Lesson • Inductive Reasoning

Name ______________________________ Period __________ Date ______________

For Exercises 1–8, use inductive reasoning to find the next two terms in each sequence.

1. 4, 8, 12, 16, ______, ______

2. 400, 200, 100, 50, 25, ______, ______

3. $\frac{1}{8}, \frac{2}{7}, \frac{1}{2}, \frac{4}{5}$, ______, ______

4. −5, 3, −2, 1, −1, 0, ______, ______

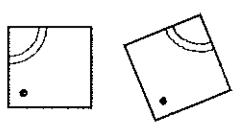
5. 360, 180, 120, 90, ______, ______

6. 1, 3, 9, 27, 81, ______, ______

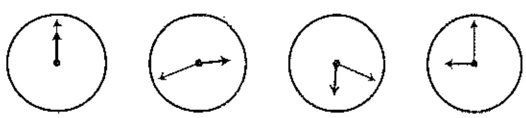
7. 1, 5, 17, 53, 161, ______, ______

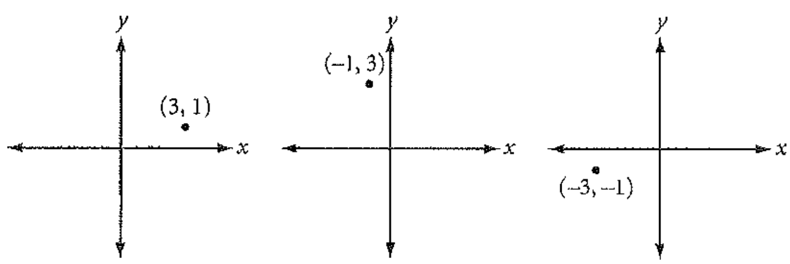
8. 1, 5, 14, 30, 55, ______, ______

For Exercises 9–12, use inductive reasoning to draw the next two shapes in each picture pattern.

9. 

10. 

11. 

12. 

For Exercises 13–15, use inductive reasoning to test each conjecture. Decide if the conjecture seems true or false. If it seems false, give a counterexample.

13. Every odd whole number can be written as the difference of two squares.

14. Every whole number greater than 1 can be written as the sum of two prime numbers.

15. The square of a number is larger than the number.

PRACTICE WORKSHEET – Patterns & Inductive Reasoning

VOCABULARY

A **conjecture** is an unproven statement that is based on observations.

Inductive reasoning is a process that involves looking for patterns and making conjectures.

A **counterexample** is an example that shows a conjecture is false.

Find a counterexample for each.

A counterexample can be a drawing, a statement, or a number.

1. If Susan is in school, then she is in math class.

Counterexample: ______________________________

2. If you were born in New York, then you live in New York.

Counterexample: ______________________________

3. If the car will not start, then it is out of gas.

Counterexample: ______________________________

4. If the basketball team has scored 100 points, then they must be winning.

Counterexample: ______________________________

5. *All figures with 4 sides are squares!*

Counterexample: ______________________________

Write the letter for the correct answer in the blank

6. _____ Choose the numbers that are counterexamples for the following statement. *If two odd numbers are added, then the sum is also an odd number.*

A 3, 8 **B** 4, 6 **C** 1, 7 **D** 2, − 1

7. _____ Which numbers are *not* counterexamples for the following statement? *For any numbers a and b,* $a \div b = a - b$.

A $a = 8, b = 4$ **B** $a = 10, b = 5$ **C** $a = 6, b = 3$ **D** $a = 4, b = 2$

8. _____ Which number is a counterexample for the following statement? *For all numbers a,* $2a + 5 < 17$.

A $a = 6$ **B** $a = 0$ **C** $a = 5$ **D** $a = 1$

Lesson 2.2 • Finding the *n*th Term

Name ______________________ Period __________ Date ______________

For Exercises 1–4, tell whether the rule is a linear function.

1.

n	1	2	3	4	5
$f(n)$	8	15	22	29	36

2.

n	1	2	3	4	5
$g(n)$	14	11	8	5	2

3.

n	1	2	3	4	5
$h(n)$	−9	−6	−2	3	9

4.

n	1	2	3	4	5
$j(n)$	$-\frac{3}{2}$	−1	$-\frac{1}{2}$	0	$\frac{1}{2}$

For Exercises 5 and 6, complete each table.

5.

n	1	2	3	4	5
$f(n) = 7n - 12$					

6.

n	1	2	3	4	5
$g(n) = -8n - 2$					

For Exercises 7–9, find the function rule for each sequence. Then find the 50th term in the sequence.

7.

n	1	2	3	4	5	6	. . .	n	. . .	50
$f(n)$	9	13	17	21	25	29	. . .		. . .	

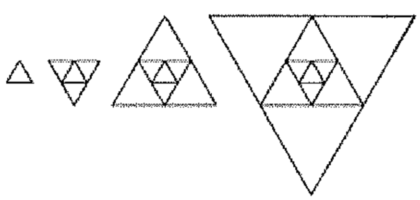
8.

n	1	2	3	4	5	6	. . .	n	. . .	50
$g(n)$	6	1	−4	−9	−14	−19	. . .		. . .	

9.

n	1	2	3	4	5	6	. . .	n	. . .	50
$h(n)$	6.5	7	7.5	8	8.5	9	. . .		. . .	

10. Use the figures to complete the table.



n	1	2	3	4	5	. . .	n	. . .	50
Number of triangles	1	5	9			. . .		. . .	

11. Use the figures above to complete the table. Assume that the area of the first figure is 1 square unit.

n	1	2	3	4	5	. . .	n	. . .	50
Area of figure	1	4	16			. . .		. . .	

Figurate numbers-Numbers that correspond to geometric figures.

1. Find the differences between the numbers in the series.

n	1	2	3	4	5	6	7			20
	2	6	12	20	30	42	56			

2. Sequences that have a constant difference of this type have there patterns in the **factor**s of each term. See if you can find a pattern in the factors.

n	1	2	3	4	5	6	7			20
	2	6	12	20	30	42	56			
First factor Second factor										

3. This gives us two new sequences.

The first factors

n	1	2	3	4	5	6	7

The second factors

n	1	2	3	4	5	6	7

4. Put them together this is your nth term. Now find the 20th term.

1.

n	1	2	3	4	5	6	7			20
	0	3	8	15	24	35				

n	1	2	3	4	5	6	7

n	1	2	3	4	5	6	7

2.

n	1	2	3	4	5	6			20
	-3	8	25	48	77	112			

n	1	2	3	4	5	6	7

n	1	2	3	4	5	6	7

2.2 Finding the nth term

n	1	2	3	4	5	6		15
n-3								

n	1	2	3	4	5	6		15
2n-1								

n	1	2	3	4	5	6		15
3[(n-1)+n]								

1. Find the formula for the nth term, then find the 15th term.

n	1	2	3	4	5	6		15
	3	6	9	12	15	18		

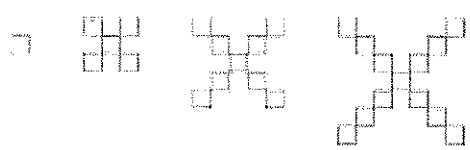
n	1	2	3	4	5	6		15
	2	4	6	8	10	12		

n	1	2	3	4	5	6		15
	2	5	8	11	14	17		

n	1	2	3	4	5	6		15
	-3	6	15	24	33	42		

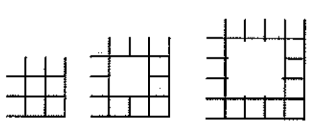
n	1	2	3	4	5	6		15
	0	5	10	15	20	25		

2. Square in a cross pattern.



cross	1	2	3	4	5	6		15
Number of	1	5						

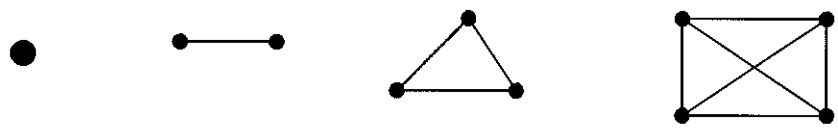
3.



Donut side length	3	4	5	6	7	8		15
Number of squares								

2.3 Mathematical Modeling
Creating the sequences from events.

1. How many ways can you connect 30 dots on a piece of paper if no three are in a line? Don't try to draw it, try drawing smaller versions and find the pattern.



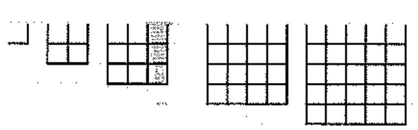
n	1	2	3	4	5	6		30
	0	1	3	6	10			

2. If there are 20 people sitting around a table, how many different pairs of people can have conversations during dinner? What geometric figures can you use to represent this?

3.If a polygon has 20 diagonals leaving a vertex, then how many sides does it have. Hint: a polygon has at least 3 sides.

n	3	4	5	6	7	8		30

4. Area of a square



n	1	2	3	4	5	6		15