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Indicate the answer choice that best completes the statement or answers the question.

1. Which of the following statements is (are) true for all positive integers?

1) $\frac{1}{1\cdot 2}+\frac{1}{2\cdot 3}+\frac{1}{3\cdot 4}+\ldots+\frac{1}{n(n+1)}=\frac{n}{n+1}$

2) $\frac{1}{5}+\frac{1}{5^2}+\frac{1}{5^3}+\ldots+\frac{1}{5^n}=\frac{1}{4}\left(1-\frac{1}{5^n}\right)$

a. Both statements are true. b. None of the statements are true.
c. Only the first statement is true. d. Only the second statement is true.

2. Which of the following statements is (are) true for all positive integers?

1) $3^n + 3$ is divisible by 4.
2) $11^n + 15$ is divisible by 11.

a. Both statements are true. b. None of the statements are true.
c. Only the first statement is true. d. Only the second statement is true.

3. Which of the following statements is (are) true for all positive integers?

1) $4^n - 1$is divisible by 3.
2) $5^n - 1$is divisible by 6.

a. Both statements are true. b. None of the statements are true.
c. Only the second statement is true. d. Only the first statement is true.

4. Which of the following statements is (are) true for all positive integers?

1) $7^n - 2^n$is divisible by 5.
2) $n^2 + 2n$is divisible by 2.

a. Both statements are true. b. None of the statements are true.
c. Only the first statement is true. d. Only the second statement is true.

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5. Which of the following statements is (are) true for all positive integers?

1) $\frac{1}{5}+\frac{1}{5^2}+\frac{1}{5^3}+\ldots+\frac{1}{5^n}=\frac{1}{3}\left(1-\frac{1}{2^n}\right)$

2) $9^n-1$is divisible by 7.

a. Both statements are true.
b. None of the statements are true.
c. Only the second statement is true.
d. Only the first statement is true.

6. Which of the following statements is (are) true for all positive integers?

1) $1+3+5+\ldots+n=2n^2$

2) $1^3+2^3+3^3+\ldots+n^3=\frac{1}{4}n^2(n+1)^2$

a. Both statements are true.
b. None of the statements are true.
c. Only the first statement is true.
d. Only the second statement is true.

7. Which of the following statements is (are) true for all positive integers?

1) $n^3+2n$is divisible by 3.
2) $5^{2n}-1$is divisible by 24.

a. Both statements are true.
b. None of the statements are true.
c. Only the first statement is true.
d. Only the second statement is true.

8. Which of the following statements is (are) true for all positive integers?

1) 13^n+10 is divisible by 2.
2) 7^n+11 is divisible by 4.

a. Both statements are true.
b. None of the statements are true.
c. Only the second statement is true.
d. Only the first statement is true.

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9. Which of the following statements is (are) true for all positive integers?

1) $1 + 2 + 3 + 4 + \ldots + n = \dfrac{n(n+1)}{2}$

2) $1 + 3 + 5 + \ldots + (2n - 1) = n^2$

a. Both statements are true.
b. None of the statements are true.
c. Only the first statement is true.
d. Only the second statement is true.

10. Which of the following statements is (are) true for all positive integers?

1) $2 + 2^2 + 2^3 + \ldots + 2^n = 2^{n+1} - 2$

2) $1 + 3 + 5 + \ldots + n = n^3$

a. Both statements are true.
b. None of the statements are true.
c. Only the first statement is true.
d. Only the second statement is true.

11. Use the Binomial Theorem to expand $(3a - b)^5$.

a. $243a^5 + 405a^4b + 270a^3b^2 + 90a^2b^3 + 15ab^4 + b^5$
b. $a^5 - 5a^4b + 10a^2b^3 + 5ab^4 - b^5$
c. $243a^5 - 405a^4b + 270a^3b^2 - 90a^2b^3 + 15ab^4 - b^5$
d. $243b^5 + 405ab^4 + 270a^2b^3 - 90a^3b^2 + 15a^4b + a^5$

12. Find $\sum_{k=1}^{6} (8k + 2)$.

a. $10 + 18 + 26 + 34 + 42;\ 180$
b. $18 + 26 + 34 + 42 + 50;\ 10$
c. $10 + 18 + 26 + 34 + 42;\ 50$
d. $10 + 18 + 26 + 34 + 42 + 50;\ 180$

13. Find the sum of an infinite geometric series in which $a_1 = 34$ and $r = -0.07$. Round to the nearest hundredth if necessary.

a. 31.78
b. 34.7
c. 36.56
d. 48.29

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Find the coefficient of the indicated term in each expansion.

14. $(5x - 4y)^6$, x^2y^4 term

a. 30 b. 96,000
c. 192,000 d. 6,400

15. Write an arithmetic sequence that has three arithmetic means between 145 and 205.

a. 145, 160, 175, 190, 205 b. 145, 190, 175, 160, 205
c. 145, 155, 165, 175, 205 d. 145, 165, 185, 195, 205

16. Find $\sum_{k=1}^{6}(6k+5)$.

a. $11 + 17 + 23 + 29 + 35; 41$ b. $11 + 17 + 23 + 29 + 35 + 41; 156$
c. $17 + 23 + 29 + 35 + 41; 11$ d. $11 + 17 + 23 + 29 + 35; 156$

17. 7th partial sum of $a_n = \frac{3n+3}{n}$.

a. $\frac{507}{20}$ b. $\frac{73}{4}$
c. $\frac{4029}{140}$ d. $\frac{437}{20}$

18. A ditch contains 10 centimeters of water. The total amount of rainwater in the ditch is as follows:
10 centimeters of water after 1 second, 15 centimeters after 2 seconds, 20 centimeters after 3 seconds, and so on.
Assuming that the ditch has sufficient capacity for storage, how many centimeters of water will it have after 10 seconds?

a. 55 cm b. 65 cm
c. 75 cm d. 110 cm

19. Find the sum of the first five terms of a geometric series with $a_1 = 0.15$, $a_5 = 614.4$, and $r = 8$. Round to the nearest hundredth if necessary.

a. 702.15 b. –6,107.67
c. 546.15 d. 8,370.51

20. Last year, 150 cases were reported of a new infectious disease. It has been predicted that the number will double every year. How many cases will be reported in the ninth year?

a. 38,400 b. 166
c. 76,800 d. 256

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21. Find S_n if $a_1 = 10$, $d = -10$, and $n = 16$.

a. –1120 b. –2080
c. 2500 d. –1040

22. Find the sum of the first 43 terms of the sequence 3, 4, 5, 6, 7, ...

a. 1032 b. 1034
c. 1033 d. 1031

23. Use Euler's formula to write $4\sqrt{2} - 4i\sqrt{2}$ in exponential form.

a. $e^{i\frac{7\pi}{4}}$ b. $8e^{i}$
c. $8e^{i\frac{\pi}{4}}$ d. $8e^{i\frac{7\pi}{4}}$

Write the expansion of each expression using sigma notation.

24. $(-5m - 7n)^{19}$

a. $\sum_{r=0}^{19} \binom{19}{r} (-5m)^{19-r}(-7n)^{r}$ b. $\sum_{r}^{19} \binom{19}{r} (-5m)^{19-r}(-7n)^{r}$
c. $\sum_{r=0}^{19} \binom{19}{r} (-5m)^{r}(-7n)^{19-r}$ d. $\sum_{r=0}^{19} \binom{r}{19} (-5m)^{19-r}(-7n)^{r}$

Use Pascal's triangle to expand each binomial.

25. $(x - 4y)^3$

a. $x^3 + 3x^2y + 3xy^2 + y^3$
b. $x^3 - 12x^2y + 48xy^2 - 64y^3$
c. $y^3 - 4y^2x + 16yx^2 - 64x^3$
d. $x^3 - 4x^2y + 16xy^2 - 64y^3$

26. Use Euler's formula to write $9 + 9i\sqrt{3}$ in exponential form.

a. $18e^{i\frac{\pi}{3}}$ b. $9e^{i}$
c. $18e^{\frac{i}{3}}$ d. $3e^{\frac{i}{3}}$

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27. Use Euler's formula to write $3+3i$ in exponential form.

a. $3e^{i}$ b. $6e^{\frac{i}{3}}$

c. $e^{\frac{i}{3}}$ d. $6e^{i\frac{\pi}{3}}$

28. Find the sum of the given arithmetic series.

$$\sum_{i=10}^{400} (20n + 2)$$

a. 1,595,880 b. 1,603,882

c. 1,599,390 d. 1,524,900

29. Find the sum of an infinite geometric series in which $a_1 = -2$ and $r = -0.02$. Round to the nearest hundredth if necessary.

a. –1.96 b. –1.8

c. –2.04 d. 3.92

30. Use Euler's formula to write $-10\sqrt{3}+10i$ in exponential form.

a. $e^{i\frac{5\pi}{6}}$ b. $2e^{i\frac{5\pi}{6}}$

c. $20e^{i}$ d. $20e^{i\frac{5\pi}{6}}$

Write the expansion of each expression using sigma notation.

31. $(-6m + 6n)^5$

a. $\sum_{r=0}^{5} \binom{5}{r} (-6m)^{5-r}(6n)^{r}$ b. $\sum_{r}^{5} \binom{5}{r} (-6m)^{5-r}(6n)^{r}$

c. $\sum_{r=0}^{5} \binom{5}{r} (-6m)^{r}(6n)^{5-r}$ d. $\sum_{r=0}^{5} \binom{r}{5} (-6m)^{5-r}(6n)^{r}$

32. Find $\sum_{k=1}^{6} (2k + 2)$.

a. $4 + 6 + 8 + 10 + 12; 14$ b. $4 + 6 + 8 + 10 + 12; 54$

c. $6 + 8 + 10 + 12 + 14; 4$ d. $4 + 6 + 8 + 10 + 12 + 14; 54$

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33. 5th partial sum of $a_n = \frac{-4n+1}{n}$.

a. $-\frac{167}{12}$ b. $-\frac{3511}{120}$

c. $-\frac{1063}{60}$ d. $-\frac{3557}{140}$

34. What is the second part of the second step to prove that $S_n \Rightarrow 1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$?

a. Assume that S_n is valid for $n = k$. b. Verify that S_n is valid for $n = 1$.

c. Show that S_n is valid for $n = k$. d. Prove that S_n is valid for $n = k + 1$.

35. What is the first part of the second step to prove that $S_n \Rightarrow 1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$?

a. Show that S_n is valid for $n = k$. b. Prove that S_n is valid for $n = k + 1$.

c. Verify that S_n is valid for $n = 1$. d. Assume that S_n is valid for $n = k$.

36. Use the Binomial Theorem to expand $(c - 11)^4$.

a. $c^4 - 44c^3 + 726c^2 - 44c + 1$

b. $c^4 - 44c^3 + 726c^2 - 5324c + 14641$

c. $11c^4 + 44c^3 + 726c^2 + 5324c + 14641c$

d. $c^4 + 44c^3 + 726c^2 + 5324c + 14641$

37. Write a sequence that has four geometric means between 36 and –279,936.

a. 36, –4,320, –6,480, –8,640, –10,800, –279,936

b. 36, 216, 1,296, 7,776, 46,656, –279,936

c. 36, 1,296, –7,776, 46,656, –279,951, –279,936

d. 36, –216, 1,296, –7,776, 46,656, –279,936

38. Form a sequence that has two geometric means between –12 and –324.

a. –12, 108, –108, –324 b. $-6, \sqrt{-36}, -108$

c. –12, –36, –108, –324 d. $-36, 108, \sqrt{-12}$

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39. Find $\sum_{k=3}^{8}(2k+2)$.

a. $8+10+12+14+16+18;\ 78$ b. $8+10+12+14+16;\ 18$
c. $10+12+14+16+18;\ 8$ d. $8+10+12+14+16;\ 78$

40. Find the sum of the given arithmetic series.

$\sum_{k=5}^{20}(2n+27)$

a. 848 b. 832
c. 1664 d. 616

Find the specified *n*th term of each geometric sequence.

41. $a_3 = 12,\ r = 0.5,\ n = 8$

a. 0.375 b. 0.0313
c. 0.75 d. 0.0938

Find the indicated sum for each sequence.

42. S_8 of –2, –13, –24, –35, ...

a. –324 b. –79
c. –628 d. –175

43. Two elevators begin descending from the same height. Elevator A has descended 4 feet after one second, 9 feet after two seconds, 14 feet after three seconds, and so on. Elevator B has descended
3.5 feet after one second, 6.5 feet after two seconds, 9.5 feet after three seconds, and so on.
How many feet would each elevator descend in 10 seconds?

a. A: 54 ft; B: 33.5 ft b. A: 85 ft; B: 72 ft
c. A: 59 ft; B: 36.5 ft d. A: 49 ft; B: 30.5 ft

Write a recursive formula for finding the *n*th term of each geometric sequence.

44. –6, –12, –24, ...

a. $a_1 = -6,\ a_n = 2a_{n-1}$ b. $a_1 = -12,\ a_n = 2a_{n-1}$
c. $a_1 = -24,\ a_n = 2a_{n-1}$ d. $a_1 = -6,\ a_n = 2a_{n-2}$

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45. Find $\sum_{k=4}^{9}(5k+5)$.

a. $25+30+35+40+45;\ 50$ b. $25+30+35+40+45;\ 225$
c. $30+35+40+45+50;\ 25$ d. $25+30+35+40+45+50;\ 225$

Write the expansion of each expression using sigma notation.

46. $(-5m-2n)^{15}$

a. $\sum_{r}^{15}\binom{15}{r}(-5m)^{15-r}(-2n)^{r}$ b. $\sum_{r=0}^{15}\binom{r}{15}(-5m)^{15-r}(-2n)^{r}$
c. $\sum_{r=0}^{15}\binom{15}{r}(-5m)^{r}(-2n)^{15-r}$ d. $\sum_{r=0}^{15}\binom{15}{r}(-5m)^{15-r}(-2n)^{r}$

47. Find $\sum_{k=6}^{11}(5k+5)$.

a. $35+40+45+50+55;\ 60$ b. $35+40+45+50+55+60;\ 285$
c. $35+40+45+50+55;\ 285$ d. $40+45+50+55+60;\ 35$

48. Use Pascal's Triangle to expand $(2a-y)^5$.

a. $32a^5y-80a^4y+80a^3y^2+40a^2y^3+10ay^4-2ay^5$
b. $32a^5-80a^4y+80a^3y^2-40a^2y^3+10ay^4-y^5$
c. $32a^5-128a^4y+80a^3y^2-40a^2y^3+16ay^4-y^5$
d. $160a^5-80a^4y+80a^3y^2-40a^2y^3+10ay^4-5y^5$

49. What is the second step to prove that $S_n \Rightarrow 2+2^2+2^3+\ldots+2^n=2(2^n-1)$?

a. Assume that S_n is valid for $n=k$ and prove that S_n is valid for $n=k+1$.
b. Show that S_n is valid for $n=k$.
c. Show that S_n is valid for $n=k+2$.
d. Verify that S_n is valid for $n=1$.

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Find the indicated sum for each sequence.

50. S_9 of –9, 36, –144, 576, ...

a. 1,887,435 b. –471,852
c. –471,861 d. –585

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Answer Key

1. a

2. b

3. d

4. c

5. b

6. d

7. a

8. b

9. a

10. c

11. c

12. d

13. a

14. b

15. a

16. b

17. c

18. a

19. a

20. a

21. d

22. a

23. d

24. a

25. b

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26. c

27. b

28. b

29. a

30. d

31. a

32. d

33. c

34. d

35. d

36. b

37. d

38. c

39. a

40. b

41. a

42. a

43. d

44. a

45. d

46. d

47. b

48. b

49. a

50. c