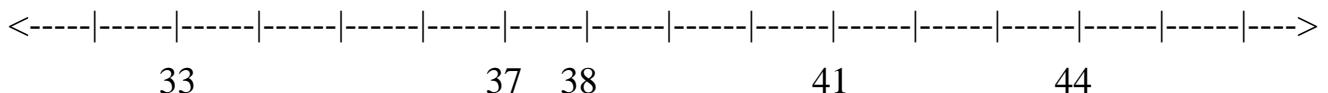




a problem solving newsletter

Vol. 1 No. 1

- ★★ 1. Some numbers are missing. Write them on this number line:



- ★★★ 2. What is the rule?

$$6 \text{-----} > 4$$

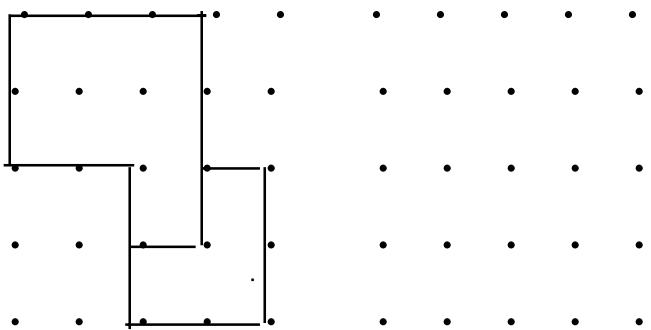
$$8 \text{-----} > 6$$

$$10 \text{-----} > 8$$

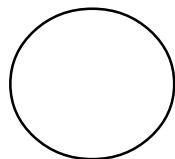
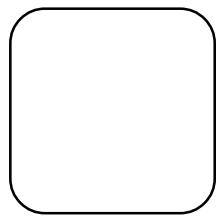
$$20 \text{-----} > 18$$

Rule: \_\_\_\_\_

- ★★ 3. Draw a figure just like this one:



- ★ 4. Color the figure with the largest area:



### Strategy of the Month

Someone said, "A picture is worth a thousand words." Turning the words of a problem into a picture or a diagram can help you "see" the problem. By using the part of your brain that visualizes a situation or object, you may see relationships or information that helps you solve the problem. When someone tells you a story, try turning the words into a motion picture or a cartoon. When reading a description, try "seeing it in your mind's eye." If you can do these things, this strategy may be for you! Try using a picture or make a diagram to solve this problem:

On the playground there are three bicycles and four tricycles. How many wheels are there?

## MathStars Home Hints

*Every year you grow and change in many different ways. Get someone to help you measure and record these data about yourself. Be sure to save the information because we will measure again in two months!*

How tall are you? \_\_\_\_\_

How much do you weigh? \_\_\_\_\_

What is the circumference of your head?  
\_\_\_\_\_

- ★★★ 5. Place these sums in the correct column:

$4 + 0$	$3 + 4$	$2 + 2$
$0 + 5$	$3 + 1$	$4 + 5$
$4 + 4$	$6 + 2$	$1 + 2$

Less than 6

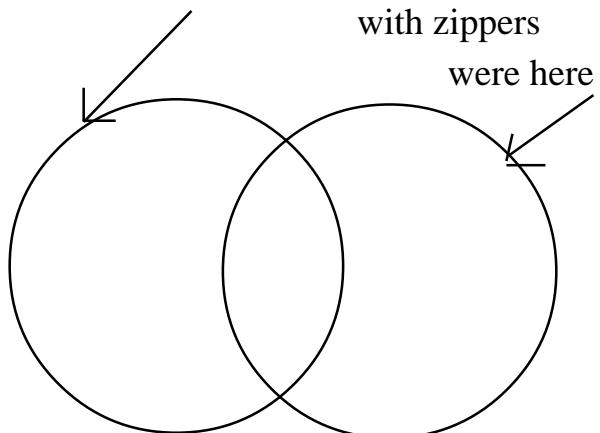
Greater than 6

- ★★ 7. How many paper clips long is the dotted line below?



About \_\_\_\_\_ paper clips.

- ★★★★ 8. If all clothes with buttons were here and all clothes with zippers were here



What would go in the middle?

## Setting Personal Goals

- ★★ 6. Jody saw a ladybug with eight spots. Draw a picture to show how many spots Jody would see on three ladybugs ?

*Problem solving is what you do when you don't know what to do. Being a good problem solver will help you be ready to live and work in our changing world. Computers can do computations but people must tell the computers what to do. Good problem solvers know how to make plans and use many different strategies in carrying out their plans. They use all of their past experiences to help them in new situations. We learn to swim by getting in the water; we learn to be good problem solvers by solving problems!*

## About these newsletters...

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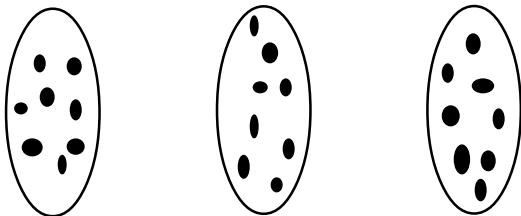
## Discussion of problems.....

1. **(32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46)** This problem reinforces the concept of using the number line while giving students the opportunity to count and record numbers up to 50. It is sometimes difficult for students to start at a number other than one.
2. **(Subtract two, or count backwards by two.)** Children will need to use their knowledge of patterns to solve this problem. Some will see the pattern quickly, others will need to look at each problem independently, while still others may use the rhythm of the number line to find the pattern.
3. Spatial visualization and the ability to transfer a figure are needed to successfully complete this problem. The concept of congruency is the basis for the exercise.
4. Again, spatial visualization is the issue. Area, the amount of space enclosed by the figure, and largest are key vocabulary words.

5. 
$$\left( \begin{array}{c|cc} \text{Less than 6} & \text{Greater than 6} \\ \hline 4+0 & 1+2 & 4+4 \\ 3+1 & 0+5 & 2+2 \\ & 3+4 & \end{array} \right)$$

Computation and number theory are applied in this problem.

6.



The "draw a picture" strategy should be helpful to children in solving this problem. Some more advanced students may give the total **24**.

7. **(about 4)** The use of estimation and non-standard units are important experiences to help students develop confidence as problem solvers.

8. **(Clothes with buttons and zippers)** Identifying attributes can be a powerful tool to help students make logical distinctions between and among ideas and concepts in mathematics. String circles, yarn circles, or hula hoops make it easy for children to see and manipulate objects during sorting activities.



a problem solving newsletter

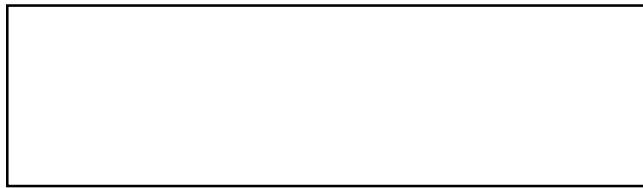
Vol. 1 No. 2

- ★★★ 1. Circle the expressions that equal 24: (You may use a calculator to help you.)

$$20 + 4 \quad 41 - 10 \quad 24 - 0 \quad 12 + 12$$

$$6 + 12 \quad 18 + 6 \quad 16 + 9 \quad 14 + 11$$

- ★★ 2. Cut a strip of cardboard the same length as this unit:  If it equals two, about how long and how tall is this rectangle?



across \_\_\_\_\_ units

up and down \_\_\_\_\_ units.

- ★★★ 3. What is the rule?

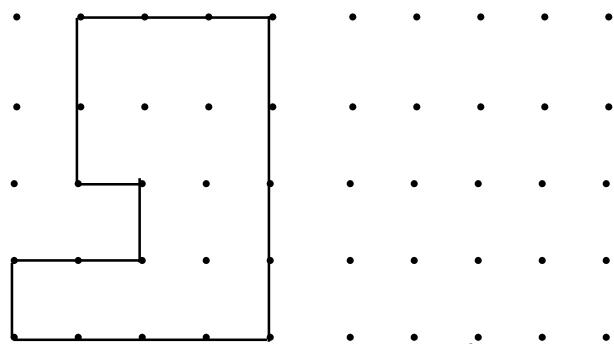
$$\begin{array}{l} 6 \text{-----} > 11 \\ 12 \text{-----} > 17 \\ 20 \text{-----} > 25 \\ 50 \text{-----} > 55 \end{array}$$

Rule: \_\_\_\_\_

- ★★★ 4. Chris had a roll of stamps worth six cents each. If there are ten stamps on his roll, how much is his roll of stamps worth?

\_\_\_\_\_ cents

- ★ 5. Draw a figure just like this one:



### Strategy of the Month

*Your brain is an organizer. It organizes information as it stores that information. When a problem involves many pieces of information, your brain will have an easier time sorting through it if you make an organized list. A list helps you be sure you have thought of all of the possibilities without repeating any of them. Like drawing a picture or making a diagram, making an organized list helps your brain "see" the problem clearly and find a solution. Try **making an organized list** to solve this problem:*

You have three pennies, two nickels and a dime. How many different amounts of money can you make?

## MathStars Home Hints

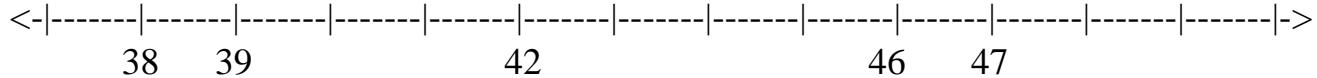
Sometimes the hardest part of solving a problem is just getting started. Having some steps to follow may help you.

1. Understand the information in the problem and what you are trying to find out.
2. Try a strategy you think might help you solve the problem.
3. Find the solution using that strategy or try another way until you solve the problem.
4. Check back to make certain your answer makes sense.

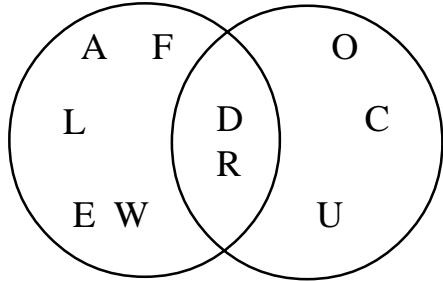
★★★★ 8. If Frank has 12 cows in his pasture, draw a picture showing how many legs are on the 12 cows? Circle the answer that best matches your picture.

- A. more than 60
- B. less than 25
- C. close to 100
- D. between 40 and 50

★ 6. Some numbers are missing. Write them on the number line in the correct places.



★★★ 7. Where do these letters belong in the diagram below? Q, T, K, P, S



## Setting Personal Goals

Being able to ask good questions will help you in many ways. Use these to solve problems:

- What information do I know?
- What else do I need to find out?
- What question am I trying to answer?
- Have I missed anything?
- Does my answer make sense?

Set the goal of asking good questions!



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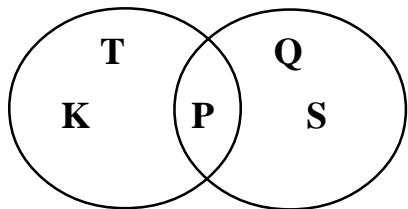
## Discussion of problems.....

1. **(20 + 4    24 - 0    12 + 12    18 + 6)** These expressions are not easy for first grade students. The use of manipulatives, the number line, counting rods, the hundred board and other aids is encouraged.
  
2. **(across - about seven; up and down - about two)** Two processes are involved in this activity. First to measure or estimate the two dimensions, second to realize that the unit is equal to two measures rather than one. Discussion of different approaches to a solution is important. The different strategies can be explored and tried so that each student sees one way different from her/his own.
  
3. **(add five)** The pattern shown in this chart is the addition of five to each number. Extensions might include giving other numbers and asking the student to apply the rule asking, " What number comes before if the rule gives us this number?"
  
4. **(60 cents)** Drawing a picture, making a chart or using coins or other manipulatives are all methods students may use to solve this problem. The use of grouping techniques is especially helpful i.e. one stamp is ten cents, two stamps - 20 cents, etc. and shows advanced understanding of number relationships.
  
5. The concept of congruent figures is revisited in this problem. The ability to transfer visually and interpret distances on the plane is important in the study of geometry.

6. (37, 38, 39, **40, 41**, 42, **43, 44, 45**, 46, 47, **48, 49, 50**)

The number line is always a good standard for students to consult when solving problems. Every student should have easy access to it when exploring solutions.

7.



Exploring the characteristics of geometric figures is equally possible with letters, buttons, beans, puzzle pieces etc. A discussion of letters with curved lines, straight lines or both is basic to understanding the underlying strategy in this exercise.

8. (**D. between 40 and 50**) The problem does not request an exact answer, but rather an estimate of how many legs. Some students may draw pictures or use counters but to select their answer they must think of the range or relative size of the number. This is excellent preparation for rounding and estimation. A number sense is cultivated with similar activities.



a problem solving newsletter

Vol. 1 No. 3

- ★★★ 1. Place these expressions in the proper column:

$$6 + 6$$

$$4 + 7$$

$$14 + 6$$

$$12 + 7$$

$$6 + 17$$

$$9 + 10$$

$$12 + 2$$

$$8 + 15$$

$$21 + 2$$

$$8 + 9$$

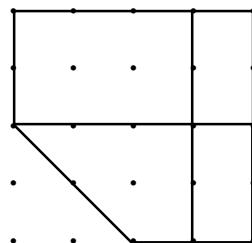
$$10 + 4$$

$$5 + 8$$

Less than 18

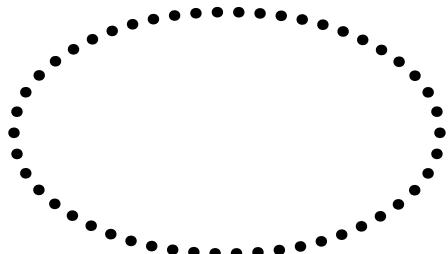
Greater than 18

- ★★★ 3. Draw a figure just like this one:



- ★★★ 4. Maegen uses four blocks to build a house. If she builds a town with six houses, how many blocks will she need?

- ★★ 2. Guess how many beads there are in the necklace. Check your answer by counting.



### Strategy of the Month

*Being a problem solver is something like being a detective! A detective has to solve crimes by guessing what happened and checking the guess to see if it fits the situation. For some problems, your best strategy may be to make a guess and then check to see if your answer fits the problem. If not, decide if your guess was too high or too low and then make a second "guesstimate." A good detective keeps records (usually some kind of chart) to help see any patterns and to narrow down the possibilities. You should do this too. The results of incorrect guesses can give you valuable clues to the correct solution. Guess and then check the solution to this problem:*

Billy has 42 marbles to put in boxes. Each box will hold five marbles. How many boxes will he need?

# MathStars Home Hints

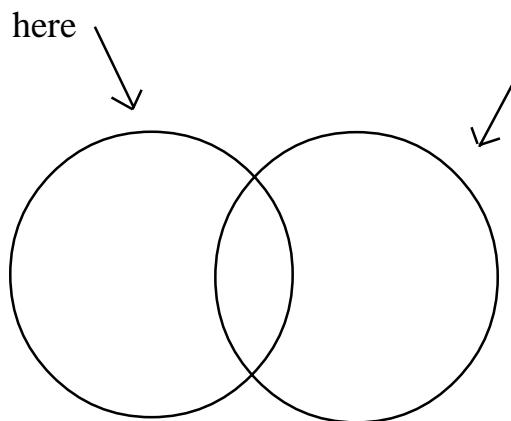
*Memorizing number facts will save you time.  
Flash cards are one way to learn new facts, but  
you also might try these ideas:*

- play dice or card games in which you need to add, subtract, multiply, or divide.
  - learn new facts using ones you already know ( $7+7=14$  so  $7+8=15$ ).
  - learn facts that are related to each other ( $7+6=13$ ,  $6+7=13$ ,  $13-7=6$ ,  $13-6=7$ ).
  - make a list of the facts you need to memorize and learn 5 new facts each week.
  - Spend 5-10 minutes every day practicing facts.

5.

If you put all  
shoes with laces  
here ↴

and put all shoes  
with velcro here



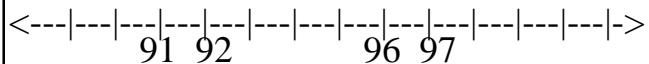
## What would belong in the middle?

## ★★★ 6. What is the rule?

$$\begin{array}{rcl} 4 & \xrightarrow{\hspace{1cm}} & 1 \\ 8 & \xrightarrow{\hspace{1cm}} & 5 \\ 36 & \xrightarrow{\hspace{1cm}} & 33 \\ 50 & \xrightarrow{\hspace{1cm}} & 47 \end{array}$$

Rule: \_\_\_\_\_

★★ 7. Some numbers are missing.  
Write the missing numbers on the number line in the correct places.



★★★★★ 8. After rolling a number cube 20 times, Taylor has collected this information:

1 - \\\  
2 - \  
3 - #####  
4 - \|  
5 - ##### |  
6 - \\\

Help her make a graph  
with it.

## Setting Personal Goals

*Communicating mathematically means that you are able to share your ideas and understandings with others orally and in writing. Because there is a strong link between language and the way we understand ideas, you should take part in discussions, ask questions when you do not understand, and think about how you would explain to someone else the steps you use in solving problems.*

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## Discussion of problems.....

1.	Less than 18	Greater than 18
$6 + 6$	$12 + 2$	$8 + 9$
$4 + 7$	$10 + 4$	$5 + 8$

$12 + 7$	$6 + 17$	$8 + 15$
$14 + 6$	$9 + 10$	$21 + 2$

Solving this problem involves both computation and an understanding of the relative size or magnitude of numbers.

2. Students can solve this problem using counting strategies, a piece of string or yarn, or other methods that adapt to an irregular shape. Again, a discussion of the different methods and their ease of use, as well as accuracy, is important. Students should be encouraged to try a method different from one they are accustomed to and then discuss their experience and the results.
3. In duplicating this figure students should have the opportunity to transfer figures using spatial visualization as preparation for geoboard recordings, see the work of others and also discuss their methods of solution.
4. **(24 blocks)** For this problem students can duplicate the activity or draw pictures to help arrive at the solution. As with all good problem solving, a discussion of their work, both method and solution, is important.

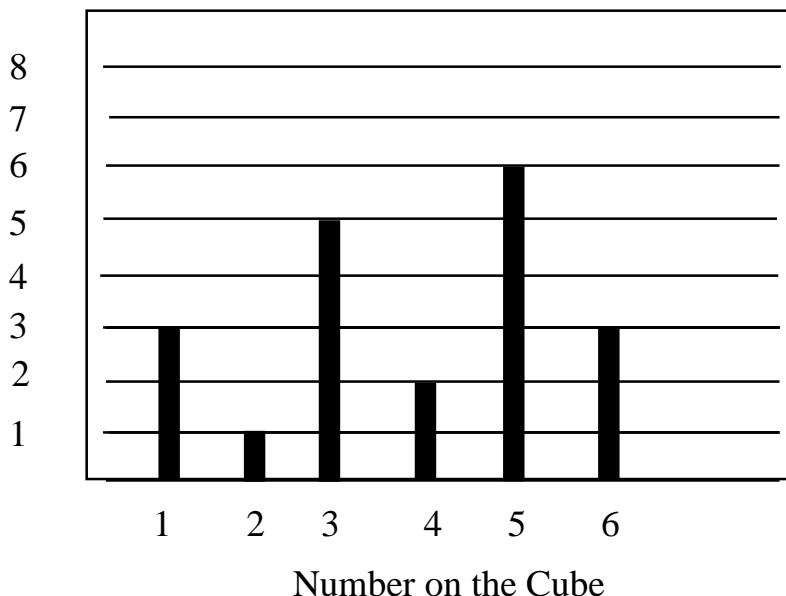
5. (**Shoes with velcro and laces**) This requires an exploration of the properties using reasoning and logic. Children need opportunities sorting, classifying and labeling to understand these concepts.

6. (**Subtract three**) This can be played as a game once the rule has been discovered. Students can take turns giving number pairs or writing numbers and matching them according to the rule.

7. (**89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101**) Children may find the appearance of 100 exciting. A discussion of the 100th day of school could spring from this problem. Watch for 101 to be mis-recorded as 1001 if place value has not been expanded beyond 100.

8. Students should be reminded that a complete graph has a title, a label for each axis and numbering for the scales.

My Number Cube Graph

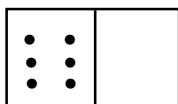
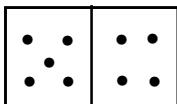




a problem solving newsletter

Vol. 1

- ★ 1. How many dots are needed to make the dominoes equal?



- ★ 5. Continue the pattern:

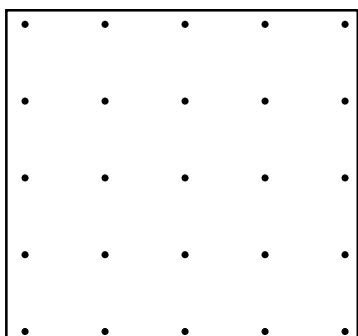
A, M, A, A, M, A, A, A, M, \_\_\_,  
\_\_\_, \_\_\_ , \_\_\_ , \_\_\_

- ★★ 2. Follow the path to find the answer:

$$6 + 5 - 4 + 2 = \textcircled{ }$$

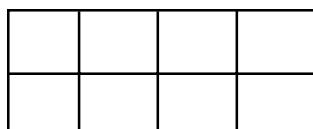
- ★★★ 3. You have a quarter and loan ten cents to a friend. What are the different ways you can show the money you have left?

- ★★★★ 4. Connect the points to make a shape that has four sides and four corners.



### Strategy of the Month

*Noticing patterns helps people solve problems at home, at work, and especially in math class! Math has been called "the study of patterns," so it makes sense to look for a pattern when you are trying to solve a problem. Recognizing patterns helps you to see how things are organized and to make predictions. If you think you see a pattern, try several examples to see if using the pattern will fit the problem situation. Looking for patterns is helpful to use along with other strategies such as make a list or guess and check. How can finding a pattern help you solve this problem?*



How many different rectangles can you find in the figure on the left?

## MathStars Home Hints

*Set aside a special time each day to study. This should be a time to do homework, to review, or to do extra reading. Be organized and have a special place in which to work. This place needs to have a good light and to be a place where you can concentrate. Some people like to study with quiet music; others like to sit at the kitchen table. You need to find what works for you!*

*Remember that when you are reviewing or working on solving problems it may help to study in a group.*

- ★★ 7. Jane gets home from school at 3:00. She begins her homework at 5:00. How much time does she have to play before she begins her homework?

---

- ★★★ 8. Use your calculator to find:

a. How many two's are in 18? \_\_\_\_\_

b. How many fives's make 30? \_\_\_\_\_

c. How many four's make a dozen? \_\_\_\_\_

- ★★ 6. On a trip to the beach you see a group of starfish. There are six in the group. How many arms do you count?

starfish	1	2	3	4	5	6
arms	5		15			

## Setting Personal Goals

*If your goal is to become a more responsible student, it means that you*

- actively participate in class.
- complete your assignments.
- have everything you need in class.
- ask for help when you do not understand.
- be willing to investigate new ideas.



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## Discussion of problems...

1. **(three)** This problem can be solved in a number of ways. Computationally students can add and find the missing addend, geometrically they can use a one-to-one correspondence and compare the dots.
2. **(nine)** Students will need to notice the different operations as they move along the path and compute in order.
3. **(See table below)** This problem has many solutions. Students' familiarity with making change and equivalent values will be a factor in finding more than one solution or combination of coins. Access to real or play money gives every student strategies and an opportunity to be successful. Student responses of three or more combinations show a good command of coins and money.

pennies	nickels	dimes
15	0	0
10	1	0
5	2	0
5	0	1
0	3	0
0	1	1

4. This construction does not require right angles or congruent sides but rather the ability to combine two conditions and produce an appropriate figure. Any closed quadrilateral will satisfy the conditions.

5. (A, M, A, A, M, A, A, A, M, **A, A, A, A, M**) In this problem students need to discover the increasing number of A's and the constant occurrence of M's.

6. 
$$\left( \begin{array}{|c|c|c|c|c|c|c|} \hline \text{starfish} & 1 & 2 & 3 & 4 & 5 & 6 \\ \hline \text{arms} & 5 & \mathbf{10} & 15 & \mathbf{20} & \mathbf{25} & \mathbf{30} \\ \hline \end{array} \right)$$

Students can complete the table by adding five for each starfish. The practice of adding on a constant or skip counting is an important prelude to multi-addend computation and later multiplication.

7. (**two hours**) This problem deals with elapsed time. A clock face with moveable hands will help students determine the time required. If digital clocks are used subtraction is another possibility.

8. (**a. nine; b. six; c. three**) A four-function calculator with a repeating constant feature is an important and valuable tool in developing students' number sense. By counting up or subtracting out students can complete these exercises. Vocabulary: dozen is a significant number word.



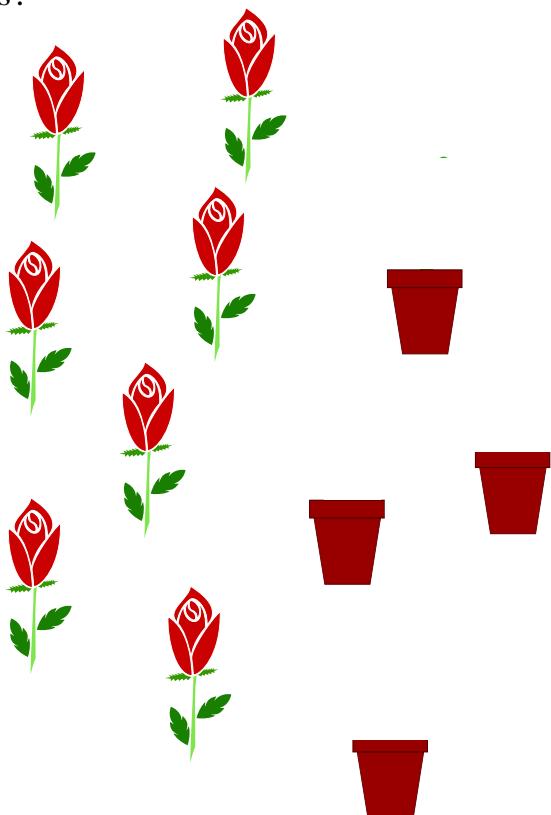
a problem solving newsletter

Vol. 1 No. 5

- ★ ★ ★ 1. This puzzle piece was cut from a hundred board. Fill in the missing numbers:

36		38
56		58

- ★ 2. How many flowers do not have pots?



- ★ ★ ★ ★ 3. In January, Mrs. Clark's class read ten books. In February they read two more than in January. If this pattern continues, how many books will they read in April?

- ★ ★ 4. Don wants to buy an eraser at the school store. If erasers cost 14 cents and he pays with two dimes, what coins could he receive in change?

### Strategy of the Month

Sometimes mathematical ideas are hard to think about without something to look at or to move around. Drawing a picture or using objects or models helps your brain "see" the details, organize the information, and carry out the action in the problem. Beans, pennies, toothpicks, pebbles, or cubes are good manipulatives to help you model a problem. You can use objects as you guess and check or look for patterns. Try using objects to help you solve this problem:

A factory has wheels for go-carts and scooters. If they have 18 wheels, how many of each can they make? Is there more than one answer?

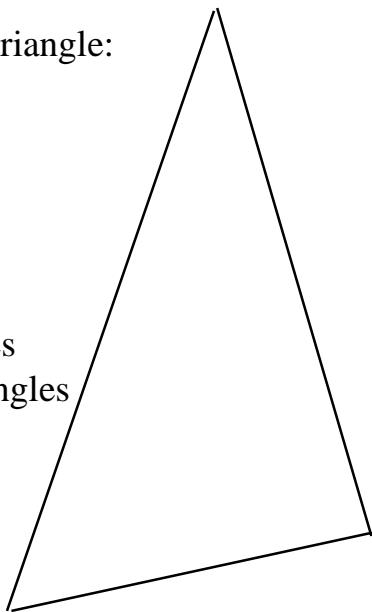
## MathStars Home Hints

Remember when you had "Show and Tell" in kindergarten? Now you have a great deal to share in mathematics. Talk to the folks at home about what you are learning. Show them your papers and tell them about what is happening in your math class. Let them see that you are doing problems in class similar to these. Each week choose an assignment that you are proud of and display it somewhere in your house.

- ★ ★ ★ 5. What are the next three numbers in this series?

77, 66, 55, 44, 33, \_\_\_, \_\_\_, \_\_\_

- ★ 6. This is a triangle:



How many sides would four triangles have?

Use the calendar to answer these questions:

## NOVEMBER

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

- ★ ★ ★ ★ 7. (a) Jane's birthday is the 3rd Sunday in November. What date is her birthday?

- (b) She is having a birthday party on November 20. What day of the week is her party?

- (c) She will mail her invitations two weeks before the party. What date will she mail the invitations?

## Setting Personal Goals

*Mathematics is all around us. We use it every day in personal living and in all of our school work. When we read graphs in social studies, gather and use data in science investigations, or count in music or physical education, we are using mathematics. We make connections in our math classes also; for example, measurement skills help us in solving many geometry problems and classification skills help us in organizing data. We use computation in many different situations. You will become a stronger mathematics student by making connections.*

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## Discussion of problems...

1. **(46, 47, 48)** Familiarity with the hundred board will help students solve this problem. A move to the right increases the number by one for each square moved, if you move to the left the numbers decrease by one. If you move up the number deceases by ten and if you move down it increases by ten. Games on the board that use these patterns add to students' confidence and number sense.

36		38
<b>46</b>	<b>47</b>	<b>48</b>
56		58

2. **(three)** This problem lets students pair objects for a one-to-one correspondence. The use of two different colored or shaped manipulatives is a helpful strategy.

3. **(16)** Recognizing a pattern that increases by two, as well as knowledge of the months of the year are necessary to solve this problem. When the pattern is extended, students must decide how far to go to find the solution.

4. **(six pennies or a nickel and a penny)** Making change and coin recognition are important skills at this level. The term "dime" for a coin worth ten cents may also be a vocabulary factor for grade one students. Manipulatives in the form of real or play money give students greater access to the solutions.

5. (77, 66, 55, 44, 33, **22, 11, 00**) This pattern is both arithmetic and figurative in nature. The arithmetic aspect is evident when the student must decide on the last (third) element in the solution, i.e., the numbers decrease by 11. The figurative or geometric aspect occurs if the student merely counts backward and writes the digit twice.

6. (**12**) This is another pattern or repeated addition problem. Manipulatives to create triangles or pattern blocks will assist the student who wishes to model the situation.

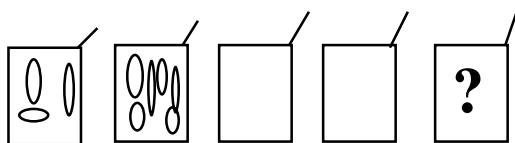
7. (**November 21; Saturday; November 6**) These problems involve time, calendar and vocabulary skills. Students will need to find the Sunday column and count down three weeks to find the date described. They must also use standard vocabulary to state the birthday. Finding the day for the party students will need to work back from the 20th to the top row to decide which day of the week is appropriate. Lastly, when they look for the date the invitations were mailed, they will need to know how the calendar measures weeks to count up to the proper date. Note: If a student gives an incorrect answer to problem (b) and uses that information to solve (c) and figures back correctly they should receive full credit for (c).



a problem solving newsletter

Vol. 1 No. 6

★ ★ ★ ★ 1. The first box has three balloons, the second box has six balloons. If this pattern continues, how many balloons will be in the fifth box?



★ ★ ★ 4. How many wheels are on four tricycles and three bicycles?

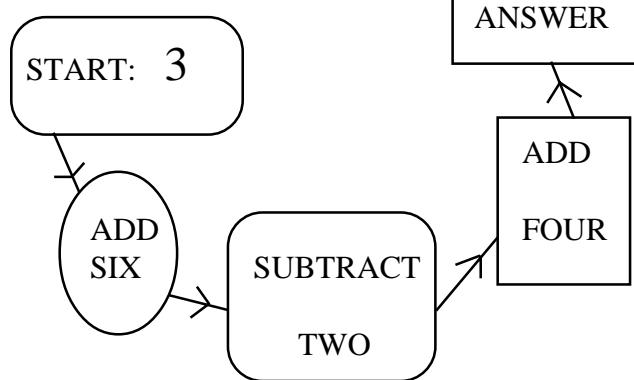
★ ★ 2. How tall do you think eight apples would be?

More than a foot

Less than a foot

Exactly a foot

★ ★ 3. Follow the directions to the answer:



### Strategy of the Month

When a problem involves data with more than one characteristic, **making a table, chart, or graph** is a very good way to organize the information. It helps your brain to identify patterns and to discover any missing data.

Tables help you record data without repeating yourself. Making a table or chart is especially useful for certain problems about probability and for some logic problems. Sometimes tables and charts are included in your information and you need to read through them carefully to understand the data you need to solve your problem. Creating a graph is also a good way to organize and visualize information. **Make a table** to solve this problem:

Loni has red, blue, green and yellow markers. She is coloring the stripes on the new soccer team flag. How many different flags can she color?



## MathStars Home Hints

*Everyone learns from sharing, and you can continue to learn by teaching others about the new mathematics ideas you are learning. Become a teacher and help a younger student. Explain what you have learned and what else you want to know. Good teachers set goals and evaluate the progress made toward reaching these goals. You will continue to be a learner whenever you become a teacher.*

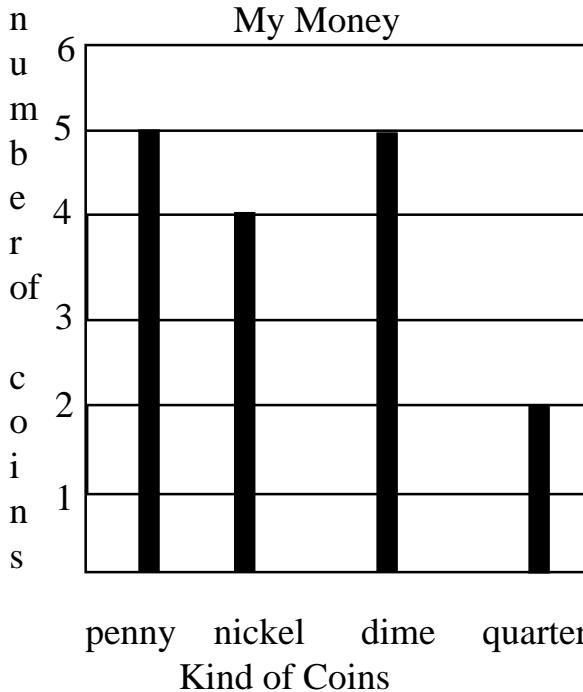
- ★ ★ ★ ★ 5. Twelve animals are swimming in the pond. There are twice as many ducks as there are frogs.

How many ducks are in the pond? \_\_\_\_\_

How many frogs are in the pond? \_\_\_\_\_

Hint: What two numbers add to 12?

- ★ ★ ★ ★ 6. Bill made a graph of the coins he had in his pocket.



How much money does he have in:  
a. pennies \_\_\_\_\_

b. nickels \_\_\_\_\_

c. dimes \_\_\_\_\_

d. quarters \_\_\_\_\_

7. How much does he have to spend?  
\_\_\_\_\_

## Setting Personal Goals

*Perseverance means that you do not give up easily. Good problem solvers try different strategies when they are stumped and are not discouraged when they cannot find an answer quickly. They stick to the task, using all of their previous experiences to make connections with what they know and the problem they are trying to solve. If something does not work, they discard the unsuccessful idea and try again using a different strategy.*

## About these newsletters...

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As with all good problems, the solutions and strategies suggested are merely a sample of what you and your students may discover. Enjoy!!

## Discussion of problems.....

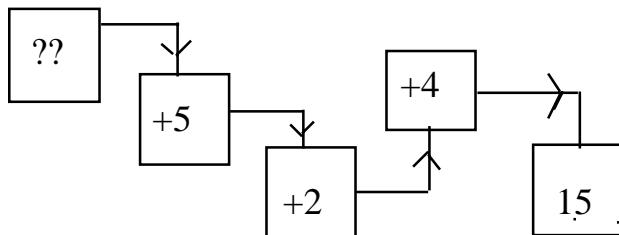
1. **(15 or 48 balloons)** Students can solve this problem in several ways. If they assume that the balloons increase by three in each box, then the fifth box will contain 15 balloons but if they assume that the balloons are doubling then the fifth box will hold 48 balloons! This is a good example of a situation where the teacher needs to ask, " How did you arrive at your answer?"
2. **(More than a foot)** This is a good problem to test out estimation skills. It could easily spawn a series of estimates and subsequent verifications.
3. **(11)** This mini-flowchart has multiple operations in sequence. Students may wish to use a calculator or form a human computer. Students take the part of Add 6, Subtract 2 and so on and the teacher or another student can supply the starting number.
4. **(21)** A good problem for manipulatives. By modeling the wheels on bikes and trikes or making a chart of the situation, students can organize the data and arrive at their solution. Manipulatives also provide the opportunity for regrouping to express the final answer.
5. **(eight ducks and four frogs)** This problem is not easy. *Twice as many* may need to be modeled or demonstrated for some students. Providing a series of criteria to be met is another strategy that is helpful. Number pairs that add to 12: "Is this addend twice as large as that addend? No? Let's try another."
6. **(a. 5 cents; b. 20 cents; c. 50 cents; d. 50 cents)** This problem provides an opportunity for graph interpretation and use of coins. Students should be encouraged to study the title and horizontal and vertical legends of the graph to be sure they can interpret the data correctly. Again, modeling with manipulatives is also very helpful.
7. **(\$1.25)** Finding the total amount of money involves regrouping the data. The use of coins provides a natural motivation for hundreds, tens, and ones.

# MathStars

a problem solving newsletter

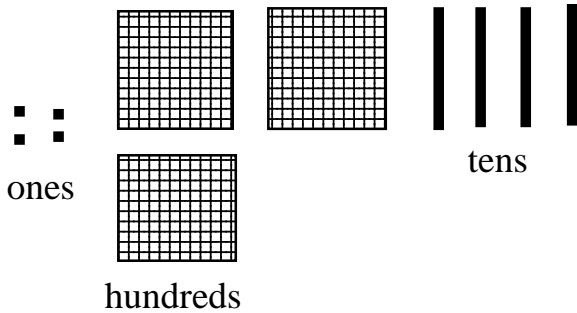
Vol. 1 No. 7

★★ 1. Find the first number for the flowchart:



★★★★★ 2. Curly, Flipsy, Fuzzy and Topsy are sitting in a row. Topsy is first. Fuzzy is last. Curly is between Topsy and Flipsy. Who is in the third seat?

★★ 3. What numeral is shown?



★★ 4. A waiter brought a pitcher of water to a table of six persons. Each person filled his glass and the pitcher was empty. If each glass holds 4 ounces, how much water was in the pitcher at the start?

★★★★★ 5. There are six puppies in the yard. How many tails, ears and legs are in the yard? Fill in the chart below to help you find the answers.

Tails \_\_\_\_\_ Ears \_\_\_\_\_ Legs \_\_\_\_\_

Dogs	Tails	Ears	Legs
1			
2			
3			
4			
5			
6			

## Strategy of the Month

*Some problems are difficult to "see" even if you draw a picture. For these problems, it can be helpful to actually **act out the problem**. When you role-play with friends or people at home, you may discover the solution as you act out the problem. Or you may recognize another strategy that will help you find the answer. Sometimes "acting out" a problem can be done with manipulative materials. To find the solution to the problem below, become the director and choose your cast to act this out:*

Freddy Frog is at the bottom of the stairs. He can move up three steps each time he hops. The pool is at the top of the stairs. If Freddy Frog hops five times before he is in the pool, how many stairs are there to the pool?

## MathStars Home Hints

*Calculators are important tools. They do not replace mathematical thinking; you must tell the calculator what numbers and operations to use. Calculators allow students to focus their energies on solving problems and to easily try alternative solutions. They also allow students to solve problems that are too difficult for pencil and paper. Number sense and good estimation skills are important when students use technology to carry out computations. Explore some "what if" situations with the calculator. "What if the cost of gas goes up 4¢... What if we build the patio 2 feet wider..."*

★★ 6. Jody is trying to estimate the number of marbles in a jar. Use these clues to help him make a good guess:

- (1) there are more than 44 marbles.
- (2) there are fewer than 50 marbles.
- (3) there is an even number of marbles.

How many marbles should Jody guess?

---

★★ 7. What number will make this statement true?

$$7 + 6 = \boxed{\phantom{0}} + 9$$

★★★★ 8. Complete the graph to show the lunch count for Mr. Scott's class.

On Monday, four students brought their lunch.

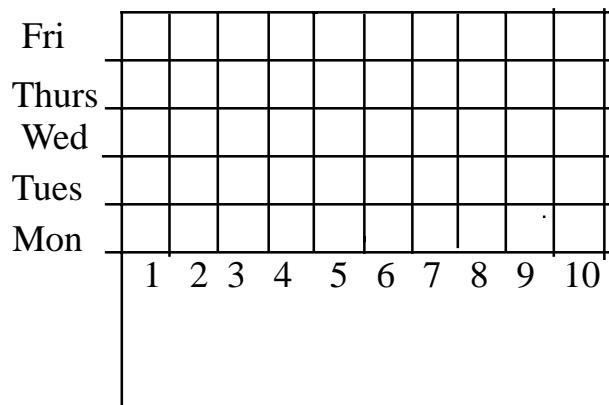
On Tuesday, two more than on Monday brought their lunch.

On Wednesday, three less than on Tuesday brought their lunch.

On Thursday, two more than on Wednesday brought their lunch.

On Friday, three more than on Thursday brought their lunch.

**Lunches**



## Setting Personal Goals

*Accuracy is very important to everyone. Pharmacists must always measure accurately when preparing prescriptions and carpenters must cut supporting boards precisely to fit. Careless mistakes may be avoided in the classroom by computing carefully, checking back over work, and writing numbers clearly and neatly. Remember: If work is worth doing, it is worth doing well.*

## About these newsletters...

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As with all good problems, the solutions and strategies suggested are merely a sample of what you and your students may discover. Enjoy!!

## Discussion of problems.....

1. (**four**) This problem is set up for students to begin working backwards. They may begin with 15 and undo or subtract each addend in succession until they reach the beginning; some may wish to find the sum of the three addends and then see what is needed to make 15; others may wish to use the guess and check method. The different approaches should be discussed and students encouraged to try more than one method.
  
2. (Topsy, Curly, **Flipsy**, Fuzzy) This problem can also be solved in a number of ways. Using manipulatives, acting out, drawing a picture, trial and error - these are all strategies that students may try. Knowing that Topsy is first and Fuzzy is last helps establish parameters. Where Curly is placed determines Flipsy's position. Checking back to the clues helps the student verify his/her work and make corrections or move on.
  
3. (**344**) Students need to be aware that the picture does not place the numbers in their proper order. Place value is an important understanding that begins in grade one and forms the foundation for much of the mathematics to come. Practice with counters and other grouped manipulatives is an essential activity.
  
4. (**24 ounces**) Making a chart or modeling with manipulatives will help students solve this problem. They should also be encouraged to draw pictures to illustrate the situation.

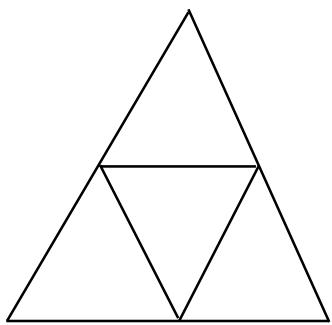
5. (**six tails; 12 ears and 24 legs**) Students should be encouraged to complete the chart to solve this problem. The tails column gives practice in adding on one, the ears column requires adding two and the legs column has addends of four.
6. (**46 or 48**) Using the clues and a hundred board, students should proceed to eliminate the odd numbers between 44 and 50. Again, they should be encouraged to check their answers against the clues and verify that they are on the right track.
7. (**four**) Again there are many ways to approach this problem. Modeling with manipulatives, guess and check, making a balance, summing the addends and using subtraction -- all of these can help students find the missing number. When students use guess and check they should be encouraged to examine the strategy for where it takes them. If students guess three and find the expression  $13 = 12$  to be unacceptable, where do they go from there? Do they understand that the sum 12 must be increased? If so, by how much? If the increase is too large, do they choose a smaller number? These are important observations in determining students' number sense.
8. (**Monday - four; Tuesday - six; Wednesday - three; Thursday - five; Friday - eight**) Students will need to complete the graph for each day as they follow the clues to determine how many students brought their lunch.

# MathStars

a problem solving newsletter

Vol. 1 No. 8

- ★ 1. How many different triangles are there in the diagram below?



\_\_\_\_\_ triangles

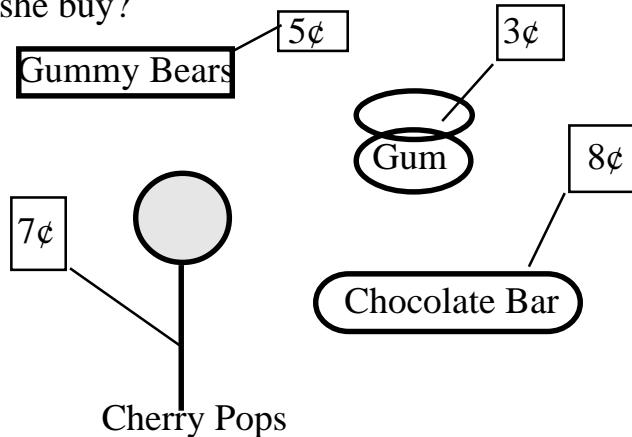
- ★★ 2. Robin Bird loves to eat worms. The chart below shows how many he ate in three days. If the pattern continues, how many will he eat on the eighth day?

Day	1	2	3	4	5	6	7	8
Worms	2	4	6					

- ★ 3. Ben's bus picks him up at 7:30 each morning. He arrives at school at 8:00 and the bell for class rings at 8:30. How many minutes does the bus ride take?

\_\_\_\_\_

- ★★★★ 4. Tamisha has 20 cents to spend at the school store. She wants to buy some candy to share with her friends. What can she buy?



\_\_\_\_\_

\_\_\_\_\_

## Strategy of the Month

*What do you do if you have a problem that seems to be very complicated? It may have lots of large numbers, too much information, or multiple conditions. One approach is to create a simpler problem like the one you need to solve. As you solve the easier problem, you may see the way to solve the more difficult one. Or you may discover a different process that will work with the harder problem. The trick is to be sure that your simpler problem is enough like the original one that the patterns or process you use will help you with the harder situation. **Make a simpler problem first as you solve this:***

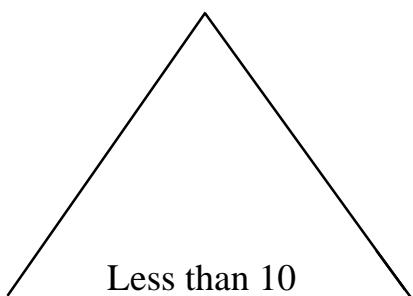
Six soccer players will shake hands before the game begins. How many handshakes will there be? {Suppose there are only three players; four players.}

## MathStars Home Hints

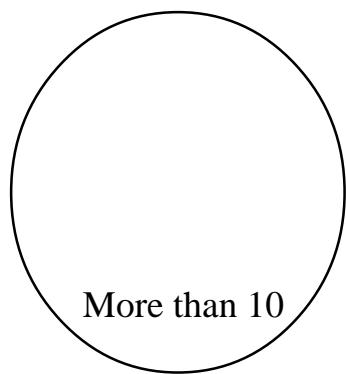
*Math skills develop as you apply concepts learned in school to real life situations. Which product is the best buy? How many tiles will it take to cover the kitchen floor? What time should we start baking the turkey so that we can have dinner at 7 p.m.? What do the statistics say about the two baseball players?*

- ★★ 5. Place the number facts in the correct shape:

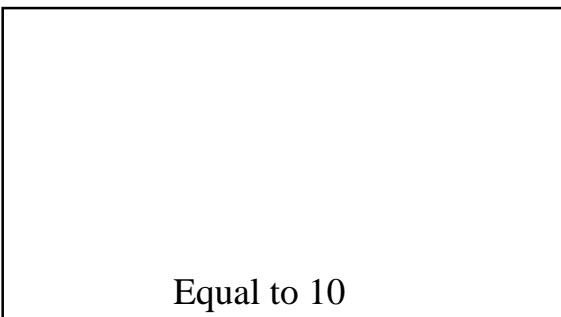
$$\begin{array}{cccc} 6 + 4 & 5 + 4 & 6 + 6 & 9 + 5 \\ 2 + 8 & 1 + 9 & 3 + 4 & 8 + 3 \end{array}$$



Less than 10



More than 10



Equal to 10

- ★★★ 6. Estimate how many steps it takes to walk from your bedroom to the kitchen. Then carefully count the number of steps you actually take. Would this be the same for everyone in your family? Why?

Estimate for you \_\_\_\_\_

Number you actually walked \_\_\_\_\_

Who takes more steps? \_\_\_\_\_

Why? \_\_\_\_\_

- ★ 7. Write the numeral for:  
six tens + two ones + two hundreds

- ★ 8. How many days are in two weeks?

### Setting Personal Goals

*Confidence means that you believe in yourself. You can become a more confident problem solver by learning to use a variety of strategies. If your first idea does not work, don't give up just try another way! Working with a buddy also helps. You need to remember that there is usually more than one way to solve a problem and that practice always helps us learn.*



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## Discussion of problems.....

1. (**five triangles - four small and one large**) Encourage students to trace with their fingers or use crayons of different colors to find all the triangles in the diagram. Spatial sense and the definition of a triangle are important concepts to emphasize.

2. (**16 worms**) Here is yet another example of a chart to help students organize their information. As the pattern is extended some students may notice that the number of worms is double the day!

3. (**30 minutes**) This is the first problem with extraneous information. It is important that students read carefully and select only the numbers and facts they need to solve a problem.

4. (**See chart below**) Using sets of coins that equal 20 cents will help students "spend" their money and satisfy the conditions of the problem. A chart is also helpful in determining the various combinations that answer the question.

Gummy Bears	Cherry Pops	Chocolate Bars	Gum	Total	Cost
0	0	2	1	3	19¢
3	0	0	1	4	18¢
2	0	1	0	3	18¢
2	0	0	3	5	19¢
1	0	0	5	6	20¢
1	1	1	0	3	20¢
0	2	0	2	4	20¢
1	1	0	1	3	18¢
2	1	0	1	4	20¢

and so on...

5. (**See chart below**) Another place for students to make decisions about sums. The combinations should be fairly familiar by now but the sorting is an added way to make decisions about the relative size of numbers. The number line and the hundred board are both useful aids for students who have yet to develop this number facility.

Less than 10	Equal to 10	More than 10
$5 + 4$ $3 + 4$	$6 + 4$ $8 + 2$ $9 + 1$	$6 + 6$ $9 + 5$ $8 + 3$

6. (**Answers will vary for this exercise**) Students should note that less steps are necessary for adults because the unit (steps or stride) is longer. Likewise, if there is a younger child in the home, the number of steps will be greater because the steps are smaller. A discussion of varying units is helpful as young students form their concepts of measure and measuring.

7. (**262**) Blocks and counters may be necessary for some students as they deal with the place values in this problem. Many opportunities to display their understanding and decision-making strategies about place value are important.

8. (**14 days**) Another measurement situation, this one involving time. Use of a calendar, manipulatives or the calculator will provide access to this problem for all children.



a problem solving newsletter

Vol. 1 No. 9

- ★★★ 1. Toss a penny in the air 20 times and let it land flat.

Mark on the chart each head and tail.

Heads	Tails
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
Total:	

1¢

- ★★★ 3. If  $a = 1\text{¢}$ ,  $b = 2\text{¢}$ ,  $c = 3\text{¢}$ , and so on, what is the value of your first name?

4. In your pocket you have two dimes, one nickel and two pennies. Your friend has one dime, three nickels and five pennies in his pocket.

My pocket:

Friend's pocket:

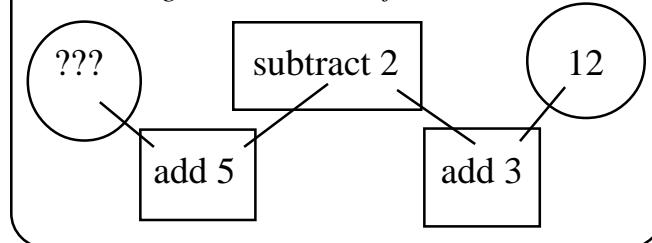
\_\_\_\_\_¢      \_\_\_\_\_¢

Who has more money, you or your friend?

How much more?

### Strategy of the Month

What if you know the result of a situation, but you don't know the beginning? For example, you might know that you end up with thirteen baseball cards after doing a certain number of trades and you want to figure out how many cards you had before the trading started. In that case you need to work backwards; you have to think about your actions in reverse order. This strategy works for any sequence of actions when you know the end result rather than the starting place. Try **working backwards** to find the starting number on this flow chart:



## MathStars Home Hints

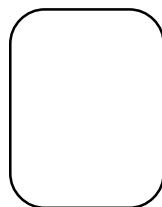
*Mathematics can make life easier for you when you become a good estimator. Spatial estimation helps you plan how you will rearrange your furniture or how far to jump to cross a puddle of water. Using estimation helps you know whether you have enough money for your purchases before you get to the check-out line. We become good estimators by practicing. Use your number sense and spatial sense to think about what the answers to problems will be before you start to solve them.*

### ★★ 5. What number am I?

I am greater than nine.

I am less than  $7 + 6$ .

I am an odd number.

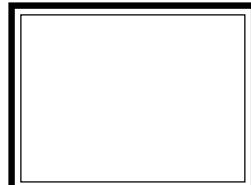


### ★★★ 6. Put the numbers in the boxes where they belong.

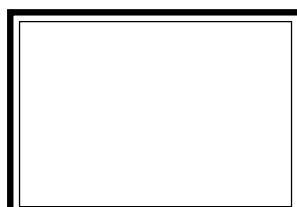
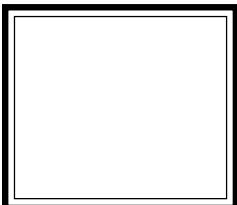
[Hint: two numbers will not belong in any box.]

6, 28, 51, 33, 48, 59, 14, 66, 8, 73, 25, 82,  
38, 17, 96

Greater than 52

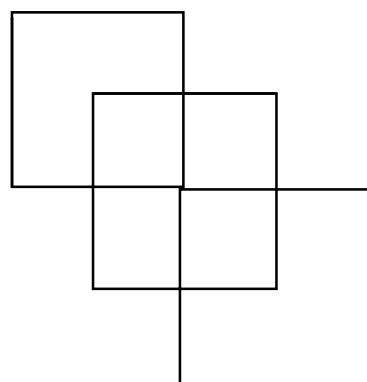


Less than ten



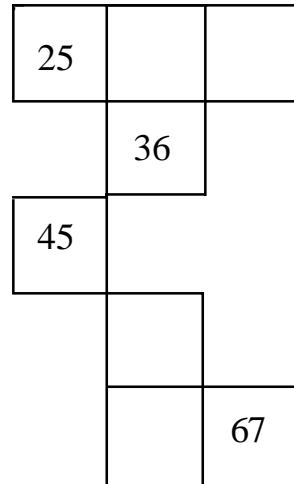
Greater than 12  
and less than 39

### ★ 7. How many squares are in this picture?



\_\_\_\_\_ squares

### ★★★ 8. This puzzle piece was cut from a hundred board. Fill in the missing numbers.



## Setting Personal Goals

*When you encounter a new situation, you use all of your previous experiences to figure out the current problem. Reasoning mathematically means using your brain power to think logically and sequentially, to put prior knowledge with new information. Set the goal of developing mathematical power and use your thinking power to achieve the goal!*

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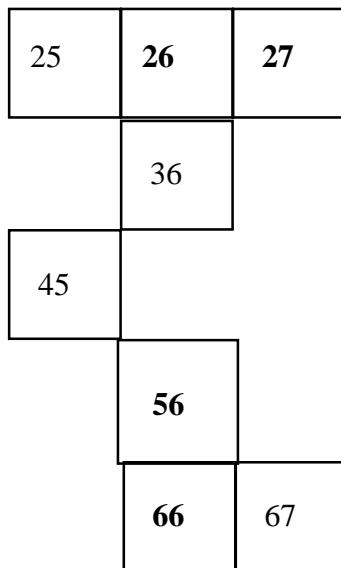
## Discussion of problems.....

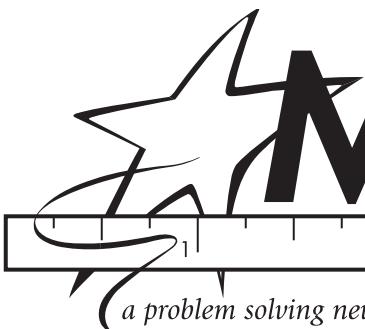
1. Students should realize that there is no right or wrong answer to this problem. The data collected could be shared for a large class graph. Discussion could focus on the "what ifs" of several situations, i.e., what if you had four heads in a row, what could come up next? What if you had all tails, what do you think could happen? What if you did this experiment five more times, what do you think would happen?
2. **(20 eggs)** Without modeling or drawing a picture the numbers in this problem would present quite a challenge for a first grade student. Students should be encouraged to talk through their solutions and share their strategies.
3. Again there is not a unique answer. Students could use coins or their calculators to help solve this problem. Extensions might include a search for the most (or least) expensive day of the week, month of the year, animal or car. Students can suggest other categories and explore the possibilities.
4. **(My Pocket: 27¢, Friend's Pocket 30¢; my friend has three cents more)** Another problem involving coins. Modelling with real or play money is an excellent way to help students arrive at solutions.
5. **(11)** The hundred board is an excellent help in solving this problem. Eliminating some numbers and highlighting others, students can solve number puzzles and later propose some of their own.

**6. (Less than ten: 6, 8; Greater than 12 and less than 39: 14, 17, 25, 28, 33, 38; Greater than 52: 59, 66, 73, 82, 96)** Students will practice making decisions about relative number values as well as using the vocabulary of comparison in solving this problem. It is also important that students justify their decisions as they place numbers in the boxes.

**7. (seven squares)** An organized method of counting should be encouraged. What is a square? How many large squares do you see? How many small squares? Colored markers or crayons may help some students. Tracing with fingers while counting is also to be encouraged.

**8. (See diagram below)** Familiarity with the hundred board will help students solve this problem. When I go up one square, by how much does the number change? If I move one square to the left, how does the value change? These kinds of explorations will help students make good use of the hundred board.





# MathStars

a problem solving newsletter

Vol. 1 No. 10

★★★ 1. Bob and his mother went shopping. These are the bills:

**Store A**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \$13.00

~~Store B~~  
 \_\_\_\_\_  
 \_\_\_\_\_ \$20.00

\*\*\*Store C\*\*\*  
 \_\_\_\_\_    \_\_\_\_\_  
 \_\_\_\_\_ \$15.00

**Store D**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \$18.00

Can you figure out what they bought?

Prices:

Shirts \$8.00

Pants \$12.00

Shoes \$10.00

Caps \$5.00

Belts \$4.00

Jackets \$16.00

Store A \_\_\_\_\_

Store B \_\_\_\_\_

Store C \_\_\_\_\_

Store D \_\_\_\_\_

★ 2. Fill in the missing number:

$$9 + 12 = \boxed{\quad} + 10$$

★★★ 3. Grandma made four peach pies. She used six peaches for each pie. How many peaches did she use?

★★★★ 4. The neighborhood pool opens at 2:00. You arrive at 2:30. How long can you swim before the pool closes?

Pool Hours:  
 2 - 4 daily

\_\_\_\_\_

## Strategy of the Month

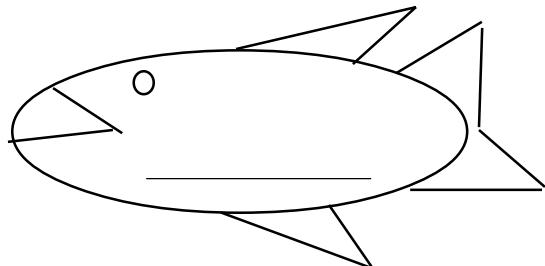
*You have tried many ways to solve problems this year. Already you know that when one strategy does not lead you to a solution, you back up and try something else. Sometimes you can find a smaller problem inside the larger one that must be solved first. Sometimes you need to think about the information that is missing rather than what is there. Sometimes you need to read the problem again and look for a different point of view. Sometimes you need to tell your brain to try to think about the problem in an entirely different way - perhaps a way you have never used before. Looking for different ways to solve problems is like brainstorming. Try to solve this problem. You may need to change your point of view.*

Mrs. Gomez is planning a party. She needs seating for 26 people. She can use hexagon tables for six guests and square tables for four guests. She would like to use more hexagon tables than square tables. How many of each does she need?

## MathStars Home Hints

*Identifying the mathematics that is all around you can be lots of fun. Think about the geometry and spatial visualization you use in playing video games or when you play golf or basketball. When your parents parallel park, they are using their spatial skills too. When you track a hurricane, you use coordinates. When you check the stock market or read the latest sports statistics, you are using mathematics. With your family or friends go on a math scavenger hunt. Who can identify mathematics in the most unusual places?*

- ★★ 5. Three friends went fishing. Juan caught five fish, Betty caught twice as many as Juan and Darryl caught seven. How many fish did the three friends catch?

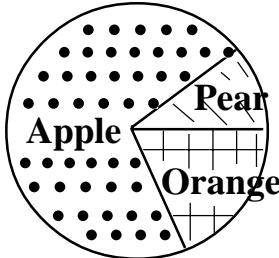


- ★ 6. Circle the letters that have a line of symmetry:

R    D    H

S    W    Y

- ★★★ 7. Mr. Allen's class made a graph to show their favorite fruit. Look at the information on the graph. Then decide whether the following statements are true or false.



- a. More students like apples.  
true or false
- b. More students like pears than oranges.  
true or false
- c. More students like pears and oranges than apples.  
true or false
- d. Over half the class prefers apples.  
true or false

- ★★ 8. Three students bring "Show and Tell" on Monday, five students on Tuesday, seven students on Wednesday. If this pattern continues, how many students will bring "Show and Tell" on Friday?
- 

## Setting Personal Goals

*Students who recognize the value of mathematics are well on their way to becoming mathematically powerful citizens. Valuing mathematics means that we appreciate the richness, power, and usefulness of mathematics. Without math there would be no roads or bridges, computers or movies, banks or fast food restaurants. How can you become mathematically powerful?*



About these newsletters...

The purpose of the MathStars Newsletters is to challenge students beyond the classroom setting. Good problems can inspire curiosity about number relationships and geometric properties. It is hoped that in accepting the challenge of mathematical problem solving, students, their parents, and their teachers will be led to explore new mathematical horizons.

As with all good problems, the solutions and strategies suggested are merely a sample of what you and your students may discover. Enjoy!!

Discussion of problems.....

1. (**See chart below**) This problem requires adding various clothing prices to match the totals on the bills. Students may choose two or more items for each bill; some students may find more than one combination to arrive at a given total.

Answer:

Item	Shirt	Shoes	Belt	Pants	Cap	Jacket
Store						
A	1				1	
			2		1	
B	1			1		
	1		3			
	2		1			
		2				
		1			2	
			2	1		
			1			1
			5			
C					4	
					3	
		1			1	
D	1	1				
		1	2			
	1				2	

2. **(11)** Students can solve this problem in several ways. Manipulatives to model the numbers, a balance to experiment with solutions, guess and check or addition and subtraction (missing addend). The important feature is the use of different strategies to determine the missing number.
3. **(24 peaches)** A good problem for modeling with manipulatives, drawing a picture or acting out. Again, students should be encouraged to try more than one strategy or to share their strategies with the class.
4. **(90 minutes or an hour and a half)** This problem involves unequal time intervals. The use of toy clocks or clock faces to help students "see" intervals is important. Manipulatives to help keep track of the time or pictures to model the situation - all are excellent helps to insure access for every student.
5. **(22 fish)** This problem requires students to know the concept "twice as many" to determine Betty's catch. The problem lends itself to modeling or using manipulatives as well as regrouping to state the final answer.
6. **(D, H, W, Y)** An understanding of symmetry is needed to solve this problem. Students should be encouraged to draw the line of symmetry and verify that the two parts are identical. Folding is another good test for symmetry; the concept of a mirror image also helps students with this concept. Note: some students may notice that H has two lines of symmetry. Can you find other letters or numbers that are symmetrical?
7. **(a. true; b. false; c. false; d. true)** Students will need to study the data represented by the graph. Since there are no numbers involved in this problem, a sense of the relative areas represented needs to be emphasized. Spatial sense, area and comparisons are important features of a graph of this type. Students might be encouraged to ask what ifs for the data, i.e., what if 25 students chose apples, then how many do you think chose pears, or chose oranges? Experiences with concrete circle graphs will help children understand these abstract representations.
8. **(11 students)** Besides recognizing an increase of two students per day, an understanding of the calendar and daily succession is needed to solve this problem.