1.1 Exercises

CONCEPT CHECK

1. _____ reasoning starts with specific examples or observations and comes to a general conclusion.

2. _____ reasoning starts with accepted facts and comes to a specific conclusion.

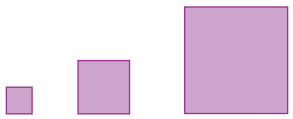
3. True or False: If every pair in a sequence of terms differs by a multiple of two, then the sequence is an arithmetic sequence.

4. True or False: If a single counterexample to a line of reasoning is found, then the line of reasoning is false.

PRACTICE

Identify whether each statement is an example of inductive or deductive reasoning.

5. The sides of all squares are proportional. The three quadrilaterals shown are all squares. Therefore all of their sides are proportional.



6. If Jessica plays basketball and makes 7 out of every 12 free throws, then she should make 35 out of every 60 free throws.

7. I have an 8:00 a.m. math class on Tuesdays and Thursdays. Each class day, I leave for class in my car at 7:30 a.m. Every day that the drive to campus takes 15 minutes, I arrive to class on time. Therefore, if I leave for class at 7:30 a.m. today and the drive to campus takes 15 minutes, I will be on time.

8. My grade on the first test in Quantitative Reasoning was 85, so I will make a B in the course.

9. If you live in New York, you are a resident of the United States.

10. All squares are rectangles, and all rectangles have four sides. Therefore all squares have four sides.

11. All known planets travel about the sun in elliptical orbits; therefore all planets travel about the sun in elliptical orbits.

12. I spent $76.54 on groceries last week and $77.23 on groceries this week, so I will spend less than $80 on groceries next week.

Find the missing terms of each sequence and determine if the sequence is arithmetic, geometric, or neither. If the sequence is arithmetic, state the common difference; if the sequence is geometric, state the common ratio.

13. 1, 3, 5, 7, ____ , ____ , ____

14. 1, 5, 9, 13, ____ , ____ , ____

15. 15, 10, 5, 0, ____ , ____ , ____

16. 5, 10, 20, 40, ____ , ____ , ___

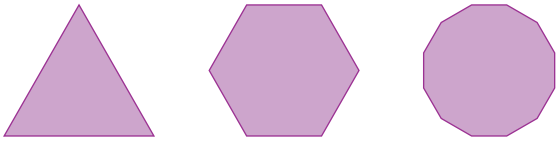
17. $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8},$ ____ , ____ , ____

18. 3, 5, 8, 12, 17, ____ , ____ , __

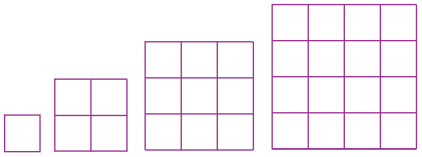
19. 10, 100, 1000, 10,000, ____ , ____ , ____

20. 1, 3, 4, 7, 11, 18,

21.



22.



Find a counterexample to each statement.

23. Every Tuesday is an even day of the month.

24. The product of two numbers is always even.

25. If the difference between two numbers is even, then the numbers are both even.

26. If a geometric figure has 4 sides, then the figure is a square.

27. If $a > b$ and $a > c$, then $b > c$.

28. If the sum of two numbers is odd, then both numbers are odd.

Use deductive reasoning to choose the correct conclusion for each argument.

29. A grocery store requires a membership card to receive exclusive discounts on groceries. I do not have a store membership card, so I ___.

a. cannot buy groceries from this store.

b. cannot receive the exclusive discounts on groceries from this store.

30. A local animal shelter only allows residents of the county it is located in to adopt animals from the shelter. Julian is a resistant of the county the shelter is located in, so Julian ___.

a. is allowed to adopt an animal from the shelter.

b. will adopt a puppy from the shelter.

31. Chicken that is baked in an oven needs to reach an internal temperature of 165 °F to be considered fully cooked. A piece of chicken that was baked in the oven has an internal temperature of 150 °F, so the piece of chicken ___.

a. needs to go back into the oven.

b. is not fully cooked.

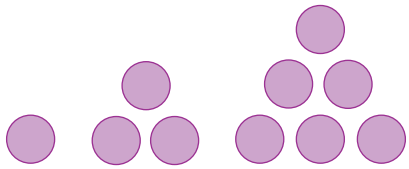
32. An album receives gold status after attaining the equivalent of 500,000 sales. A musician's album passed the equivalent of 500,000 sales last week, so the album ___.

a. will receive gold status.

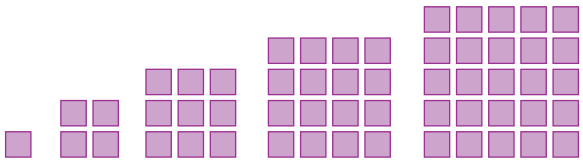
b. was well received.

Figurate numbers are numbers that can be represented by any regular geometric figure. (A regular geometric figure is a figure such as a triangle, pentagon, or hexagon where all sides have the same length.)

33. **Triangular Numbers:** Triangular numbers are numbers that can be represented by an equilateral triangle. The first three triangular numbers, 1, 3, and 6, are shown in the figure. Find the next two triangular numbers and represent them with dots in the shape of a triangle.



34. **Square Numbers:** Square numbers are numbers that can be represented by a square. We discussed the first five square numbers, 1, 4, 9, 16, and 25, in Examples 2 and 5. Determine the 6th and 7th square numbers and represent them using squares in the shape of a square.



Complete the following Sudoku puzzles.

35.

9	3		5	6	8	1	2	
	2	6	7	1		5	9	3
	5	7	9		3	4	6	
	7	8	1	5	9	3	4	6
6	4	1	3	8		2	5	9
3	9		6	4		7	8	1
5	6	3	4		1	8	7	2
	8		2	3	5	6	1	
4	1	2					3	5

36.

	5				9	3		6
7		9		5	6	8		1
4	6	8	3	7	1			5
	8	7		2	4		5	9
		1		6	3	4	2	8
2	4	6		9		7		3
9	1	4	6	3	7	5	8	2
	2	5	9		8	1	3	7
			5	1	2	9		4

WRITING & THINKING

37. Consider the following pattern.

$$1 \cdot 12 = 12$$
$$11 \cdot 12 = 132$$
$$111 \cdot 12 = 1332$$
$$1111 \cdot 12 = 13{,}332$$

a. Based on this pattern, predict the product $111{,}111 \cdot 12$.

b. Check your prediction by finding the product.

c. What type of reasoning did you employ?

38. Consider the following information.

Multiplication Patterns		
Multiplication	**Repeated Addition**	**Sum**
$4 \cdot -2$	$-2+(-2)+(-2)+(-2)$	-8
$3 \cdot -7$	$-7+(-7)+(-7)$	-21
$5 \cdot -6$	$-6+(-6)+(-6)+(-6)+(-6)$	-30

What can you conclude about the sign of the final sum based on multiplication?

1.1 PROJECT

THE LOGIC OF NONOGRAMS

In Section 1.1, you learned about solving problems using logic and you explored a variety of situations and a logic puzzle. Another type of logic puzzle is the nonogram. Nonograms are picture logic puzzles and were created by Non Ishida in 1987. A beginner level 6 x 5 nonogram is shown here.

	1	1	5	1	4	1 1
5						
1 1 1						
1 1						
1 1						
1 1						

The numbers across the top and along the side indicate how many squares in the columns or rows should be shaded to solve the puzzle. For instance, the 5 in the first row indicates that 5 consecutive squares should be shaded in that row. A space between numbers indicates that there is a gap of *at least* one square between the consecutive shaded squares. For instance, 1 1 indicates that there are two single shaded squares that are separated by at least one empty square. When a nonogram is solved, the solution creates a picture.

There are several ways to approach solving these puzzles, but we'll only cover a few in this project. As you answer the questions, shade any squares you are confident about in the puzzle. If you know a cell will *not* be shaded, you may place an X in that square.

1. While we can start anywhere with solving this puzzle, we'll start with the largest numbers. The third column indicates that 5 consecutive squares should be shaded. Can we guarantee any of the squares in this column will be shaded? Explain your reasoning.

2. The top row indicates that 5 of the 6 squares in the row should be shaded. Since the 5 shaded squares are consecutive, which squares can we guarantee will be shaded? Explain your reasoning.