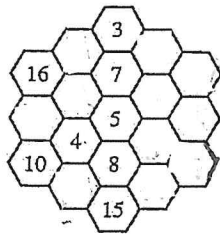


NAME _____

DATE _____

In Exercises 1 and 2, decide whether the reasoning involved is an example of inductive or deductive reasoning.

1. Carol Britz is a sales representative for a publishing company. For the past 16 years, she has exceeded her annual sales goal, primarily by selling mathematics textbooks. Therefore, she will also exceed her annual sales goal this year.
2. For all natural numbers n , n^2 is also a natural number. 176 is a natural number. Therefore, 176^2 is a natural number.
3. *Magic Hexagon* (A magic hexagon has all entries in the columns and diagonals adding up to the same sum.) Find the constant sum for the magic hexagon, and fill in the numbers so that every column or diagonal has that sum. (From *Mathematics Teacher* monthly calendar, November 20, 2007.)



4. Use the list of equations and inductive reasoning to predict the next equation, and then verify your conjecture.

$$65,359,477,124,183 \times 17 = 1,111,111,111,111,111$$

$$65,359,477,124,183 \times 34 = 2,222,222,222,222,222$$

$$65,359,477,124,183 \times 51 = 3,333,333,333,333,333$$

5. Use the method of successive differences to find the next term in the sequence

$$3, 11, 31, 69, 131, 223, \dots$$

6. Find the sum $1 + 2 + 3 + \dots + 250$.

7. Consider the following equations, where the left side of each is an octagonal number.

$$1 = 1$$

$$8 = 1 + 7$$

$$21 = 1 + 7 + 13$$

$$40 = 1 + 7 + 13 + 19$$

Use the pattern established on the right sides to predict the next octagonal number. What is the next equation in the list?

8. Use the result of Exercise 7 and the method of successive differences to find the first eight octagonal numbers. Then divide each by 4 and record the remainder. What is the pattern obtained?

9. Describe the pattern used to obtain the terms of the Fibonacci sequence

$$1, 1, 2, 3, 5, 8, 13, 21, \dots$$

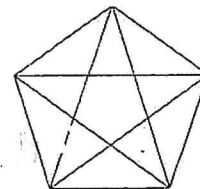
Use problem-solving strategies to solve each problem, taken from the date indicated in the monthly calendar of *Mathematics Teacher*.

10. *Building a Fraction* Each of the four digits 2, 4, 6, and 9 is placed in one of the boxes to form a fraction. The numerator and the denominator are both two-digit whole numbers. What is the smallest value of all the common fractions that can be formed? Express your answer as a common fraction. (November 17, 2004)

DO
DD

11. *Units Digit of a Power of 9* What is the units digit (ones digit) in the decimal representation of 9^{1997} ? (January 27, 1997)

12. *Counting Puzzle (Triangles)* How many triangles are in this figure? (January 6, 2000)



13. *Make Them Equal* Consider the following:

$$1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9\ 0 = 100$$

Leaving all the numerals in the order given, insert addition and subtraction signs into the expression to make the equation true. (March 23, 2008)

14. *Shrinkage* Dr. Small is 36 inches tall, and Ms. Tall is 96 inches tall. If Dr. Small shrinks 2 inches per year and Ms. Tall grows of an inch per year, how tall will Ms. Tall be when Dr. Small disappears altogether? (November 2, 2007)

15. *Units Digit of a Sum* Find the units digit (ones digit) of the decimal numeral representing the number $1111 + 1414 + 16^{16}$. (February 14, 1994)

16. Based on your knowledge of elementary arithmetic, describe the pattern that can be observed when the following operations are performed:

$$9 \times 1, 9 \times 2, 9 \times 3, \dots, 9 \times 9.$$

(Hint: Add the digits in the answers. What do you notice?)

Use your calculator to evaluate each of the following. Give as many decimal places as the calculator displays.

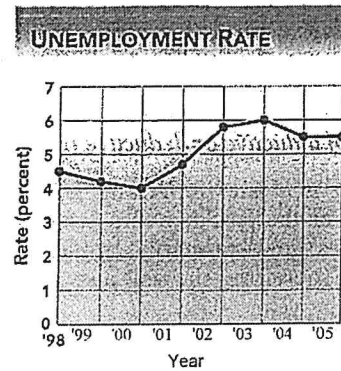
17. $V98.i6$

18. 3.25^3

19. **Basketball Scoring Results** During the 2008-09 NCAA women's basketball season, Destini Hughes of LSU made 28 of her 96 field goal attempts. This means that for every 10 attempts, she made approximately _____ of them.

A. 4 B. 3 C. 2 D. 1

20. **Unemployment Rate** The line graph shows the overall unemployment rate in the U.S. civilian labor force for the years 1998 through 2005.



Source: U.S. Department of Labor.

- (a) Between which pairs of consecutive years did the unemployment rate decrease?
 (b) What was the general trend in the unemployment rate between 2000 and 2003?
 (c) Estimate the overall unemployment rate in 2003 and 2004. About how much did the unemployment rate decline between 2003 and 2004?

Part 2

In Exercises 1-14, let

$$U = \{a, b, c, d, e, f, g, h\}, \quad A = \{a, b, c, d\},$$

$$B = \{b, e, a, d\}, \quad \text{and} \quad C = \{a, e\}.$$

Find each set.

1. $A \cup C$

2. $B \cap A$

3. B'

4. $A - (B \cap C)$

Identify each statement as true or false.

5. $b \in A$

6. $C \supset A$

7. $B \subset (A \cup C)$

8. $c \notin C$

9. $n[(A \cup B) - C] = 4$

10. $\emptyset \subset C$

11. $A \cap B'$ is equivalent to $B \cap A'$

12. $(A \cup B)' = A' \cap B'$

