

Thinking Mathematically

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From the Editor...

Along with teaching students how to operate with numbers, it is equally important that we teach them how to think as problem solvers.

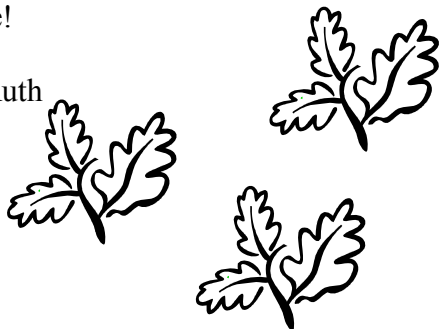
This issue focuses on logical reasoning and problem solving, and contains a variety of problems that involve skills such as place value, addition, ratios, and algebraic thinking. Whether you teach ABE math, GED math, or diploma algebra and geometry, I hope there is a problem or two that interests you (and your students).

These problems can be the focus of a lesson or used as a “warm-up” at the beginning of a class.

Do you have a problem or activity that you have gotten a lot of mileage out of in your class? Please send it along so I can include it in a future issue and share it with your colleagues! My e-mail address is:
restabrook@yahoo.com

Thanks, and enjoy the fall weather for me!

~Ruth



Problem of the Month



Uncle Henry was driving to Bangor when he saw a robber leave a bank and jump in a getaway car. He noticed that the license plate number was a four-digit number, but he couldn't remember exactly what it was. He has a good mind for useless details, however, and he remembered the following.

1. He remembered seeing a “1”.
2. He remembers the number in the hundred's place is three times the number in the thousand's place.
3. He is sure that the number in the one's place is 4 times the number in the ten's place.
4. Finally, he remembered that the number in the thousand's place is a 2.

What is the license plate number?

[answer on page 5]

Logical Thinking

I found these logical thinking problems on the Internet a few years ago – unfortunately I didn't write down the site, so I can't give credit where credit is due...

Simon, Luke, and Maggie all went to New York. One took a bus, one took a plane, and one took a train.

1. Maggie and the person who went on the plane live next door to each other.
2. Luke and the person who rode the bus left at different times.
3. Maggie did not go on the bus.

Find out how each person went.

Anna, Luis, Ramon, and Thomas have parts in a play. Their roles are a butler, a detective, a model, and a songwriter.

1. Someone told the detective that she wasn't learning her lines fast enough.
2. Everyone likes the way Luis and the butler are learning their lines.
3. Thomas, Luis, and the Model live on the same street.

Find each person's role in the play.

Cranberry Punch

Here are four different recipes for cranberry punch.

Recipe A:

2 cups cranberry juice
3 cups sparkling water

Recipe B:

4 cups cranberry juice
8 cups sparkling water

Recipe C:

3 cups cranberry juice
5 cups sparkling water

Recipe D:

1 cup cranberry juice
4 cups sparkling water

- Which recipe will make punch that has the strongest cranberry flavor? Explain your answer.
- Which recipe will make punch that has the weakest cranberry flavor? Explain your answer.
- The adult ed director says that 120 cups of punch are needed for the end of semester party. For each recipe, how many cups of cranberry juice and how many cups of sparkling water are needed? Explain your answer.

[source: nctm.org]



Fill in the squares

This activity is wonderful for logical thinking, number sense, order of operations, and algebraic thinking. It comes from *Ideas from the Arithmetic Teacher – Middle School*, an NCTM publication. I would suggest enlarging this or making a larger version of your own.

Cut out the number tags and put them in the spaces. Use each tag only once.

$$A. (\square \times \square) + 3 = 27$$

$$B. (\square + 2) \div 6 = \square$$

$$C. (\square \div 2) + 3 = 6$$

$$D. (2 \times \square) + \square = 10$$

$$E. 5 \times (\square - 8) = 5$$

$$F. 2 \times (\square - \square) = 10$$

Cut out the number squares below.

0	1	2	3	4
5	6	7	8	9

Serious Mysterious Clues



Here's another good one from *Ideas from the Arithmetic Teacher – Middle School*.

CLUES

- A. It is a multiple of 3.
- B. It is a multiple of 4.
- C. It is a multiple of 5.
- D. It is less than 20.
- E. It is a factor of 64.
- F. It is not even.
- G. It is even.
- H. It is greater than 20.
- I. It is not a multiple of 10.
- J. It is not a multiple of 4.
- K. It is a factor of 100.
- L. It is less than 10.

Use the clues to identify each mystery number.

1. The number is 15.
2. The number is 4.
3. The number is 25.
4. The number is 50.
5. The number is 8.

Next, think of your own mystery number, write down the clue letters for your number, and have someone else try to figure out your number.



Close to 1000

Materials

- A deck of cards with face cards removed. Jokers can be kept in for wild cards.
- Paper and pencils

Number of Players: 2 or 3

How to Play

1. Deal out eight cards to each player.
2. Use any six cards to make two numbers. For example, a 6, a 5, and a 2 could make 652, 625, 562, 526, 256, or 265. Wild cards can be used as any numeral. Try to make numbers that, when added, give you a total that is close to 1000.
3. Write these numbers and their total on your score sheet. For example, $652 + 347 = 999$
4. Find your score. Your score is the difference between your total and 1000.
5. Put the cards you used in a discard pile. Keep the two cards you didn't use for the next round.
6. For the next round, deal six new cards to each player. Make more numbers that come close to 1000, and record your scores.
7. When you run out of cards, shuffle the discard pile and use them again.
8. After five rounds, total your scores. The lowest score wins!

Scoring variation: Write the score with a positive or negative sign to show whether your score was above or below 1000. For example, if your total is 999, your score is -1 . If your total is 1005, your score is $+5$. The total of these two scores would be $+4$. Your goal is to get a total score for five rounds that is close to zero.

[Source: Dale Seymour Publications]



A few more fun problems...

- On Halloween, 18 pirates came to my door for trick-or-treat. Nine had cutlasses. Eleven had eye patches. Three had neither a cutlass or an eye patch. How many of the pirates had *both* a cutlass and an eye patch?
- What letter is most likely to appear in the empty square?

A B D E G H

- When wall tiles are set in a square pattern, an ornamental cove strip is often set above the square pattern to set off the design. If each of the wall tiles is $4\frac{1}{2}$ inches square and the ornamental strip is applied in units of $8\frac{1}{2}$ inches, when will a joint of the strip first match a joint of the square tile?



Answers

Problem of the Month, p. 1

The license plate number is 2614.

Logical Thinking, p. 2

Problem 1:

Maggie went by train, Simon went by bus, and Luke went by plane. You can use a chart like this to help you solve it:

	Maggie	Simon	Luke
Bus	X	O	X
Train	O	X	X
Plane	X	X	O

The X indicates options that are eliminated, and the O indicates a correct match.

Problem 2:

Anna is the detective.
Luis is the songwriter.
Ramon is the model.
Thomas is the butler.

[A chart like the one above can be used to solve this problem.]

Cranberry Punch, p. 2

If you calculate the fraction of juice in each punch, you find the following:

Recipe A is $\frac{2}{5}$ juice

Recipe B is $\frac{1}{3}$ juice

Recipe C is $\frac{3}{8}$ juice

Recipe D is $\frac{1}{5}$ juice

The highest fraction is the recipe with the strongest cranberry flavor, and the lowest fraction is the one with the weakest cranberry flavor. To compare

these fractions, you can rewrite them with a common denominator (120), or convert them to decimals or percents.

The recipe with the strongest cranberry flavor is recipe A. The weakest cranberry flavor is recipe D.

To make 120 cups of punch of each recipe, you need the following:

Recipe A: 48 cups cranberry juice (c.j.) and 72 cups sparkling water (s.w.)

Recipe B: 40 cups c.j. and 80 cups s.w.

Recipe C: 45 cups c.j. and 75 cups s.w.

Recipe D: 24 cups c.j. and 96 cups s.w.

Fill in the Squares, p. 3

[*hint: Begin with the equations that have only one possible answer: C and E.*]

A. $(8 \times 3) + 3 = 27$

B. $(4 + 2) \div 6 = 1$

C. $(6 \div 2) + 3 = 6$

D. $(2 \times 5) + 0 = 10$

E. $5 \times (9 - 8) = 5$

F. $2 \times (7 - 2) = 10$

Serious Mysterious Clues, p. 3

- 15: clues A, C, D, F, I, J
- 4: clues B, D, E, G, I, K, L
- 25: clues C, F, H, I, J, K
- 50: clues C, G, H, J, K
- 8: clues B, D, E, G, I, L

A few more fun problems, p. 4

- 5 have both a cutlass and an eye patch.
- J
- They will match after 17 square tiles and 9 cove strips.