

9.2.1 EXERCISES

For a link to all of the additional resources available for this section, click [OSttS Chapter 9 materials](#).

For help with Exercises 1 - 16, click the resource below:

- [Using summation \(sigma\) notation](#)

In Exercises 1 - 8, find the value of each sum using Definition 9.3.

1. $\sum_{g=4}^9 (5g + 3)$

2. $\sum_{k=3}^8 \frac{1}{k}$

3. $\sum_{j=0}^5 2^j$

4. $\sum_{k=0}^2 (3k - 5)x^k$

5. $\sum_{i=1}^4 \frac{1}{4}(i^2 + 1)$

6. $\sum_{n=1}^{100} (-1)^n$

7. $\sum_{n=1}^5 \frac{(n+1)!}{n!}$

8. $\sum_{j=1}^3 \frac{5!}{j!(5-j)!}$

In Exercises 9 - 16, rewrite the sum using summation notation.

9. $8 + 11 + 14 + 17 + 20$

10. $1 - 2 + 3 - 4 + 5 - 6 + 7 - 8$

11. $x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7}$

12. $1 + 2 + 4 + \cdots + 2^{29}$

13. $2 + \frac{3}{2} + \frac{4}{3} + \frac{5}{4} + \frac{6}{5}$

14. $-\ln(3) + \ln(4) - \ln(5) + \cdots + \ln(20)$

15. $1 - \frac{1}{4} + \frac{1}{9} - \frac{1}{16} + \frac{1}{25} - \frac{1}{36}$

16. $\frac{1}{2}(x-5) + \frac{1}{4}(x-5)^2 + \frac{1}{6}(x-5)^3 + \frac{1}{8}(x-5)^4$

In Exercises 17 - 28, use the formulas in Equation 9.2 to find the sum.

For help with these exercises, click on one or more the resources below:

- [Finding the partial sum of an arithmetic series](#)
- [Finding the partial sum of a geometric series](#)

17. $\sum_{n=1}^{10} 5n + 3$

18. $\sum_{n=1}^{20} 2n - 1$

19. $\sum_{k=0}^{15} 3 - k$

20. $\sum_{n=1}^{10} \left(\frac{1}{2}\right)^n$

21. $\sum_{n=1}^5 \left(\frac{3}{2}\right)^n$

22. $\sum_{k=0}^5 2 \left(\frac{1}{4}\right)^k$

23. $1 + 4 + 7 + \cdots + 295$

24. $4 + 2 + 0 - 2 - \cdots - 146$

25. $1 + 3 + 9 + \cdots + 2187$

$$26. \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots + \frac{1}{256} \qquad 27. 3 - \frac{3}{2} + \frac{3}{4} - \frac{3}{8} + \dots + \frac{3}{256} \qquad 28. \sum_{n=1}^{10} -2n + \left(\frac{5}{3}\right)^n$$

In Exercises 29 - 32, use Theorem 9.2 to express each repeating decimal as a fraction of integers.

In Exercises 9 - 16, rewrite the sum using summation notation.

For help with these exercises, click on the resource below:

- [Using a Geometric Series to write a repeating decimal as a fraction](#)

$$29. 0.\overline{7} \qquad 30. 0.1\overline{3} \qquad 31. 10.\overline{159} \qquad 32. -5.8\overline{67}$$

In Exercises 33 - 38, use Equation 9.3 to compute the future value of the annuity with the given terms. In all cases, assume the payment is made monthly, the interest rate given is the annual rate, and interest is compounded monthly.

33. payments are \$300, interest rate is 2.5%, term is 17 years.
34. payments are \$50, interest rate is 1.0%, term is 30 years.
35. payments are \$100, interest rate is 2.0%, term is 20 years
36. payments are \$100, interest rate is 2.0%, term is 25 years
37. payments are \$100, interest rate is 2.0%, term is 30 years
38. payments are \$100, interest rate is 2.0%, term is 35 years
39. Suppose an ordinary annuity offers an annual interest rate of 2%, compounded monthly, for 30 years. What should the monthly payment be to have \$100,000 at the end of the term?
40. Prove the properties listed in Theorem 9.1.
41. Show that the formula for the future value of an annuity due is

$$A = P(1 + i) \left[\frac{(1 + i)^{nt} - 1}{i} \right]$$

42. Discuss with your classmates what goes wrong when trying to find the following sums.⁸

$$(a) \sum_{k=1}^{\infty} 2^{k-1} \qquad (b) \sum_{k=1}^{\infty} (1.0001)^{k-1} \qquad (c) \sum_{k=1}^{\infty} (-1)^{k-1}$$

⁸When in doubt, write them out!

Checkpoint Quiz 9.2

1. Find the sum: $\sum_{k=1}^4 (k^2 - 1)$

2. Find the sum: $\sum_{k=0}^{49} (3k - 5)$

3. Write as a fraction: $0.\overline{31}$

For worked out solutions to this quiz, click the links below:

- [Quiz Solution](#)

9.2.2 ANSWERS

1. 213
2. $\frac{341}{280}$
3. 63
4. $-5 - 2x + x^2$
5. $\frac{17}{2}$
6. 0
7. 20
8. 25
9. $\sum_{k=1}^5 (3k + 5)$
10. $\sum_{k=1}^8 (-1)^{k-1} k$
11. $\sum_{k=1}^4 (-1)^{k-1} \frac{x}{2k-1}$
12. $\sum_{k=1}^{30} 2^{k-1}$
13. $\sum_{k=1}^5 \frac{k+1}{k}$
14. $\sum_{k=3}^{20} (-1)^k \ln(k)$
15. $\sum_{k=1}^6 \frac{(-1)^{k-1}}{k^2}$
16. $\sum_{k=1}^4 \frac{1}{2k} (x-5)^k$
17. 305
18. 400
19. -72
20. $\frac{1023}{1024}$
21. $\frac{633}{32}$
22. $\frac{1365}{512}$
23. 14652
24. -5396
25. 3280
26. $\frac{255}{256}$
27. $\frac{513}{256}$
28. $\frac{17771050}{59049}$
29. $\frac{7}{9}$
30. $\frac{13}{99}$
31. $\frac{3383}{333}$
32. $-\frac{5809}{990}$
33. \$76,163.67
34. \$20,981.40
35. \$29,479.69
36. \$38,882.12
37. 49,272.55
38. 60,754.80
39. For \$100,000, the monthly payment is \approx \$202.95.