Answer Key: Page 6

Sequence and Series Introduction:

Write the first five terms of the sequence.

1. $a_n = n!$ assume that n begins with 0
2. $a_n = 1 - \frac{1}{n}$ assume that n begins with 1
3. $a_n = \frac{n!}{(n+2)!}$ assume that n begins with 0
4. $a_n = \frac{n}{n^2+1}$ assume that n begins with 1
5. $a_n = \frac{(-1)^n}{n!}$ assume that n begins with 1

Find the sum.

6. $\sum_{n=1}^{4} \frac{n+1}{n+2}$
7. $\sum_{i=1}^{4} (1 - i)$
8. $\sum_{k=2}^{6} (-1)^k(2k)$
9. $\sum_{i=0}^{3} i!$

Arithmetic Sequence and Series:

10. Find the first 4 terms of the arithmetic sequence given the first term = 4 and common difference = -3 .
11. Find the first 4 terms of the arithmetic sequence given the first term = 4 and common difference = - 2 .

Answer the question about the following arithmetic sequences:

12. Common difference: - 3

    1st term: 7

    what is the 99th term? (assume n starts with 1)

13. Common difference: - 2

    3rd term: 15

    what is the nth formula? (assume n starts with 1)

14. Common difference: 7

    1st term: 2

    what is the 17th term? (assume n starts with 1)

Evaluate the sum of the arithmetic series.

15. $\sum_{n=1}^{50} (2n + 3)$

Geometric Sequence and Series:

16. Determine whether the sequence $3, -2, \frac{4}{3}, -\frac{8}{9}, \frac{16}{27}, \ldots$ is geometric. If it is, find its common ratio.

17. Find the first 5 terms of the geometric sequence with $a_1 = 2$ and $r = \frac{2}{3}$

Find the indicated term of the geometric sequence.

18. $a_1 = 5, \ r = 1.1, \quad a_{20} = ?$

19. $a_1 = -23,\ r = \sqrt{2},\qquad a_{23} = ?$

Write a formula for the nth term of the geometric sequence.

20. $a_1 = 2,\ r = -\frac{1}{3}$ (assume n starts with 1)

21. $a_1 = 4,\ r = \frac{1}{3}$ (assume n starts with 1)

Answer the question about the following geometric sequences:

22. 28th term: ?

    sequence: $2,\ 2.4,\ 2.88,\ 3.456,\ 4.1472, ..$

23. Common ratio: $r = \sqrt{3}$

    1st term: - 11

    what is the 14^{th} term?

Find the sum of the finite geometric series.

24. $\sum_{k=1}^{10} 4\left(\frac{3}{2}\right)^{k-1}$

25. $\sum_{n=1}^{15} 3\left(\frac{5}{4}\right)^{n}$

Infinite Geometric Series:

Decide whether the infinite geometric series has a sum.

26. $\sum_{n=1}^{\infty} 3(\frac{6}{5})^{n-1}$

27. $\sum_{n=1}^{\infty} \frac{1}{2}(\frac{1}{4})^{n-1}$

Find the sum of the infinite geometric series (if it has one).

28. $\sum_{n=0}^{\infty} 4(\frac{2}{3})^{n}$

29. $\sum_{n=1}^{\infty} 3(-\frac{1}{2})^{n}$

Binomial Theorem:

Evaluate the binomial coefficient.

30. $\binom{9}{7}$

31. $\binom{9}{5}$

Use Pascal's Triangle to find the binomial coefficient.

32. $\binom{6}{2}$

33. $\binom{6}{4}$

Use the Binomial Theorem to expand the binomial.

34. $(x - 3)^5$

35. $(2x - 3)^3$

36. $(3 - 2x)^3$

Use Pascal's Triangle to expand the binomial.

37. $(x - 2y)^4$

38. $(2x - y)^3$

Find the indicated term of the binomial expansion.

39. $(4h - j)^8$ 6th term

40. $(a^2 + b)^{22}$ 15th term

Answer Key:

Sequence and Series Introduction:

Write the first five terms of the sequence.

1. $a_n = n!$ assume that n begins with 0 $1, 1, 2, 6, 24$

2. $a_n = 1 - \frac{1}{n}$ assume that n begins with 1 $0, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}$

3. $a_n = \frac{n!}{(n+2)!}$ assume that n begins with 0 $\frac{1}{2}, \frac{1}{6}, \frac{1}{12}, \frac{1}{20}, \frac{1}{30}$

4. $a_n = \frac{n}{n^2+1}$ assume that n begins with 1 $\frac{1}{2}, \frac{2}{5}, \frac{3}{10}, \frac{4}{17}, \frac{5}{26}$

5. $a_n = \frac{(-1)^n}{n!}$ assume that n begins with 1 $-1, \frac{1}{2}, -\frac{1}{6}, \frac{1}{24}, -\frac{1}{120}$

Find the sum.

6. $\sum_{n=1}^{4} \frac{n+1}{n+2}$ $\frac{61}{20}$

7. $\sum_{i=1}^{4} (1 - i)$ -6

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

9. $\sum_{i=0}^{3} i!$ 10

Arithmetic Sequence and Series:

10. Find the first 4 terms of the arithmetic sequence given the first term = 4 and common difference = -3 . $4, 1, -2, -5, \ldots$

11. Find the first 4 terms of the arithmetic sequence given the first term = 4 and common difference = - 2 . $4, 2, 0, -2, \ldots$

Answer the question about the following arithmetic sequences:

12. Common difference: - 3

    1st term: 7

    what is the 99th term? (assume n starts with 1) -287

13. Common difference: - 2

    3rd term: 15

    what is the nth formula? (assume n starts with 1) $a_n = -2n + 21$

14. Common difference: 7

    1st term: 2

    what is the 17th term? (assume n starts with 1) 114

Evaluate the sum of the arithmetic series.

15. $\sum_{n=1}^{50} (2n + 3)$ 2700

Geometric Sequence and Series:

16. Determine whether the sequence $3, -2, \frac{4}{3}, -\frac{8}{9}, \frac{16}{27}, \ldots$ is geometric. If it is, find its common ratio.

Yes, $r = -2/3$

17. Find the first 5 terms of the geometric sequence with $a_1 = 2$ and $r = \frac{2}{3}$ $2, \frac{4}{3}, \frac{8}{9}, \frac{16}{27}, \frac{32}{81}$

Find the indicated term of the geometric sequence.

18. $a_1 = 5, \ r = 1.1, \ a_{20} = ?$ 30.5795

19. $a_1 = -23,\ r = \sqrt{2},\quad a_{23} = ?$ -47104

Write a formula for the nth term of the geometric sequence.

20. $a_1 = 2,\ r = -\frac{1}{3}$ (assume n starts with 1) $a_n = 2\left(-\frac{1}{3}\right)^{n-1}$

21. $a_1 = 4,\ r = \frac{1}{3}$ (assume n starts with 1) $a_n = 4\left(\frac{1}{3}\right)^{n-1}$

Answer the question about the following geometric sequences:

22. 28th term: ? 274.7411

sequence: $2,\ 2.4,\ 2.88,\ 3.456,\ 4.1472, ..$

23. Common ratio: $r = \sqrt{3}$

1st term: - 11

what is the 14th term? $-8019\sqrt{3}$

Find the sum of the finite geometric series.

24. $\sum_{k=1}^{10} 4\left(\frac{3}{2}\right)^{k-1}$ 453.320

25. $\sum_{n=1}^{15} 3\left(\frac{5}{4}\right)^{n}$ 329.06

Infinite Geometric Series:

Decide whether the infinite geometric series has a sum.

26. $\sum_{n=1}^{\infty} 3(\frac{6}{5})^{n-1}$ *no sum*

27. $\sum_{n=1}^{\infty} \frac{1}{2}(\frac{1}{4})^{n-1}$ *yes, has sum*

Find the sum of the infinite geometric series (if it has one).

28. $\sum_{n=0}^{\infty} 4(\frac{2}{3})^{n}$ 12

29. $\sum_{n=1}^{\infty} 3(-\frac{1}{2})^{n}$ 2

Binomial Theorem:

Evaluate the binomial coefficient.

30. $\binom{9}{7}$ 36

31. $\binom{9}{5}$ 126

Use Pascal's Triangle to find the binomial coefficient.

32. $\binom{6}{2}$ 15

33. $\binom{6}{4}$ 15

Use the Binomial Theorem to expand the binomial.

34. $(x-3)^5$ $x^5-15x^4+90x^3-270x^2+405x-243$

35. $(2x-3)^3$ $8x^3-36x^2+54x-27$

36. $(3-2x)^3$ $27-54x+36x^2-8x^3$

Use Pascal's Triangle to expand the binomial.

37. $(x-2y)^4$ $x^4-8x^3y+24x^2y^2-32xy^3+16y^4$

38. $(2x-y)^3$ $8x^3-12x^2y+6xy^2-y^3$

Find the indicated term of the binomial expansion.

39. $(4h-j)^8$ 6th term $-3584h^3j^5$

40. $(a^2+b)^{22}$ 15th term $319{,}770a^{16}b^{14}$