PALETTE OF PROBLEMS EXAMPLE

Loretta's age now is twice John's age 5 years ago. In three years, the sum of John's and Loretta's ages will be 50. How old are Loretta and John today.

ALGEBRAICALLY

Let J = John's age today
Let L = Loretta's age today

Loretta's age now is twice John's age 5 years ago can be written as:

$L = 2(J-5) = 2J - 10$

In three years, the sum of John's and Loretta's ages will be 50 can be written as:

$(L + 3) + (J+3) = 50$
$L + J + 6 = 50$
$L + J = 44$
$L = 44 - J$

Substitute for L

$2J - 10 = 44 - J$
$3J = 54$
$J = 18$

Substitute for J

$L = 2J - 10 = 2(18) - 10 = 36 - 10 = 26$

MODELING

Make a table where x represents John's age five years ago. So now his age is x + 5 and in three years John's age is x + 8.

Loretta's age now is twice John's age five years ago, so her age now is 2x. Three years from now it will be 2x + 3.

	Five Years Ago	Now	Three Years from Now
John	x	x + 5	x + 8
Loretta	2x – 5	2x	2x + 3

Now we know that in three years, the sum of John's and Loretta's ages will be 50, so:

$(x + 8) + (2x + 3) = 50 = 3x + 11$ so $x = 13$.
Go back to the table and you will see that now John's age is $x + 5 = 13 + 5 = 18$.
Loretta's age now is $2x = 2(13) = 26$.

* You must write up a full solution to each problem in order to receive full credit.

palette of problems

David Rock and Mary K. Porter

1. Doctors with last names Bork, Cork, Fork, Gork, and Hork have examination rooms in one long row, with office doors that are labeled with a 1, 2, 3, 4, or 5. Their first names are Mack, Tack, Sack, Zack, and Jack. Their rooms are colored red, yellow, blue, pink, and green. Based on the following clues, determine the color of room 5 and the first and last name of the doctor who occupies room 5.

(a) The yellow room is occupied by Tack, who is not Cork or Gork.
(b) Room 2 is red.
(c) Of Hork and Gork, one is Jack and the other has a green room.
(d) Doctors Bork, Hork, and Fork are not in room 2.
(e) Sack and Hork are not in the pink room, but one of them is in the red room and the other is in room 5.
(f) The first name of room 5's occupant is not Mack or Tack.
(g) Gork is in room 4.
(h) Fork, Gork, and Hork have room numbers that are 3 and higher.
(i) Mack's room is pink.
(j) Hork is in a blue room.
(k) Fork and the doctor in the yellow room are in rooms 1 and 3.
(l) Fork's first name is Mack.

2. A speaker comes to your school to make a 60 minute presentation in the auditorium. Of the students in the auditorium, 30 percent heard the entire speech and 10 percent slept through it; 1/2 of the remaining students heard 1/4 of the presentation, and the other 1/2 heard 3/4 of it. What was the average number of minutes of the presentation heard by the students in the audience?

3. A letter of the English alphabet is randomly selected. What is the probability that the chosen letter occurs in neither the name of one of the 12 months of the year nor the name of one of the 8 planets in the solar system?

4. Determine the next two values in the following sequence:

1/3, 1, 3, 9, 27, 81, 243, ____, ____

5. The exclamation point (!) is also used as a mathematical symbol, as in 5! (read as 5 *factorial*), in which $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$ and $7! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5040$. Find the quotient:

$$15! \div 13!$$

6. A five-digit number is represented by ABCDE, where each letter represents a digit. If we add the digit 1 in front of ABCDE, we get 1ABCDE. The product of 1ABCDE and 3 is the six-digit number ABCDE1. Find the value of the original five-digit number ABCDE.

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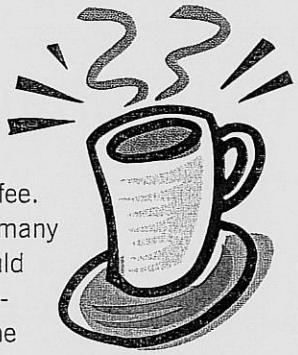
MTMS readers are encouraged to submit single problems or groups of problems by individuals, student groups, or mathematics clubs to be considered for publication. Send to the "Palette" editor, **David Rock**, at rock_david@colstate.edu. *MTMS* is also interested in students' creative solutions to these problems. Send to "The Thinking of Students" editor, **Edward S. Mooney**, at mooney@ilstu.edu. Both problems and solutions will be credited. For additional problems, see the NCTM publication, *Menu Collection: Problems Adapted from "Mathematics Teaching in the Middle School"* (stock number 726).



7. The Hot Java Coffee Company advertises its small cup of decaffeinated coffee as being 96 percent caffeine-free as compared with a small cup of caffeinated coffee. If a small coffee is 8 ounces, how many ounces of decaffeinated coffee would you have to drink to get the equivalent amount of caffeine found in one small cup of regular coffee?

8. Use three 9s, one set of parentheses, and only one algebraic operation to produce an expression that is equivalent to 1.

9. Lara bought a backpack and five binders for $56.09. Jennifer bought two backpacks and three binders for $73.96. Their uncle needs to buy four backpacks and one binder. How much will his purchase cost?

10. To find my number, take 1 fewer than the square of the smallest two-digit prime number and divide this result by the difference between the squares of the fourth and first prime numbers. What is my number? (Note: Do not include 1 as a prime number.)

11. The amount of money in Paul's bank account is 37 percent of the amount in his older brother Stefan's account. Together, Paul and Stefan have $8428.24 in their accounts. How much money is in Paul's account?

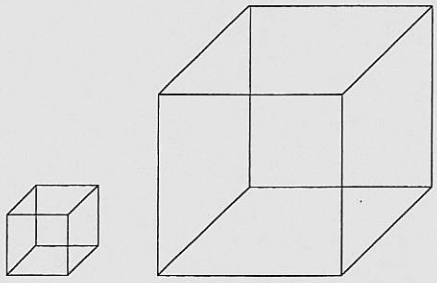
12. Each year, Maria's salary increases by the same amount of money. In her first year, Maria earned $27,000. In her seventh year, Maria earned $34,764. How much money will Maria in her twelfth year?

13. (See problem 12.) How many years will it take for Maria's salary to surpass the $100,000 mark?

14. Anthony plans to use 60 inches of wire to build a rectangle that is seven times as long as it is wide. What will be the area of his rectangle?

15. Xavier plans to use 60 inches of wire to build two squares, one with side lengths that are twice as long as the other square's side lengths. What is the total area of the two squares?

16. Shauna plans to use 60 inches of wire to build the frames of two cubes, one with side lengths that are one-third as long as the other cube's side lengths. What is the total volume of the two cubes, to the nearest hundredth of a cubic inch?



(Solutions on pages 162–64)