, 43, ...
37. Find the sum of the first 50 terms of the arithmetic sequence: -10, -6, -2, 2, ...
38. Find the sum of the first 50 terms of the arithmetic sequence: -15, -9, -3, 3, ...
39. Find $1 + 2 + 3 + 4 + \cdots + 100$, the sum of the first 100 natural numbers.
40. Find $2 + 4 + 6 + 8 + \cdots + 200$, the sum of the first 100 positive even integers.
41. Find the sum of the first 60 positive even integers.
42. Find the sum of the first 80 positive even integers.
43. Find the sum of the even integers between 21 and 45.
44. Find the sum of the odd integers between 30 and 54.

For Exercises 45–50, write out the first three terms and the last term. Then use the formula for the sum of the first n terms of an arithmetic sequence to find the indicated sum.

45. $\sum_{i=1}^{17} (5i + 3)$
46. $\sum_{i=1}^{20} (6i - 4)$
47. $\sum_{i=1}^{30} (-3i + 5)$
48. $\sum_{i=1}^{40} (-2i + 6)$
49. $\sum_{i=1}^{100} 4i$
50. $\sum_{i=1}^{50} (-4i)$

Practice Plus

Use the graphs of the arithmetic sequences $\{a_n\}$ and $\{b_n\}$ to solve Exercises 51–58.



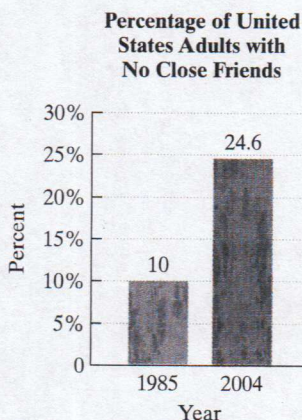
51. Find $a_{14} + b_{12}$.
52. Find $a_{16} + b_{18}$.
53. If $\{a_n\}$ is a finite sequence whose last term is -83 , how many terms does $\{a_n\}$ contain?
54. If $\{b_n\}$ is a finite sequence whose last term is 93 , how many terms does $\{b_n\}$ contain?
55. Find the difference between the sum of the first 14 terms of $\{b_n\}$ and the sum of the first 14 terms of $\{a_n\}$.
56. Find the difference between the sum of the first 15 terms of $\{b_n\}$ and the sum of the first 15 terms of $\{a_n\}$.
57. Write a linear function $f(x) = mx + b$, whose domain is the set of positive integers, that represents $\{a_n\}$.
58. Write a linear function $g(x) = mx + b$, whose domain is the set of positive integers, that represents $\{b_n\}$.

Use a system of two equations in two variables, a_1 and d , to solve Exercises 59–60.

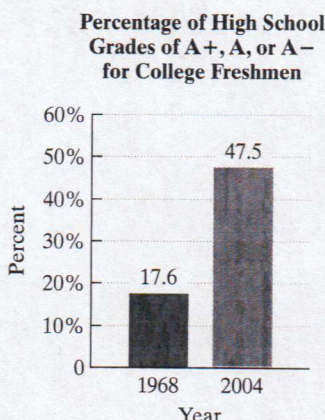
59. Write a formula for the general term (the n th term) of the arithmetic sequence whose second term, a_2 , is 4 and whose sixth term, a_6 , is 16.
60. Write a formula for the general term (the n th term) of the arithmetic sequence whose third term, a_3 , is 7 and whose eighth term, a_8 , is 17.

Application Exercises

The bar graphs show changes that have taken place in the United States over time. Exercises 61–62 involve developing arithmetic sequences that model the data.



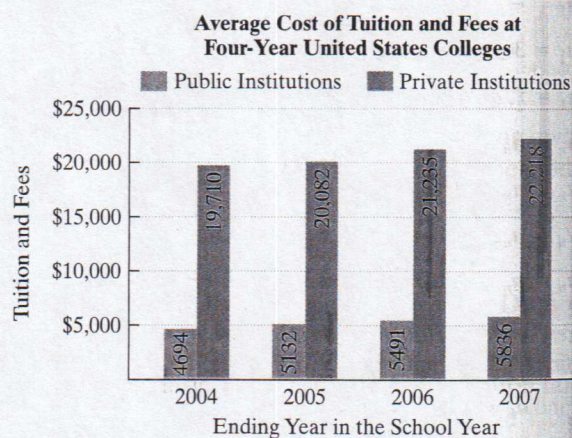
Source: American Sociological Review



Source: www.grade-inflation.com

61. In 1985, 10% of Americans had no close friends. On average, this has increased by approximately 0.77% per year.
 - a. Write a formula for the n th term of the arithmetic sequence that models the percentage of Americans with no close friends n years after 1984.
 - b. If trends shown by the model in part (a) continue, what percentage of Americans will have no close friends in 2011? Round to one decimal place.
62. In 1968, 17.6% of high school grades for college freshmen consisted of A's (A+, A, or A-). On average, this has increased by approximately 0.83% per year.
 - a. Write a formula for the n th term of the arithmetic sequence that models the percentage of high school grades of A for college freshmen n years after 1967.
 - b. If trends shown by the model in part (a) continue, what percentage of high school grades for college freshmen will consist of A's in 2018?
63. Company A pays \$24,000 yearly with raises of \$1600 per year. Company B pays \$28,000 yearly with raises of \$1000 per year. Which company will pay more in year 10? How much more?
64. Company A pays \$23,000 yearly with raises of \$1200 per year. Company B pays \$26,000 yearly with raises of \$800 per year. Which company will pay more in year 10? How much more?

In Exercises 65–67, we revisit the data from Chapter P showing the average cost of tuition and fees at public and private four-year U.S. colleges.



Source: The College Board

65. a. Use the numbers shown in the bar graph to find the total cost of tuition and fees at public colleges for a four-year period from the school year ending in 2004 through the school year ending in 2007.
- b. The model

$$a_n = 379n + 4342$$

describes the cost of tuition and fees at public colleges in academic year n , where $n = 1$ corresponds to the school year ending in 2004, $n = 2$ to the school year ending in 2005, and so on. Use this model and the formula for S_n to find the total cost of tuition and fees at public colleges for a four-year period from the school year ending in 2004 through the school year ending in 2007. Does the model underestimate or overestimate the actual sum you obtained in part (a)? By how much?