Name _____ Class _____ Date _____

Practice 11-4

Arithmetic Series

For each sum, find the number of terms, the first term, and the last term. Then evaluate the series.

1. $\sum_{n=1}^{4}(n-1)$
2. $\sum_{n=2}^{6}(2n-1)$
3. $\sum_{n=3}^{8}(n+25)$
4. $\sum_{n=2}^{5}(5n+3)$
5. $\sum_{n=1}^{4}(2n+0.5)$
6. $\sum_{n=1}^{6}(3-n)$
7. $\sum_{n=5}^{10}n$
8. $\sum_{n=1}^{4}(-n-3)$
9. $\sum_{n=3}^{6}(3n+2)$

Write the related series for each finite sequence. Then find the sum of each series

10. 1, 3, 5, . . . , 15
11. 5, 8, 11, . . . , 26
12. 4, 9, 14, 19, . . . , 44
13. 10, 25, 40, 55, 70, 85
14. 17, 25, 33, 41, 49, 57, 65
15. 125, 126, 127, . . . , 131

Use summation notation to write each arithmetic series for the specified number of terms.

16. $1 + 3 + 5 + \ldots; n = 7$
17. $2.3 + 2.6 + 2.9 + \ldots; n = 5$
18. $4 + 8 + 12 + \ldots; n = 4$
19. $10 + 7 + 4 + \ldots; n = 6$
20. $3 + 7 + 11 + \ldots; n = 8$
21. $15 + 25 + 35 + \ldots; n = 7$

Tell whether each list is a *series* or a *sequence*. Then tell whether it is *finite* or *infinite*.

22. 7, 12, 17, 22, 27
23. $3 + 5 + 7 + 9 + \ldots$
24. 8, 8.2, 8.4, 8.6, 8.8, 9.0, . . .
25. $1 + 5 + 9 + 13 + 17$
26. 40, 20, 10, 5, 2.5, 1.25, . . .
27. $10 + 20 + 30 + 40 + 50$

Each sequence has six terms. Find the sum of each related series

28. 1, 0, −1, . . . , −4
29. 4, 5, 6, . . . , 9
30. −7, −9, −11, . . . , −17
31. −6, −7, −8, . . . , −11
32. 0, 0.3, 0.6, . . . , 1.5
33. 5, 7, 9, . . . , 15

34. An embroidery pattern calls for 5 stitches in the first row and for three more stitches in each successive row. The 25th row, which is the last row, has 77 stitches. Find the total number of stitches in the pattern.

35. A marching band formation consists of 6 rows. The first row has 9 musicians, the second has 11, the third has 13 and so on. How many musicians are in the last row and how many musicians are there in all?

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Practice 11-5

Geometric Series

Decide whether each infinite geometric series *diverges* or *converges*. State whether each series has a sum.

1. $3 + \frac{3}{2} + \frac{3}{4} + \ldots$
2. $4 + 2 + 1 + \ldots$
3. $17 + 15.3 + 13.77 + \ldots$
4. $6 + 11.4 + 21.66 + \ldots$
5. $-20 - 8 - 3.2 - \ldots$
6. $50 + 70 + 98 + \ldots$

Evaluate each infinite series that has a sum.

7. $\sum_{n=1}^{\infty} 5\left(\frac{2}{3}\right)^{n-1}$
8. $\sum_{n=1}^{\infty} (-2.1)^{n-1}$
9. $\sum_{n=1}^{\infty} \left(-\frac{1}{2}\right)^{n-1}$
10. $\sum_{n=1}^{\infty} 2\left(\frac{5}{3}\right)^{n-1}$

Evaluate each infinite geometric series.

11. $8 + 4 + 2 + 1 + \ldots$
12. $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \ldots$

Determine whether each series is *arithmetic* or *geometric*. Then find the sum of the **series to the given term.**

15. $2 + 5 + 8 + 11 + \ldots; S_9$
16. $\frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \frac{1}{64} + \ldots; S_8$
17. $-3 + 6 - 12 + 24 - \ldots; S_{10}$
18. $-2 + 2 + 6 + 10 + \ldots; S_{12}$

Find the sum of the series to the given term.

19. $40 + 20 + 10 + \ldots; S_{10}$
20. $4 + 12 + 36 + \ldots; S_{15}$
21. $15 + 12 + 9.6 + \ldots; S_{40}$
22. $27 + 9 + 3 + \ldots; S_{100}$
23. $0.2 + 0.02 + 0.002 + \ldots; S_8$
24. $100 + 200 + 400 + \ldots; S_6$

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Reteaching 6-7

Permutations and Combinations

OBJECTIVE: Find permutations and combinations **MATERIALS:** Calculator

- A *permutation* of a set of items is an ordered arrangement of the items.
- If n and r are positive integers with $r \leq n$, then ${}_nP_r$ denotes the number of permutations of n distinct items taken r at a time.

$$ {}_nP_r = \frac{n!}{(n-r)!} $$

- A *combination* is a selection of items in which order does not matter.
- The number of combinations of n objects of a set chosen r objects at a time is given by the following formula:

$$ {}_nC_r = \frac{n!}{r!(n-r)!}; \text{ for } 0 \leq r \leq n $$

Example

If order is not important, in how many ways can five letters be chosen from the alphabet?

n = alphabet = 26 ← **Decide what number represents n and what number represents r.**
r = chosen letters = 5

${}_{26}C_5 = \frac{26!}{5!(21!)}$ ← **Use the formula to write the equation.**

$= \frac{7{,}893{,}600}{120}$ ← **Evaluate the factorials. Use the ! option of a calculator.**

$= 65{,}780$ ← **Simplify.**

There are 65,780 ways in which five letters can be chosen from the alphabet.

Exercises

1. How many permutations of six letters are there from A, E, B, L, N, O, S, T, and Y?
2. A chemist is making a solution of five chemicals in water. How many possible permutations are there in which to add the chemicals one at a time?
3. You have 12 CDs in your collection. You have time to listen to two CDs. How many combinations of CDs do you have to choose from?
4. Your biology teacher chooses six students from a class of 26 to do a special project. Find the total number of combinations.
5. In how many ways can a family of six line up for a photograph?
6. In how many ways can a president, vice president, secretary, and treasurer be elected from a club with 15 members?
7. A health food store offers ten toppings for yogurt. How many different three-topping yogurt sundaes can be formed with the ten toppings? (Assume that no topping is used twice.)

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Practice 6-8

The Binomial Theorem

Use the Binomial Theorem to expand each binomial.

1. $(x + 2)^4$
2. $(a + 2)^7$
3. $(x + y)^7$
4. $(d - 2)^9$
5. $(2x - 3)^8$
6. $(x - 1)^9$
7. $(2x^2 - 2y^2)^6$
8. $(x^5 + 2y)^7$

Use Pascal's Triangle to expand each binomial.

15. $(n - 3)^3$
16. $(2n + 2)^4$
17. $(n - 6)^5$
18. $(n - 1)^6$
19. $(2a + 2)^3$
20. $(x^2 - y^2)^4$
21. $(2x + 3y)^5$
22. $(2x^2 + y^2)^6$
23. $(x^2 - y^2)^3$
24. $(2b + c)^4$
25. $(3m - 2n)^5$
26. $(x^3 - y^4)^6$

Expand each binomial.

27. $(x + 1)^7$
28. $(x + 4)^8$
29. $(x - 3y)^6$
30. $(x + 2)^5$
31. $(x^2 - y^2)^5$
32. $(3 + y)^5$
33. $(x^2 + 3)^6$
34. $(x - 5)^7$
35. $(x - 4y)^4$