

1 Introduction

Welcome to the first Pleasanton Math Circle meeting of the year! We are so excited to start working with all of you and solving fun, challenging, and thought-provoking math problems together.

For a fun start to the year, we're working on riddles and deductive reasoning today. Deductive reasoning is a process where you come up with specific conclusions based on general ideas that you are given. Try the warm-up and ask a teacher if you need help.

2 Warm-Up

1. All green plants need sunlight. This rosebush is a green plant. So, what does this rosebush need?
2. If $A = B$, and $B = C$, then what is the relationship between A and C ?
3. Five people were eating apples. A finished before B, but behind C. D finished before E, but behind B. What was the finishing order?

3 Getting a Pet

Three people bought a pet one day. Their names were Zach, Rachel, and Hubert. The animals they bought were a snake, a parrot, and a guinea pig. They bought their pets for \$100, \$50, and \$25.

Can you find out which person bought which animal for which amount of money using these clues?

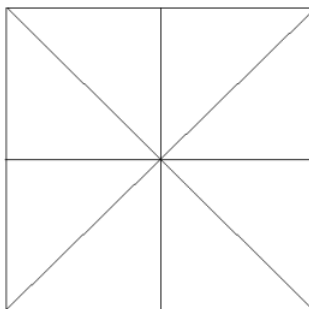
1. Zach is allergic to birds.
2. Hubert couldn't get the \$100 pet, so he bought the snake.
3. Rachel saved \$10 a week for ten weeks in order to get her pet.
4. The mammal was \$25.

Hint: Use the grid below to help you keep track of your information!

	Parrot	Snake	Guinea Pig	\$25	\$50	\$100
Zach						
Rachel						
Hubert						
\$25						
\$50						
\$100						

4 Riddles!

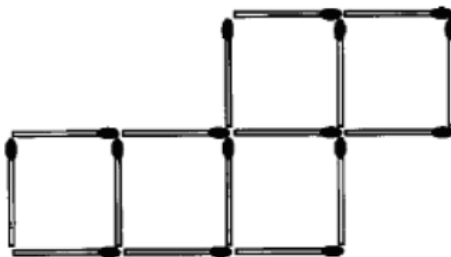
1. If a hen and a half lay an egg and a half in a day and a half, how many eggs will half a dozen hens lay in half a dozen days?
2. This old puzzle tells a farmer traveling the countryside on tour with a wolf, a goat, and a cabbage. He comes to a river bank and the only means of getting across is a small boat which can hold him with only one of the wolf, the goat or the cabbage. Unfortunately he dare not leave the wolf alone with the goat or the goat alone with the cabbage for the wolf would eat the goat and the goat would eat the cabbage. After some thought the farmer realized that he could use the boat to transport himself and all his belongings safely across the river. How did he do it?
3. Find the value of $1 + 2 + 3 + 4 + 5 + \dots + 100$.
4. How many triangles are there in the figure below?



5. (1986 AMC 8 #22) Alan, Beth, Carlos, and Diana were discussing their possible grades in mathematics class this grading period. Alan said, "If I get an A, then Beth will get an A." Beth said, "If I get an A, then Carlos will get an A." Carlos said, "If I get an A, then Diana will get an A." All of these statements were true, but only two of the students received an A. Which two received A's?
 (A) Alan, Beth (B) Beth, Carlos (C) Carlos, Diana (D) Alan, Diana (E) Beth, Diana
6. **Challenge:** My twin lives at the reverse of my house number. The difference between our house numbers ends in two. What are the lowest possible numbers of our house numbers?

5 One Square Less

1. Change the position of, but do not remove, two matches to form exactly four squares.



2. Change the position of, but do not remove, three matches to form exactly three squares.



6 Which Marble?

There is a bag which has 21 blue balls and 23 red balls. There are also 22 red balls outside the bag.

Randomly remove two balls from the bag.

* If they are of different colors, put the blue one back in the bag.

* If they are the same color, take them out and put a red marble back in the bag.

Repeat this until only one marble remains in the bag. What is the color of the sole marble left in the bag?

7 HAPPY

In the multiplication in the image, each letter and each box represent a single digit. Different letters represent different digits but a box can represent any digit. What does the five-digit number HAPPY stand for?

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8 More Riddles

1. I am a three-digit number. My second digit is 4 times bigger than the third digit. My first digit is 3 less than my second digit. Who am I?
2. How can you add eight fours together so the total adds up to 500?
3. If seven people meet each other and each shake hands only once with each of the others, how many handshakes happened?