Name _____ Date _____

Is There a Pattern Here?
Recognizing Patterns and Sequences

Vocabulary

Choose the term that best completes each statement.

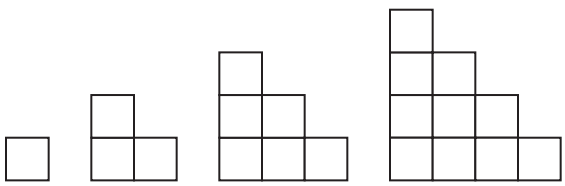
sequence	term of a sequence	infinite sequence	finite sequence

1. A sequence which terminates is called a(n) _____.
2. A(n) _____ is an individual number, figure, or letter in a sequence.
3. A(n) _____ is a pattern involving an ordered arrangement of numbers, geometric figures, letters, or other objects.
4. A sequence which continues forever is called a(n) _____.

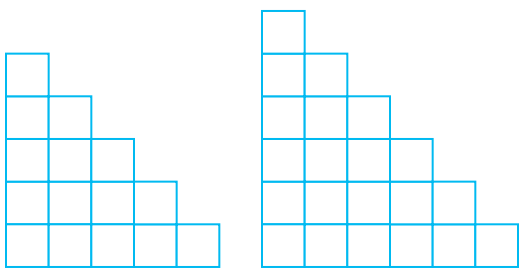
Problem Set

Describe each given pattern. Draw the next two figures in each pattern.

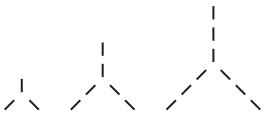
1.



The second figure has 2 more squares than the first, the third figure has 3 more squares than the second, and the fourth figure has 4 more squares than the third.

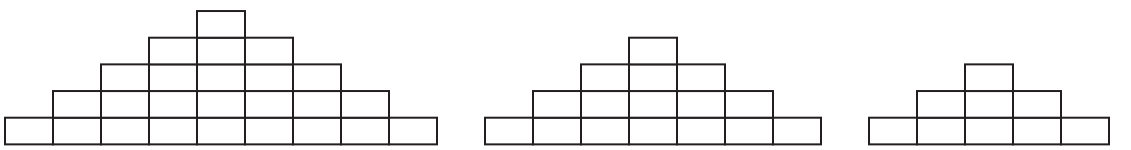


2.

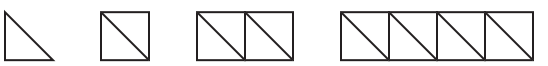


3.

4.

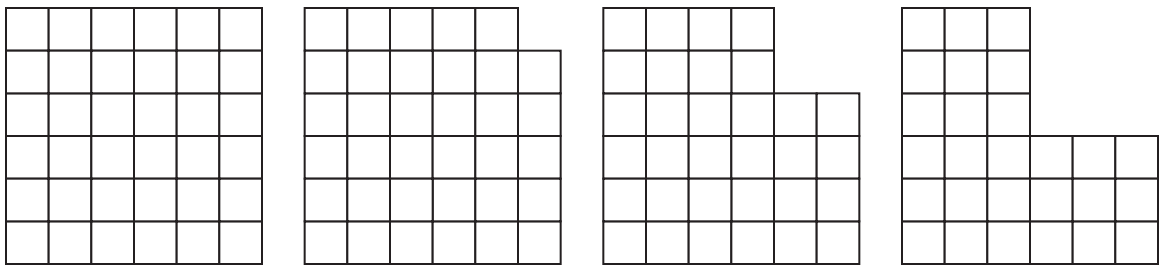


5.



Name _____ Date _____

6.

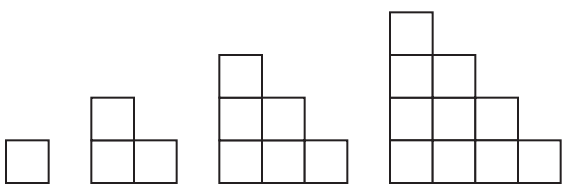


Write a numeric sequence to represent each given pattern or situation.

7. The school cafeteria begins the day with a supply of 1000 chicken nuggets. Each student that passes through the lunch line is given 5 chicken nuggets. Write a numeric sequence to represent the total number of chicken nuggets remaining in the cafeteria's supply after each of the first 6 students pass through the line. Include the number of chicken nuggets the cafeteria started with.

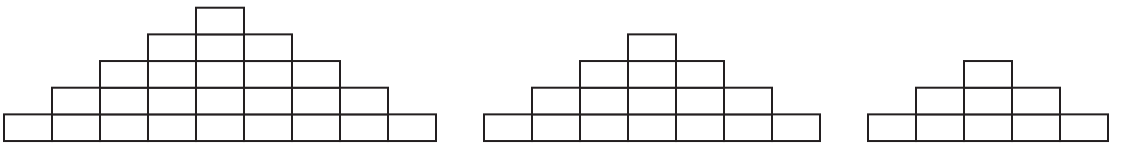
1000, 995, 990, 985, 980, 975, 970

8. Write a numeric sequence to represent the number of squares in each of the first 7 figures of the pattern.



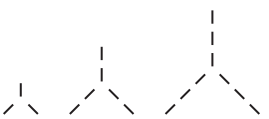
9. Sophia starts a job at a restaurant. She deposits $40 from each paycheck into her savings account. There was no money in the account prior to her first deposit. Write a numeric sequence to represent the amount of money in the savings account after Sophia receives each of her first 6 paychecks.

10. Write a numeric sequence to represent the number of blocks in each of the first 5 figures of the pattern.



11. Kyle is collecting canned goods for a food drive. On the first day he collects 1 can. On the second day he collects 2 cans. On the third day he collects 4 cans. On each successive day, he collects twice as many cans as he collected the previous day. Write a numeric sequence to represent the total number of cans Kyle has collected by the end of each of the first 7 days of the food drive.

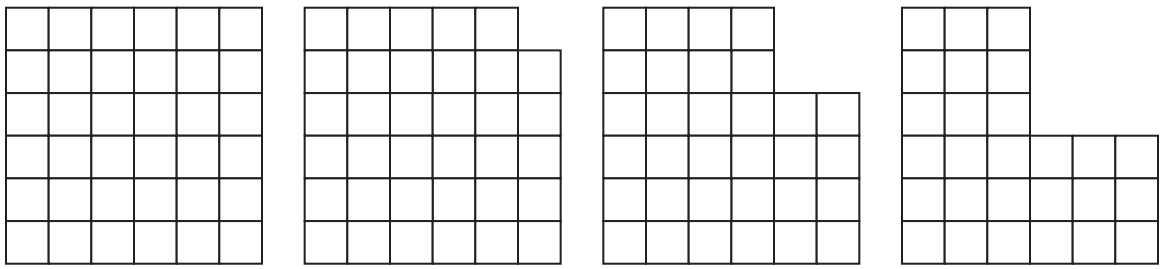
12. Write a numeric sequence to represent the number of line segments in each of the first 7 figures of the pattern.



13. For her 10th birthday, Tameka's grandparents give her a set of 200 stamps. For each birthday after that, they give her a set of 25 stamps to add to her stamp collection. Write a numeric sequence consisting of 7 terms to represent the number of stamps in Tameka's collection after each of her birthdays starting with her 10th birthday.

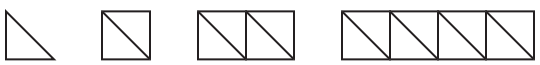
Name _____ Date _____

14. Write a numeric sequence to represent the number of squares in each of the first 6 figures of the pattern.



15. Leonardo uses 3 cups of flour in each cake he bakes. He starts the day with 50 cups of flour. Write a numeric sequence to represent the amount of flour remaining after each of the first 7 cakes Leonardo bakes. Include the amount of flour Leonardo started with.

16. Write a numeric sequence to represent the number of triangles in each of the first 7 figures of the pattern.



4

Name _____ Date _____

The Password Is . . . Operations!
Arithmetic and Geometric Sequences

Vocabulary

Describe each given sequence using the terms arithmetic sequence, common difference, geometric sequence, and common ratio as they apply.

1. 10, 20, 30, 40, . . .

2. 1, 2, 4, 8, . . .

Problem Set

Determine the common difference for each arithmetic sequence.

1. 1, 5, 9, 13, . . .

$d = 5 - 1$

$d = 4$

2. 10, 3, −4, −11, . . .

3. 10.5, 13, 15.5, 18, . . .

4. $\frac{1}{3}, \frac{2}{3}, 1, \frac{4}{3}, \ldots$

5. 95, 91.5, 88, 84.5, . . .

6. 170, 240, 310, 380, . . .

7. 1250, 1190, 1130, 1070, . . .

8. −4.8, −6.0, −7.2, −8.4, . . .

9. $8\frac{1}{2}$, 9, $9\frac{1}{2}$, 10, . . .

10. −28, −13, 2, 17, . . .

Determine the common ratio for each geometric sequence.

11. 5, 10, 20, 40, . . .

$r = 10 \div 5$

$r = 2$

12. 2, 8, 32, 128, . . .

13. 3, −6, 12, −24, . . .

14. 800, 400, 200, 100, . . .

15. 10, −30, 90, −270, . . .

16. 64, −32, 16, −8, . . .

17. 5, 40, 320, 2560, . . .

18. 45, 15, 5, $\frac{5}{3}$, . . .

19. 0.2, −1, 5, −25, . . .

20. 150, 30, 6, 1.2, . . .

Name _____ Date _____

Determine the next 3 terms in each arithmetic sequence.

21. 8, 14, 20, 26, 32, 38, 44, . . .

22. 90, 75, 60, 45, _____, _____, _____, . . .

23. −24, −14, −4, 6, _____, _____, _____, . . .

24. $\frac{3}{5}, \frac{4}{5}, 1, \frac{6}{5}$, _____, _____, _____, . . .

25. 20, 11, 2, −7, _____, _____, _____, . . .

26. 12, 16.5, 21, 25.5, _____, _____, _____, . . .

27. −101, −112, −123, −134, _____, _____, _____, . . .

28. 3.8, 5.1, 6.4, 7.7, _____, _____, _____, . . .

29. −500, −125, 250, 625, _____, _____, _____, . . .

30. 24.5, 20.7, 16.9, 13.1, _____, _____, _____, . . .

Determine the next 3 terms in each geometric sequence.

31. 3, 9, 27, 81, 243, 729, 2187, . . .

32. 512, 256, 128, 64, _____, _____, _____, . . .

33. 5, −10, 20, −40, _____, _____, _____, . . .

34. 3000, 300, 30, 3, _____, _____, _____, . . .

35. 2, −2, 2, −2, _____, _____, _____, . . .

36. 0.2, 1.2, 7.2, 43.2, _____, _____, _____, . . .

37. −8000, 4000, −2000, 1000, _____, _____, _____, . . .

38. 0.1, 0.4, 1.6, 6.4, _____, _____, _____, . . .

39. 156.25, 31.25, 6.25, 1.25, _____, _____, _____, . . .

40. 7, −21, 63, −189, _____, _____, _____, . . .

Determine whether each given sequence is arithmetic, geometric, or neither. For arithmetic and geometric sequences, write the next 3 terms of the sequence.

41. 4, 8, 12, 16, . . .

The sequence is arithmetic. The next 3 terms are 20, 24, and 28.

42. 2, 4, 7, 11, . . .

43. 3, 12, 48, 192, . . .

44. 9, −18, 36, −72, . . .

45. 1.1, 1.11, 1.111, 1.1111, . . .

46. 4, −8, −20, −32, . . .

47. 7.5, 11.6, 15.7, 19.8, . . .

48. 1, −4, 9, −16, . . .

49. 5, −20, 80, −320, . . .

50. 9.8, 5.6, 1.4, −2.8, . . .

Name _____ Date _____

The Power of Algebra Is a Curious Thing

Using Formulas to Determine Terms of a Sequence

Vocabulary

Choose the term that best completes each statement.

index	explicit formula	recursive formula

1. A(n) _____ expresses each term of a sequence based on the preceding term of the sequence.
2. The _____ is the position of a term in a sequence.
3. A(n) _____ calculates each term of a sequence using the term's position in the sequence.

Problem Set

Determine each unknown term in the given arithmetic sequence using the explicit formula.

1. Determine the 20th term of the sequence 1, 4, 7, . . .

$a_n = a_1 + d(n - 1)$

$a_{20} = 1 + 3(20 - 1)$

$a_{20} = 1 + 3(19)$

$a_{20} = 1 + 57$

$a_{20} = 58$

2. Determine the 30th term of the sequence −10, −15, −20, . . .

3. Determine the 25th term of the sequence 3.3, 4.4, 5.5, . . .

4. Determine the 50th term of the sequence 100, 92, 84, . . .

5. Determine the 42nd term of the sequence 12.25, 14.50, 16.75, . . .

6. Determine the 28th term of the sequence –242, –251, –260, . . .

7. Determine the 34th term of the sequence −76.2, −70.9, −65.6, . . .

8. Determine the 60th term of the sequence 10, 25, 40, . . .

9. Determine the 57th term of the sequence 672, 660, 648, . . .

10. Determine the 75th term of the sequence −200, −100, 0, . . .

Determine each unknown term in the given geometric sequence using the explicit formula. Round the answer to the nearest hundredth when necessary.

11. Determine the 10th term of the sequence 3, 6, 12, . . .

$g_n = g_1 \cdot r^{n-1}$

$g_{10} = 3 \cdot 2^{10-1}$

$g_{10} = 3 \cdot 2^9$

$g_{10} = 3 \cdot 512$

$g_{10} = 1536$

12. Determine the 15th term of the sequence 1, −2, 4, . . .

Name _____ Date _____

13. Determine the 12th term of the sequence 5, 15, 45, . . .

14. Determine the 16th term of the sequence 9, 18, 36, . . .

15. Determine the 20th term of the sequence 0.125, −0.250, 0.500, . . .

16. Determine the 18th term of the sequence 3, 9, 27, . . .

17. Determine the 14th term of the sequence −4, 8, −16, . . .

18. Determine the 10th term of the sequence 0.1, 0.5, 2.5, . . .

19. Determine the 12th term of the sequence 4, 5, 6.25, . . .

20. Determine the 10th term of the sequence 5, −25, 125, . . .

Determine whether each sequence is arithmetic or geometric. Then, use the appropriate recursive formula to determine the unknown term(s) in the sequence.

21. 4, 8, 16, 32, 64, . . .

The sequence is geometric.

$g_n = g_{n-1} \cdot r$

$g_5 = g_4 \cdot 2$

$g_5 = 32 \cdot 2$

$g_5 = 64$

22. 16, 30, 44, 58, _____, . . .

4

23. 2, −6, 18, _____, 162, _____, . . .

24. 7.3, 9.4, 11.5, _____, 15.7, _____, . . .

25. 320, 410, 500, _____, _____, . . .

Name _____ Date _____

26. 7, 21, 63, _____, 567, _____, . . .

27. −68, −83, −98, _____, _____, _____, . . .

28. −5, 20, −80, _____, _____, _____, . . .

Determine the unknown term in each arithmetic sequence using a graphing calculator.

29. Determine the 20th term of the sequence 30, 70, 110, . . .

$a_{20} = 790$

30. Determine the 25th term of the sequence −25, −50, −75, . . .

31. Determine the 30th term of the sequence 16, 24, 32, . . .

32. Determine the 35th term of the sequence 120, 104, 88, . . .

33. Determine the 30th term of the sequence 350, 700, 1050, . . .

34. Determine the 22nd term of the sequence 0, −45, −90, . . .

35. Determine the 24th term of the sequence 6.8, 9.5, 12.2, . . .

36. Determine the 36th term of the sequence 189, 200, 211, . . .

37. Determine the 20th term of the sequence 2500, 3100, 3700, . . .

38. Determine the 50th term of the sequence −97, −94, −91, . . .

Name _____ Date _____

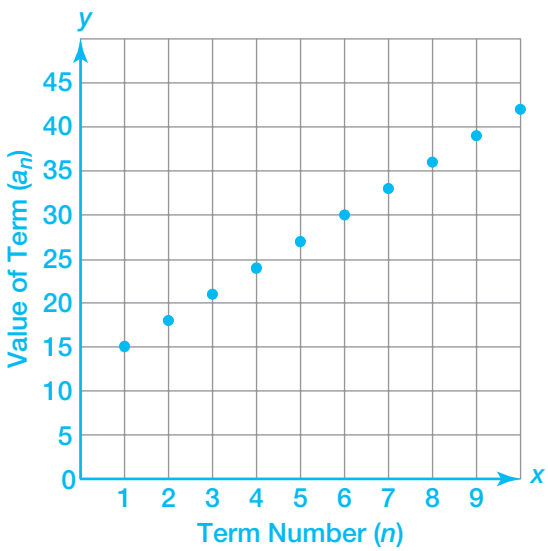
Thank Goodness Descartes Didn't Drink Some Warm Milk!
Graphs of Sequences

Problem Set

Complete the table for each given sequence then graph each sequence on the coordinate plane.

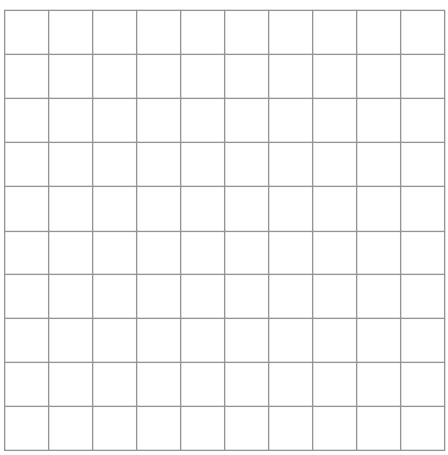
1. $a_n = 15 + 3(n - 1)$

Term Number (n)	Value of Term (a_n)
1	15
2	18
3	21
4	24
5	27
6	30
7	33
8	36
9	39
10	42



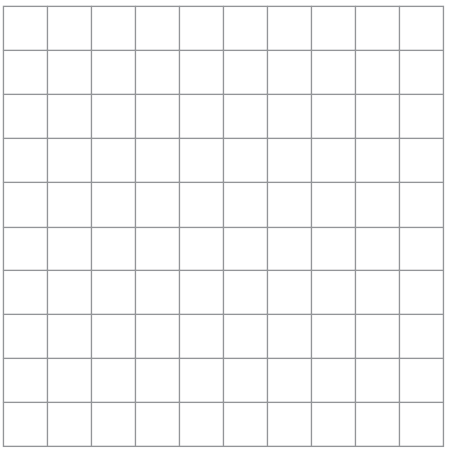
2. $g_n = 3 \cdot 2^{n-1}$

Term Number (n)	Value of Term (g_n)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	



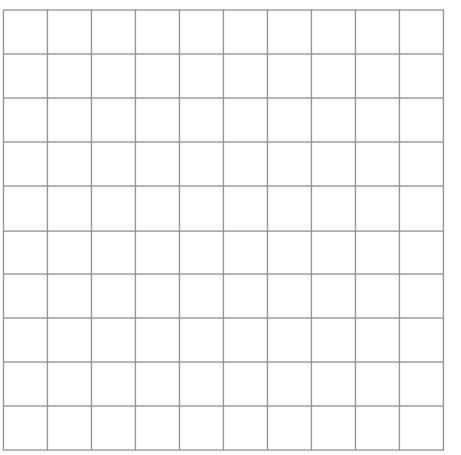
3. $a_n = 50 + (-8)(n - 1)$

Term Number (n)	Value of Term (a_n)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	



4. $g_n = 3 \cdot (-2)^{n-1}$

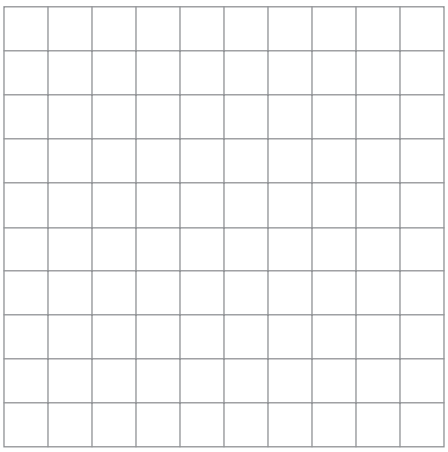
Term Number (n)	Value of Term (g_n)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	



Name _____ Date _____

5. $a_n = -24 + 6(n - 1)$

Term Number (n)	Value of Term (a_n)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

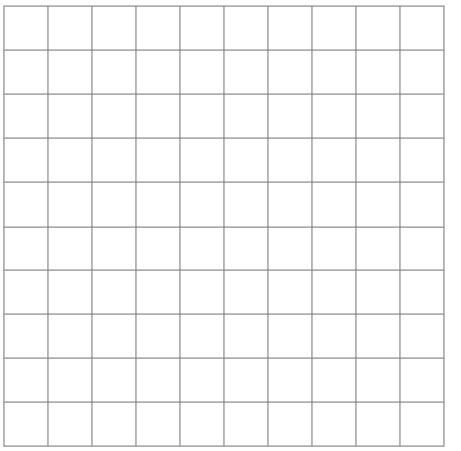


6. $g_n = -1 \cdot 2^{n-1}$

Term Number (n)	Value of Term (g_n)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

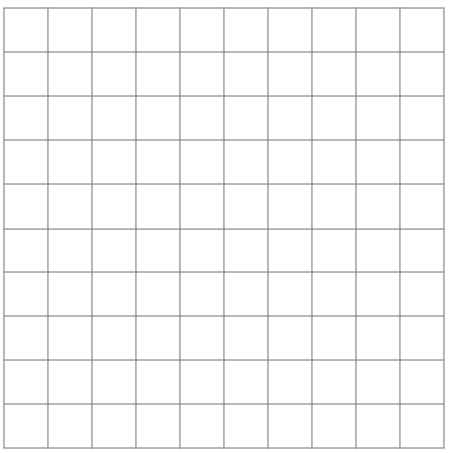
7. $a_n = 75 + 25(n - 1)$

Term Number (n)	Value of Term (a_n)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	



8. $g_n = 32{,}000 \cdot (0.5)^{n-1}$

Term Number (n)	Value of Term (g_n)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	



Name _____ Date _____

9. $a_n = 400 + (-80)(n - 1)$

Term Number (n)	Value of Term (a_n)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

10. $g_n = 2 \cdot (-3)^{n-1}$

Term Number (n)	Value of Term (g_n)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

4

Name _____ Date _____

Well, Maybe It *Is* a Function!

Sequences and Functions

Problem Set

Write each arithmetic sequence as a linear function. Graph the function for all integers, n, such that $1 \leq n \leq 10$.

1. $a_n = 16 + 5(n - 1)$

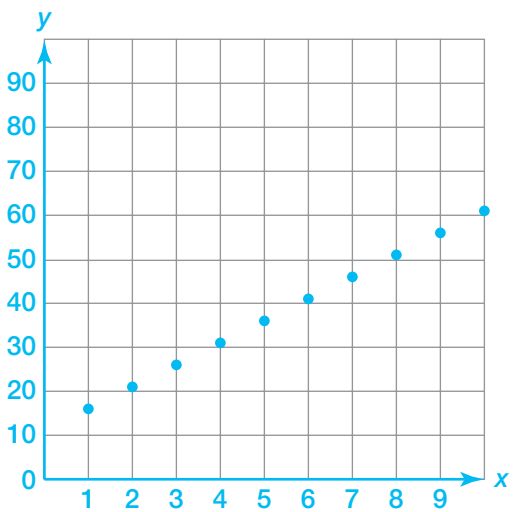
$a_n = 16 + 5(n - 1)$

$f(n) = 16 + 5(n - 1)$

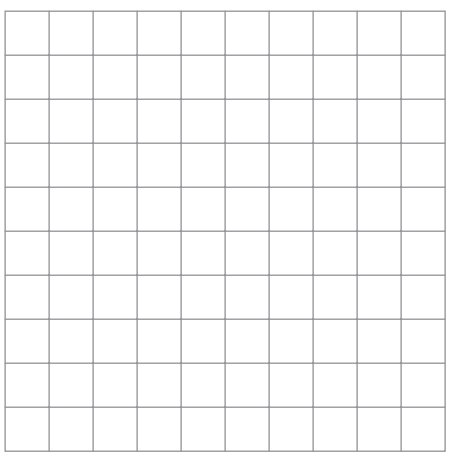
$f(n) = 16 + 5n - 5$

$f(n) = 5n + 16 - 5$

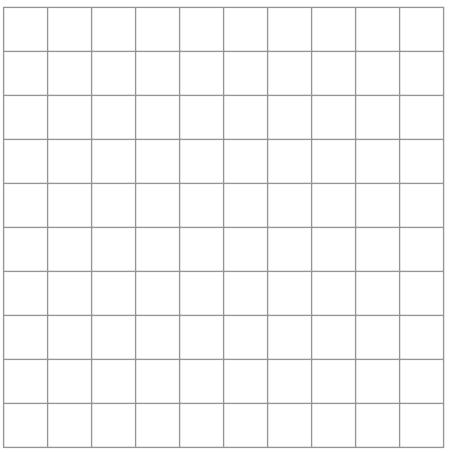
$f(n) = 5n + 11$



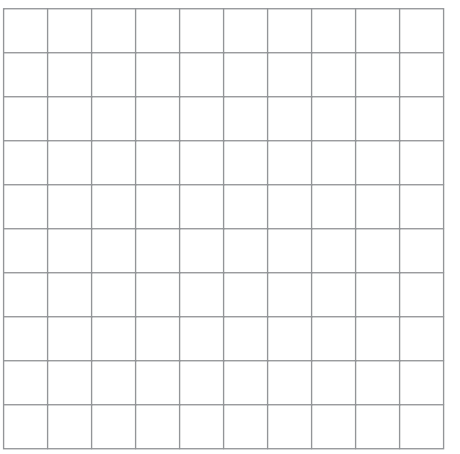
2. $a_n = -50 + 15(n - 1)$



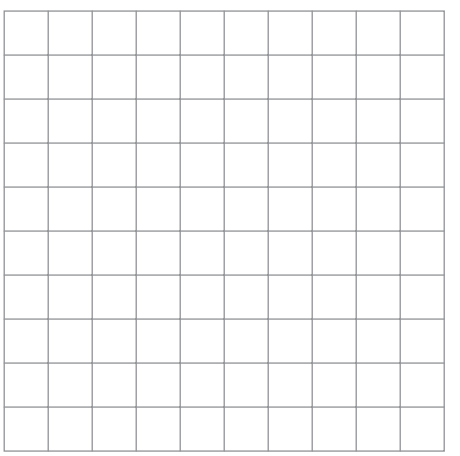
3. $a_n = 100 + (-20)(n - 1)$



4. $a_n = -9 + (-7)(n - 1)$



5. $a_n = 550 + (-50)(n - 1)$



Name _____ Date _____

6. $a_n = 3 + \left(-\frac{3}{5}\right)(n - 1)$

Write each geometric sequence as an exponential function. Graph the function for all integers, n, such that $1 \leq n \leq 10$.

7. $g_n = 5 \cdot 2^{n-1}$

$g_n = 5 \cdot 2^{n-1}$

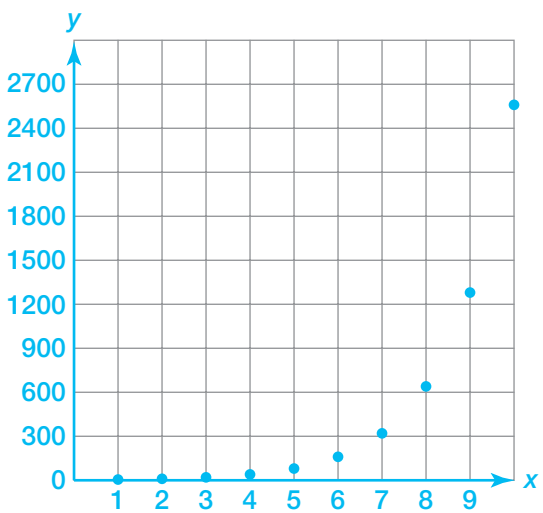
$f(n) = 5 \cdot 2^{n-1}$

$f(n) = 5 \cdot 2^{n} \cdot 2^{-1}$

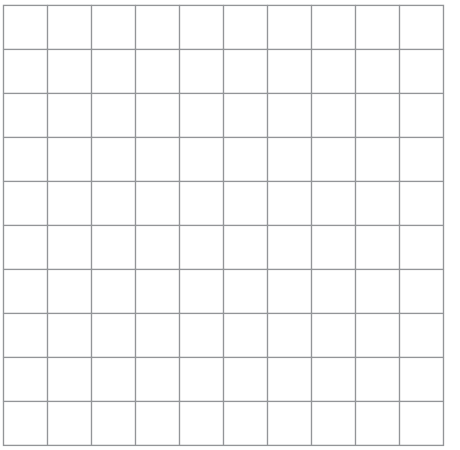
$f(n) = 5 \cdot 2^{-1} \cdot 2^{n}$

$f(n) = 5 \cdot \frac{1}{2} \cdot 2^{n}$

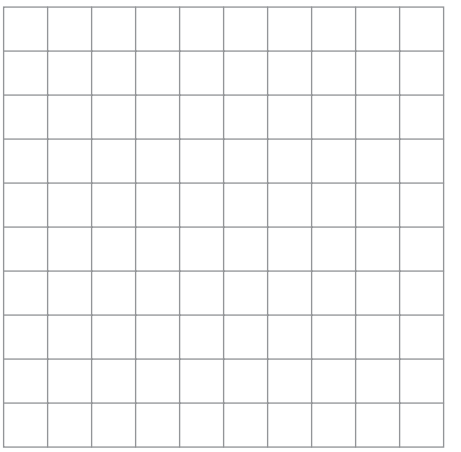
$f(n) = \frac{5}{2} \cdot 2^{n}$



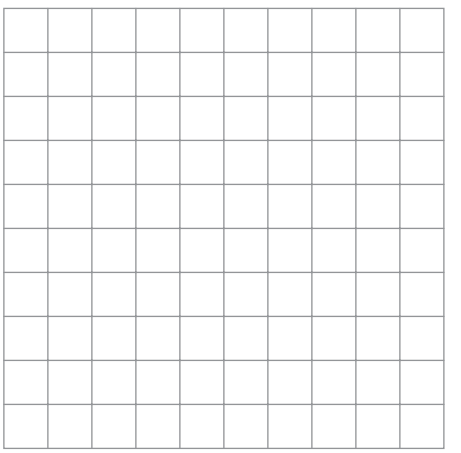
8. $g_n = -3 \cdot 3^{n-1}$



9. $g_n = 20 \cdot 2.5^{n-1}$

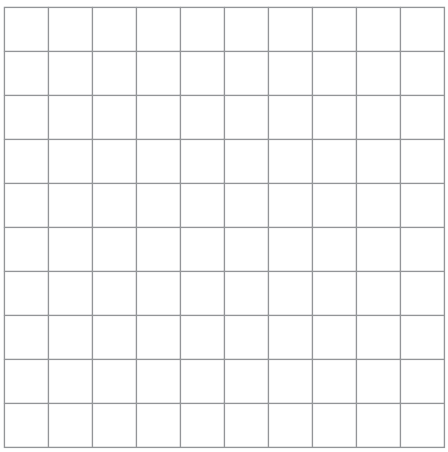


10. $g_n = 900 \cdot 0.9^{n-1}$

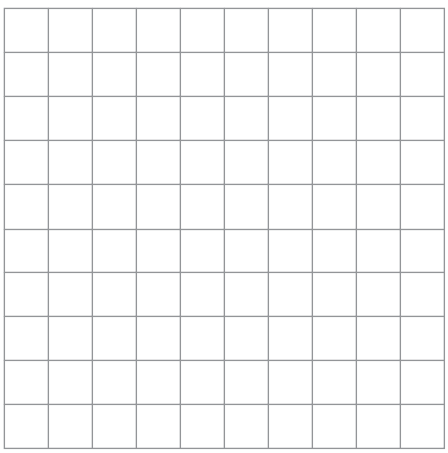


Name _____ Date _____

11. $g_n = -0.5 \cdot 2^{n-1}$



12. $g_n = 1250 \cdot 1.25^{n-1}$



4