



a problem solving newsletter

Vol. 2 No. 1

- ★★ 1. Here is part of the number line. Place the following numbers where they belong: 33, 31, 37, 28.

<---|---|---|---|---|---|---|---|---|---|--->

- ★★★ 5. Twenty-eight is a two-digit number whose digit sum is 10. [  $2 + 8 = 10$  ] How many other two-digit numbers have a digit sum of ten?

\_\_\_\_\_

What are the numbers?

- ★ 2. Put in + or - to make this statement true:

$$3 \square 4 \square 2 \square 5 = 10$$

- ★★ 3. Complete this pattern:

$$\begin{aligned} 2 &\rightarrow 4 \\ 4 &\rightarrow 6 \\ 6 &\rightarrow 8 \\ 8 &\rightarrow \underline{\hspace{2cm}} \\ 10 &\rightarrow \underline{\hspace{2cm}} \end{aligned}$$

- ★★★ 4. Kristin wishes to bake some cakes. Each cake requires four eggs. How many cakes can Kristin bake if she has one dozen eggs?

### 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:*

In 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!*

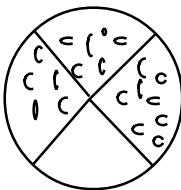
How tall are you? \_\_\_\_\_

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

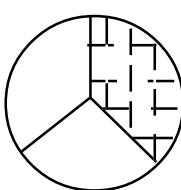
What is the circumference of your head?

- ★★★ 8. Look at the shaded parts of each circle.

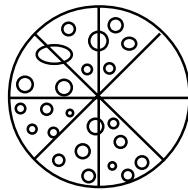
Which ones are less than half shaded?



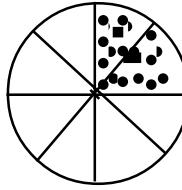
A



B

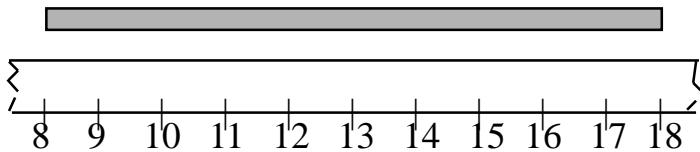


C



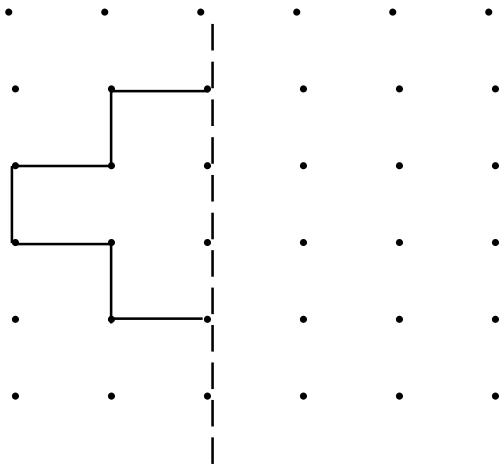
D

- ★★ 6. Pat's Mom asked her to measure some ribbon. The only ruler she could find was broken. Pat says she can still measure the ribbon.



How long is the ribbon?

- ★★ 7. This is half of a symmetrical figure. Draw the other half.



## Setting Personal Goals

*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...

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. **(28, 31, 33, 37. Twenty-eight can be placed on any of the first three points on the number line. The succeeding numbers must then be proportionally distributed.)** Students must be able to order numbers as well as have a familiarity with the number line in order to successfully complete this problem.

2. **(3 + 4 - 2 + 5 = 10)** Guess and check will probably be the most effective technique to solve this problem. Number tiles would be helpful as students test their conjectures.

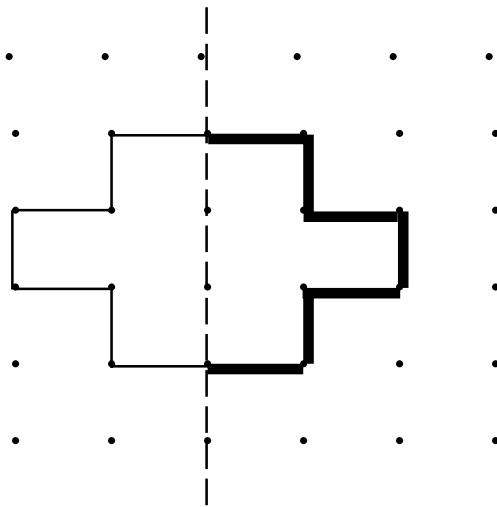
3. **(8 ---> 10; 10 ---> 12)** This pattern has as its rule "add two". Students should be asked to identify the rule as well as to extend the pattern to larger numbers.

4. **(three cakes)** Students need to know the meaning of "dozen" in order to solve this problem. Drawing a picture, modeling or sorting manipulatives will be helpful strategies.

5. **(19, 91, 82, 37, 73, 46, 64, 55)** Digit and two-digit may be new vocabulary for some students. The ten family facts will need to be explored to arrive at the solution set. The hundred board is a powerful tool for this problem and to explore other digit sum problems.

6. **(10 units)** The broken ruler is a good tool to assess students understanding of measuring against a standard. Students need to count the units that line up with the item to be measured.

7. Spatial visualization helps children to complete this drawing. An understanding of the vocabulary as well as the concept of symmetry is important.



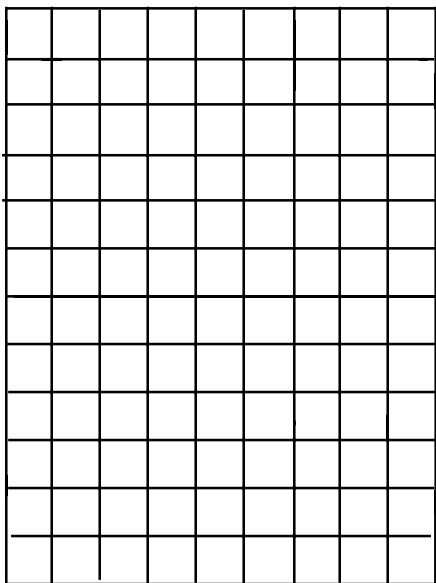
8. **(B, D)** Representing half of a figure is very easy until the whole is divided into different size pieces as shown in this problem. The concept of "less than half" may not be understood by all children at this point.



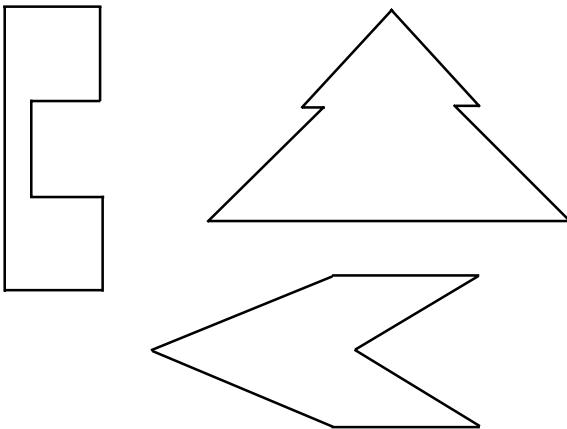
# *a problem solving newsletter*

Vol. 2 No. 2

★★ 1. Mrs. Williams took a survey of favorite vacation spots in her class. The beach was chosen by eleven students, the mountains by four students and eight students chose the desert. How could Mrs. Williams organize this information in a graph?



★ 2. Draw the line of symmetry for each of these shapes.



★★ 3. Complete this pattern:

- 1---> 2
- 2 ---> 4
- 3 ---> 6
- 4 ---> \_\_\_\_\_
- 5 --->

★ 4. Here is part of a number line:

A horizontal number line starting at 49 and ending at 58. The line is marked with vertical dashed lines at each integer value from 49 to 58. There are 10 segments between the tick marks, representing the integers 50, 51, 52, 53, and 54.

Which of the following numbers cannot fit on it?

- a. 60      b. 40      c. 51      d. 59

## 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:*

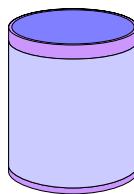
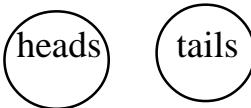
You have three pennies, two nickels and a dime. How many different amounts of money can you make?

## MathStars Home Hints

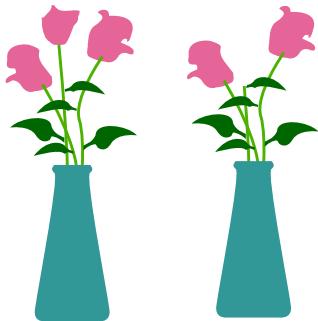
*Sometimes the hardest part of solving a problem is just getting started. Having some steps to follow may help you.*

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.*

★★★ 7. Mr. Cutter put six pennies in a jar. He shook them up and poured them on his desk. He got two heads and four tails. If he does this experiment lots of times, what are the other combinations that he can get?



★★★ 5. Jill counted the number of petals on five flowers that are all alike. When she finished she had counted 20 petals. How many petals are on each flower?



★★★ 8. Which is worth more: seven inches of dimes or nine inches of nickels?

★★★ 6. Put in + or - to make this statement true.

$$8 \square 4 \square 6 \square 7 = 11$$

## 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!*

## About these newsletters...

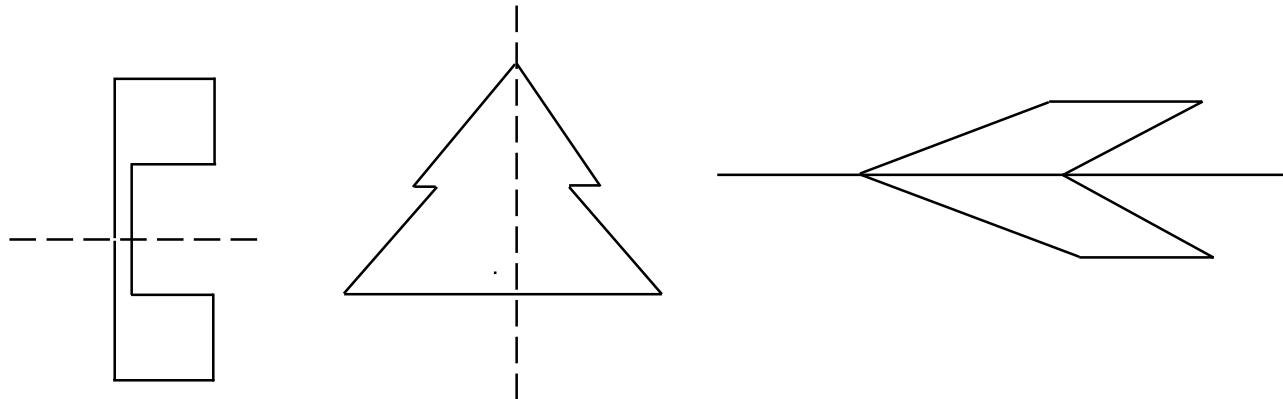
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## Discussion of problems...

1. (**Graphs may vary**) Student graphs should contain a title and labeling for both the horizontal and vertical axes. Some students may wish to use symbols or pictures rather than bars or lines.

2. Students' understanding of symmetry is evident in this example as well as their ability to draw the appropriate line.



3. (**4 ---> 8; 5 ---> 10**) The pattern here is doubling or adding a number to itself. Some students may view the numbers geometrically. Count by ones in the first column, count by twos in the second.

4. (**40 and 60**) Students can fill in the missing numbers for this portion of the number line or count over and attempt to find the points for the given numbers.



5. (**four petals**) Several strategies will be useful to help students with this problem: draw a picture, model with manipulatives, or repeated subtraction.

6. ( **$8 + 4 + 6 - 7 = 11$** ) This problem gives students an opportunity to use the guess and check strategy.

7. Making a table or a chart will be helpful as students explore the different combinations possible to solve this problem. The six family of number facts is used here.

**Answer:** Heads    Tails

<b>0</b>	<b>6</b>
<b>1</b>	<b>5</b>
<b>2</b>	<b>4</b>
<b>3</b>	<b>3</b>
<b>4</b>	<b>2</b>
<b>5</b>	<b>1</b>
<b>6</b>	<b>0</b>

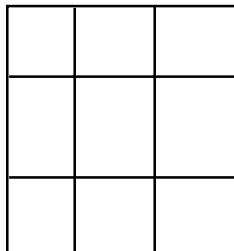
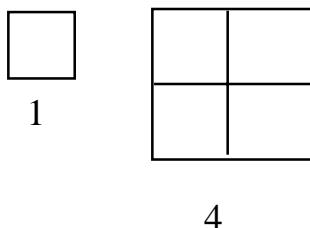
8. (**seven inches of dimes**) This is a good problem to encourage estimation as well as coin use and measurement.

# MathStars

a problem solving newsletter

Vol. 2 No. 3

- ★★★ 1. Latesha is building with tiles. Her design has a pattern like this:

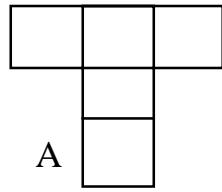


9

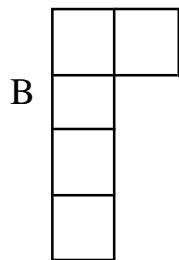
What will her next design look like? How many tiles will she use?

\_\_\_\_\_

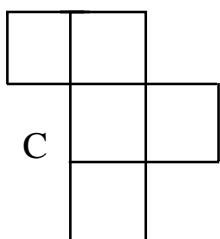
- ★★ 2. Circle the symmetrical figures:



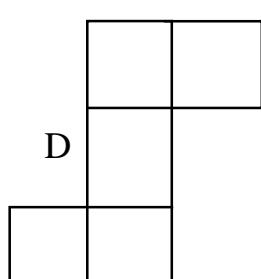
A



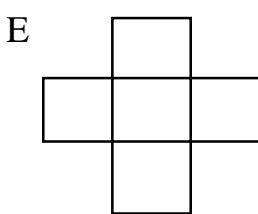
B



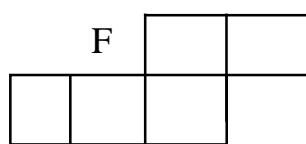
C



D



E



F

- ★★★★ 3. Flopsy and Mopsy are rabbits. Mopsy eats more than Flopsy. When Flopsy eats one bowl of food, Mopsy eats three bowls of food and when Flopsy eats two bowls of food, Mopsy eats six bowls of food. If Flopsy eats five bowls of food, how much will Mopsy eat?

\_\_\_\_\_

- ★★★ 4. Use the digits 2, 4, 6, 7 to make this a true statement:

$$\begin{array}{r}
 \boxed{\phantom{0}} \quad \boxed{\phantom{0}} \\
 + \boxed{\phantom{0}} \quad \boxed{\phantom{0}} \\
 \hline
 1 \quad 0 \quad 0
 \end{array}$$

## 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 ( $7+6=13$ ,  $6+7=13$ ,  $13-6=7$ ,  $13-7=6$ ).
- 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.

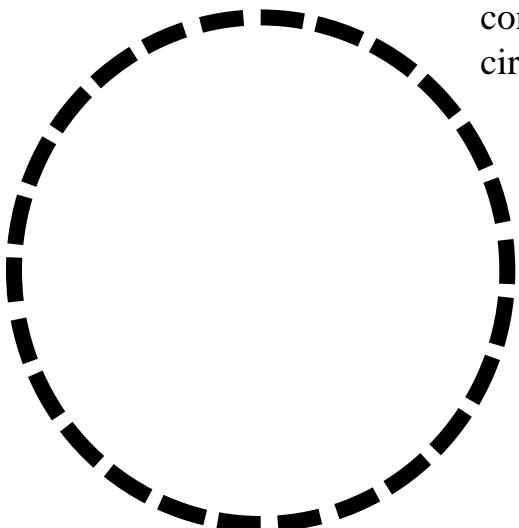
★★★★ 5. Luke made flowerpots for his friends. He has 32 flowers. If he puts six flowers in each pot how many pots will he make?

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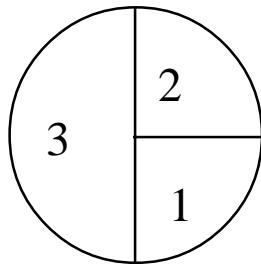
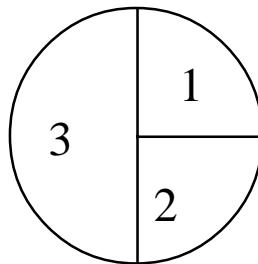
★★★ 6. Alyssa's class graphed their favorite colors. This is what they like:

Color	Number
Red	5
Blue	7
Green	6
Orange	3
Yellow	5

Help them complete the circle graph.



★★★ 7. Carlos has spinners like these:



If he spins each one and adds the results, what sums do you think he will get?

★★★★ 8. Farmer Jones has an orchard that will hold 12 trees. He will plant the same number of apple trees and pear trees. He will plant twice as many cherry trees as apple trees. How many of each will he plant?

\_\_\_\_\_ Apple trees

\_\_\_\_\_ Pear trees

\_\_\_\_\_ Cherry trees

## 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.*

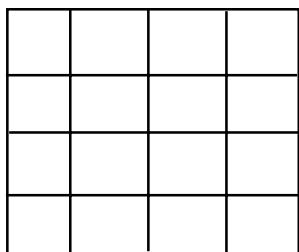
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### Discussion of problems.....

1. **(16)** This growing pattern is actually the square numbers which children will learn to use in later years. Children can attempt to predict the continuation of this pattern and experiment with tiles to test their predictions.



2. **(A and E)** These shapes are only some of the figures students can make using five square tiles (pentominoes). They can explore the possibilities using four or six squares and sort the shapes according to the property of line symmetry. A good way to help students test symmetry is to draw the shapes on grid paper, cut them out and fold them along proposed lines of symmetry.

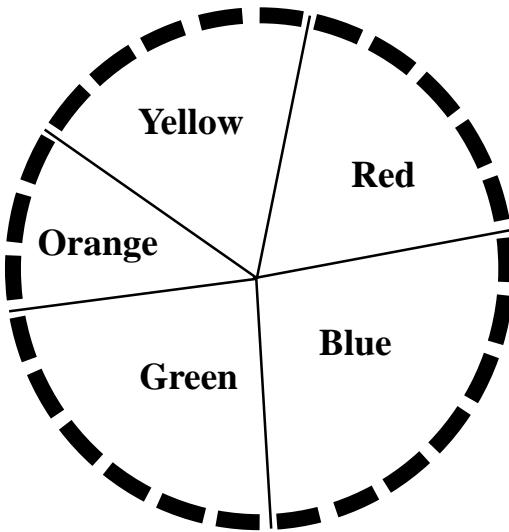
3. **(15 bowls)** Students may wish to set up a table to organize their thinking for this problem. Drawing a picture or modeling the situation are also good strategies. As always, manipulatives give all children access to the problem through acting out the story.

4. **(26 + 74 or 24 + 76)** There are two possibilities for solutions to this problem (order is not important). Children can use the calculator to experiment with this problem.

5. (**five pots**) The fact that there are two flowers left over may be a source of confusion for some students. It is important to discuss this outcome and listen to student attempts to explain the situation.

6. Students will need to organize the data in order to complete the circle graph.

Labeling or coloring the points on the circumference is helpful.



7. (**6** [3 + 3]; **5** [2 + 3, 3 + 2]; **4** [2 + 2, 3 + 1, 1 + 3]; **3** [2 + 1, 1 + 2]; **2** [1 + 1]) This is a very good problem for experimenting with sums. Students can use the spinners to make predictions or conjectures and then test them out. What sum do you think will occur most often, least often, why? The fact that four is the most likely sum is not immediately evident but can be the subject of lively discussion.

8. (**three apple trees, three pear trees and six cherry trees**) Students can draw pictures or use different colored markers to distinguish between and among the three types of trees when modeling this problem. Guess and check is a good strategy here; with several conditions to be satisfied, students may wish to work in groups to solve this problem.



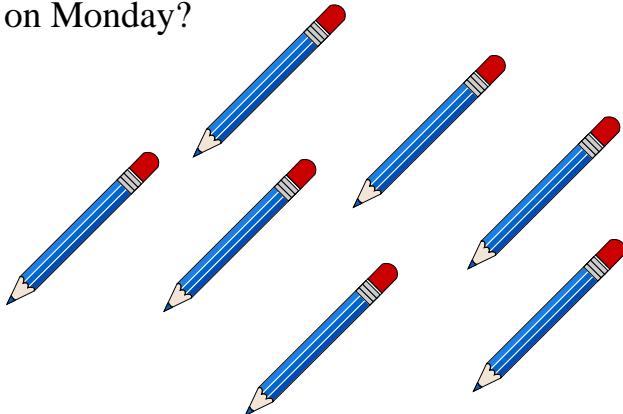
# MathStars

a problem solving newsletter

Vol. 2 No. 4

- ★ 1. Mrs. Hall planted 15 flowers in rows of five each. How many rows did she plant?

- ★ 2. On Monday, Tasha had a pocketful of pencils. On Wednesday she loaned four to her friends and had seven pencils left. How many pencils were in Tasha's pocket on Monday?



- ★★★★ 3. Mario got one dollar from the tooth fairy for his lost tooth. He bought one of these toys and got two coins in change.

Ball 52¢

Top 86¢

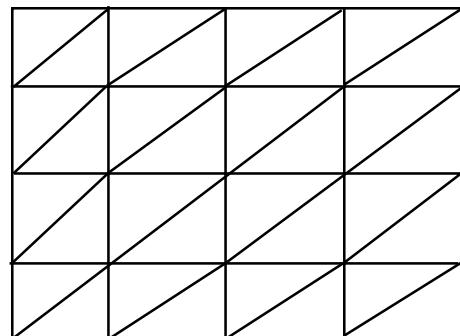
Whistle 69¢

Car 74¢

Which toy did he buy? \_\_\_\_\_

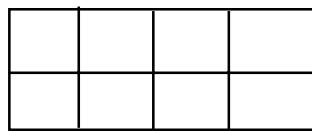
Which coins did he get in change?  
\_\_\_\_\_

- ★★ 4. Aunt Rose makes quilts. She is looking for new ideas for her patterns. She would like to use two colors and arrange them so that half the quilt is blue and the other half is green. Can you help her with a design?



## 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?

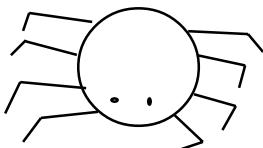
## MathStars Home Hints

*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.*

★★★ 5. Mike likes to collect spiders.

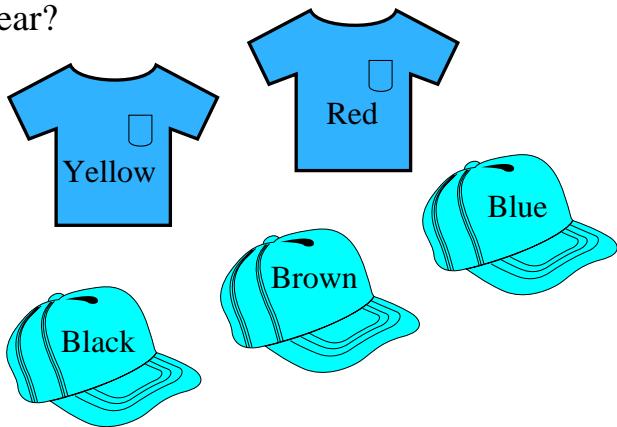
Fill in the chart to show how many eyes and legs he sees on his spiders.



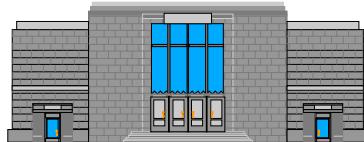
Spiders	Eyes	Legs
1		
2		
3		
4		

★★★ 6. Joe can walk eight blocks in ten minutes. How far can he walk in 30 minutes? \_\_\_\_\_

★★ 7. Mark has a red shirt and a yellow shirt. His hats are black, brown and blue. How many different outfits could Mark wear?



★ 8. If Sean takes 24 one dollar bills to the bank, how many ten dollar bills will the bank give her in return?



## 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.



## About these newsletters...

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As with all good problems, the solutions and strategies suggested are merely a sample of

## Discussion of problems...

1. (**three rows**) A good problem for modeling or drawing a picture. Students may also choose to count by fives and keep track of the succession with markers or manipulatives.

2. (**11 pencils**) Working backwards is an effective strategy, but not the only one, for solving this problem.

Students should be encouraged to share their methods with their classmates and to try other strategies.

3. (**car; a penny and a quarter**) Real or play coins will help students solve this problem. The calculator is also an excellent tool to help them explore solutions.

4. (**Answers will vary**) The important concept here is that half means an equal number of parts coloured blue and green. The actual arrangement of the pieces will vary in complexity of design. Again, it is good practice to let students share their solutions and determine why each is correct.

5. A chart or list is a good way to organize data. Students can model, use manipulatives, draw pictures or count by twos and eights to solve this problem.

Spiders	Eyes	Legs
1	2	8
2	4	16
3	6	24
4	8	32

6. (**24 blocks**) The strategy students use for determining how many tens are in 30 is significant. A one-to-one correspondence between groups of ten minutes and eight blocks will help them arrive at a final solution. Asking the question "Does this answer make sense?" is also a good practice to introduce at this time.

7. (**six outfits**) The red shirt can be worn with black, brown or blue pants; likewise the yellow shirt can be worn with three different pants. Students might use unifix cubes to model the situation, draw pictures or make a chart.

8. (**two ten-dollar bills**) This is a simple regrouping exercise. Students can model this problem with their counting tiles or number blocks to illustrate the exchange.



# MathStars

a problem solving newsletter

Vol. 2 No. 5

- ★ 1. What is the largest three-digit number Anna can make using these number tiles?

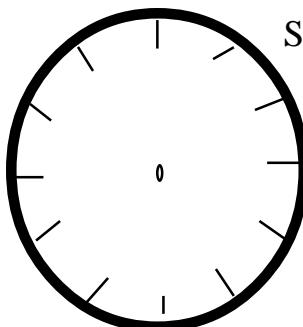
6      5      3      2      8      4

\_\_\_\_\_

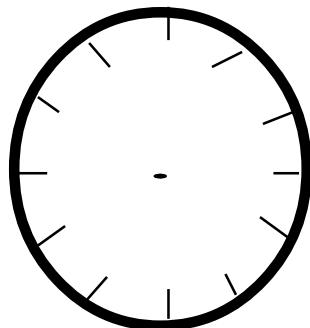
- What is the smallest three-digit number she can make?

\_\_\_\_\_

- ★★ 2. Ray and Kim started raking leaves at noon. They finished in three and a half hours. Draw hands on the clocks to show when they started and when they finished.



START



FINISH

James is putting his baseball cards in an album that holds 500 cards. He has 180 rookie cards and 234 player cards.

- ★★ 3. How many more cards does he need to fill his album?

\_\_\_\_\_

- ★★ 4. How many more player cards does he have than rookie cards?

\_\_\_\_\_

- ★★★★ 5. When James decides to buy more cards to fill his album, he wants to buy an equal number of player cards and rookie cards. How many of each will he buy?

\_\_\_\_\_

## 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 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.

★★★ 6. Jeff likes to stack his pennies into two piles that are the same height. He knows that if he has an **even** number of pennies he can make two equal piles. If the piles are not even then he knows he has an **odd** number of pennies.

Use Jeff's method and tell if the pennies are even or odd:

Number of Pennies	Even or Odd
-------------------	-------------

17 \_\_\_\_\_

18 \_\_\_\_\_

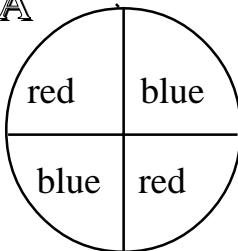
23 \_\_\_\_\_

30 \_\_\_\_\_

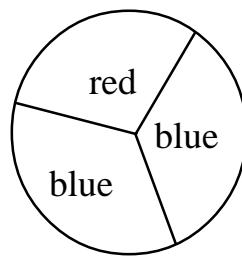
36 \_\_\_\_\_

★★★★ 7. Mary is playing a game at the school fair. She will win a prize if the spinner lands on red. She may choose which spinner to play. Which spinner should she choose to win?

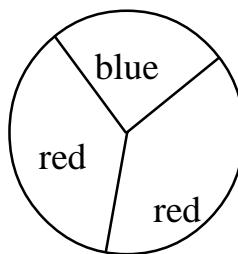
A



B



C



★ 8. Debbi is collecting nickels in a jar. She has 65 cents so far. How many more nickels does she need to make one dollar?

## 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.*

## 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!!

1. **(865 and 234)** An understanding of place value is important in solving this problem. Choosing and arranging the digits to find the largest (or smallest) number successfully is an indicator of their mastery of this concept.
2. **(12:00 on the first clock and 3:30 on the second clock)** This situation requires that students recognize noon as twelve o'clock and elapsed time in hours and half hours. They must also distinguish between the hour and the minute hand on the second clock. Clocks with moveable hands will help students with this problem.
3. **(86 cards)** This is a two-step problem that requires some organization or plan on the part of students. They must first determine the total number of cards and then find the difference between that total and 500. The use of a calculator would be appropriate for some students while others may make use of number blocks or counters.
4. **(54 cards)** This problem has students compare the numbers to see how many more, i.e., a comparison by subtraction. Again, the use of manipulatives may be helpful for some students as they model the two numbers.
5. **(43 of each type)** In order to complete this task students need to analyze their work so far. How many cards are needed to fill the album? They should refer to problem #3 and determine how to divide this number into two equal addends. Trial and error, or modeling are good strategies. If the answer to #3 is incorrect but the student uses that value correctly, she/he should receive full credit for this problem.
6. **(17 and 23: odd; 18, 30 and 36: even)** This problem has a built-in strategy to help students distinguish between odd and even numbers. As they continue to encounter this concept and the numbers increase in size, each should develop a rule to help decide even vs. odd.



7. (**Spinner C**) Students need many experiences with spinners and objects with varying ratios and recording information from experiments. This will foster a familiarity with fairness, proportion, fractions, and probability long before these concepts are formally defined or written. They can learn the vocabulary of probability with such phrases as "one out of three" compared with "one out of five".

8. (**Seven nickels**) Students may use counting by fives, play or real coins, calculators or counters to help solve this problem.



# MathStars

a problem solving newsletter

Vol. 2 No. 6

- ★★★ 1. Ashley, Bob, Tawana and Zack have ordered a large pizza. Show two different ways that the pizza could be cut for each person to have equal shares.



- ★★★ 2. Tyler is a second grader who plays soccer on Wednesdays and takes Karate lessons on Tuesdays and Saturdays. Look at the calendar to help him plan his month.

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	31			

How many soccer matches will he play this month?

---

How many Karate lessons will he have?

---

His birthday is on the third Friday. What is the date of his birthday?

---

- ★★★ 3. At the math center students were estimating how much they could hold in one hand. Use the words in the box to complete the sentences below:

a single	a lot of
a couple	zero

I can hold \_\_\_\_\_ pennies in my hand.

I can hold \_\_\_\_\_ goldfish in my hand.

I can hold \_\_\_\_\_ walnuts in my hand.

I can hold \_\_\_\_\_ bikes in my hand.

## Strategy of the Month

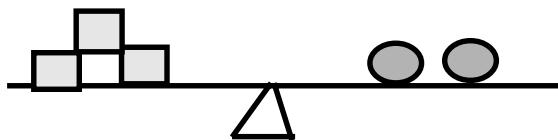
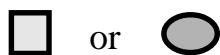
When a problem involves data with more than one characteristic, **making a table, chart, or graph** is a very good way to organize the information. It helps your brain to identify patterns and to discover any missing data. Tables help you record data without repeating yourself. Making a table or chart 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 2 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.*

★★ 4. Which weighs more?



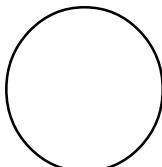
★ 5. The Ace Wheel Company has 30 wheels ready for the factory.

How many bicycles can they make? \_\_\_\_\_

How many tricycles can they make? \_\_\_\_\_

How many wagons can they make? \_\_\_\_\_

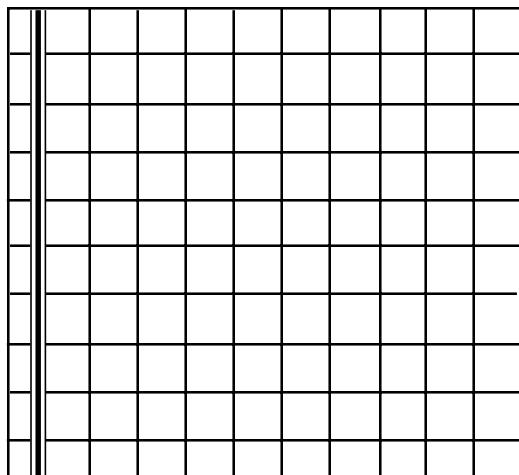
★ 6. Draw a line of symmetry for each picture:



★★ 7. Milk costs 30 cents in the lunchroom. How much milk money does Linda need for a school week?

★★ 8. Students in Ms. Cutler's class recorded the daily weather for two weeks. Make a bar graph to show their data.

rainy, cloudy, sunny, sunny, sunny, cloudy, sunny, sunny, rainy, sunny



### 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.*

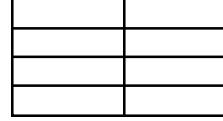
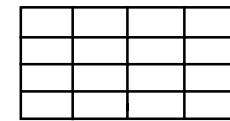
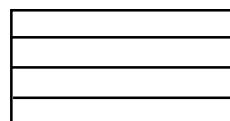
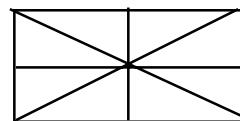
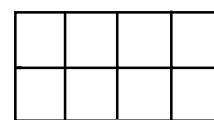
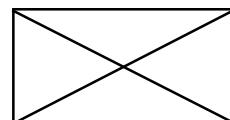
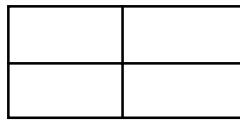
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As with all good problems, the solutions and strategies suggested are merely a sample of what you and your students may discover. Enjoy!!

## Discussion of problems.....

1. Students should see equal amounts as four, eight, twelve or any parts that are multiples of four. Manipulative experiences with folding, cutting, or sharing are helpful. The teachers need to ask, "How did you arrive at your answer?" for variant solutions or rationales.



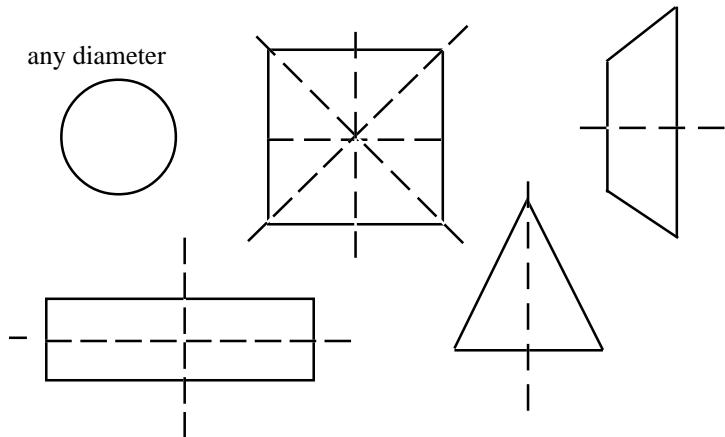
2. **(five soccer matches; nine Karate lessons; the 19th of the month)** Students need to be familiar with the layout and organization of the calendar, the weekly arrangements and be able to locate or describe specific dates. Daily class calendar activities can be used to reinforce these concepts.

3. **(a lot of pennies; a single goldfish, a couple walnuts, zero bikes)** Students need many experiences with estimation and subsequent confirmation by doing. Holding objects in their hands, weighing, and measuring them rather than merely counting them - all these activities help children form concepts based on reality rather than conjecture.

4. **(the ball)** Students also need experiences using the balance to determine the relative weight or mass of common objects. As they compare various objects on the balance, their understanding of more and less expands and develops.

5. (**15 bicycles; ten tricycles; seven wagons and two wheels left over**) Students can draw pictures, group manipulatives, do repeated subtraction, or skip count to solve this problem.

6. Discussions of symmetry should include folding, mirror images or equal parts. Some figures will have more than one line of symmetry.



7. (**\$1.50**) Students will need to remember that a school week is five days long. Repeated addition, the calculator, modeling with coins (and trading), skip counting or drawing a picture - all of these strategies will help students successfully solve this problem.

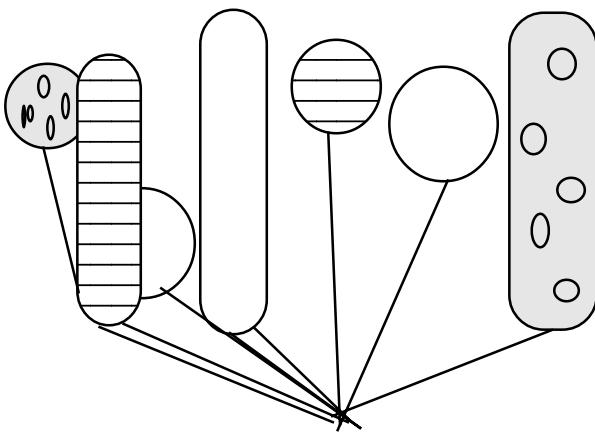
8. Students need to use tallies in collecting and interpreting data. Their organization of the information, decision to make a horizontal or vertical graph, the labeling of the axes and writing of a title - all of these activities reinforce the notion of conveying information via a graph. Students should be encouraged to share their graphs and discuss the features that make some graphs easier to read and understand than others.

# MathStars

a problem solving newsletter

Vol. 2 No. 7

- ★ 1. Mr. Bobo, the balloon man, had this bunch of balloons at the carnival.



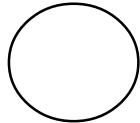
Fill in the blanks to describe his balloons:  
\_\_\_\_\_ out of \_\_\_\_\_ balloons are round.

\_\_\_\_\_ out of \_\_\_\_\_ balloons are long.

\_\_\_\_\_ out of \_\_\_\_\_ balloons have dots.

\_\_\_\_\_ out of \_\_\_\_\_ balloons are plain.

- ★★★ 2. Juan had 79 marbles in his box. Mark had 124 marbles in a can and Tom had 98 marbles in a sack. How many marbles did the three boys have?



- ★★★★ 3. It usually takes Mr. Gordon two hours of mowing to cut his lawn. On a very hot summer day, Mr. Gordon mows for 30 minutes and then rests for 30 minutes. If he started at 10:00 a.m., at what time did he finish?  
\_\_\_\_\_

- ★★★★ 4. The students in Mrs. Alvarez's class made a pictograph to record the books they read at home.

= 2 books

Kelsey

Jamie

Brad

How many books has Jamie read? \_\_\_\_\_

How many more books has Kelsey read than Brad? \_\_\_\_\_

## Strategy of the Month

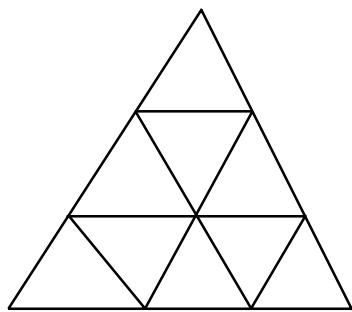
*Some problems are difficult to "see" even if you draw a picture. For these problems, it can be helpful to actually **act out the problem**. When you role play with friends or people at home, you may discover the solution as you act out the problem. Or you may recognize another strategy that will help 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 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 were 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..."*

★★★★ 5. How many triangles can you find in this figure? Watch for all sizes!!

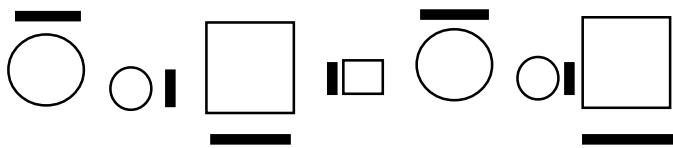


triangles \_\_\_\_\_

★★ 6. Toby emptied his bank and found that he had saved three quarters, two dimes, two nickels, and four pennies.

How much money had he saved? \_\_\_\_\_

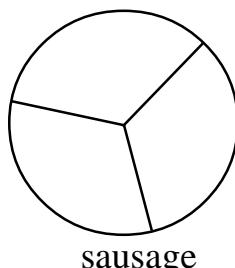
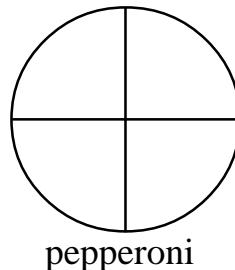
★ 7. Study this pattern:



Draw the next shape here: \_\_\_\_\_

★★★ 8. Barry likes all kinds of pizza. He is very hungry. His mother cut the pepperoni pizza into four pieces and the sausage pizza into three pieces. She said he could have only one slice of pizza before supper. Which kind of pizza do you think he chose? \_\_\_\_\_

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



## 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 out of seven are round; three out of seven are long; two out of seven have dots; three out of seven are plain**) This problem is set up for students to begin thinking in terms of ratios without the formal definition of such. By counting the number of balloons described and completing the statements they set up the proper ratios.

2. (**301 marbles**) This problem involves addends that students would have difficulty combining by the algorithm. Manipulatives, number blocks, drawing a picture or the use of a calculator would provide wider access to this problem.

3. (**1:30 p.m.**) Discuss the number of minutes in an hour as a prelude to attempting this problem. The use of clocks with moveable hands will help students "see" time pass. Students will also need to determine how many half hours he will mow and how many half hours he will rest before the job is done.

4. (**14 books; two books**) Students need to understand that one symbol (book) represents two books read. The use of the pictograph is another addition to the types of graphs students will encounter in the organization and display of data.

5. (**13 triangles-nine small, three medium and one large**) In counting the triangles, students should be encouraged to organize their work. How many different sizes of triangles do you see? How many are there of each kind?



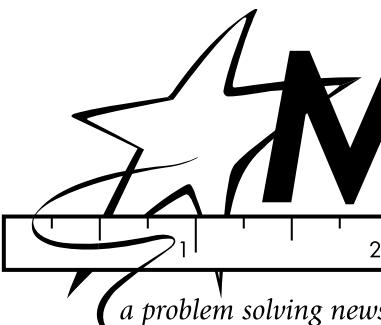
6. (**\$1.09**) The use of play or real coins will provide wide access to this problem. Not every child will need to model or see the coins, but every child who wishes to should have the materials to do so. As teachers observe their students they can assess which students have progressed beyond the concrete to the symbolic or abstract stage of money concepts.

7. ( |  )

This geometric pattern involves not only different shapes in a repetitive sequence but also positioning of a line up, right, down and left. Not all students will notice the line and its movement at first. When solutions are shared and critiqued the observations and discussions will be helpful for all students.

Answer:

8. (**sausage pizza, because the slices are larger**) The selection of the largest slice of pizza involves comparing two ratios or rational numbers concretely. Students may wish to cut out the pieces to compare their relative size. The discussion of the reasoning behind their choices is important as an indicator not only of their thinking but also of the level of abstraction they bring to the situation.



# MathStars

a problem solving newsletter

Vol. 2 No. 8

- ★ 1. Billy has collected 46 baseball cards. How many more does he need to have a collection of 100 cards?

\_\_\_\_\_

- ★★ 2. Coach Long can ride his bike about two miles in 15 minutes. About how far could he ride in an hour?

\_\_\_\_\_

- ★★ 3. Follow the clues to find the mystery number:

I am less than  
 $10 + 23$

I am greater than  
 $12 - 5$

I am present when  
you count by threes  
and by eights

Who am I ??

- ★ 4. Students lined up their dogs by weight at the Community's Annual Dog Show.

Bo was 76 pounds, Spot was 48 pounds, Lucky was 67 pounds and Blacky was 58 pounds.

Write the dogs' names in their proper places.

\_\_\_\_\_

first

\_\_\_\_\_

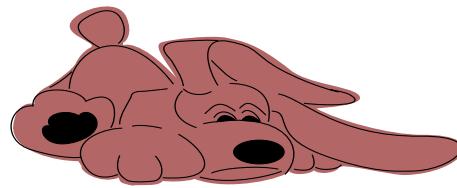
second

\_\_\_\_\_

third

\_\_\_\_\_

fourth



## Strategy of the Month

What do you do if you have a problem that seems to be very complicated? It may have a 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.*

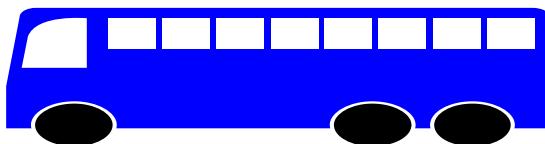
*Which product is the best buy? How many tiles will it take to cover the kitchen floor?*

*What time should we start baking the turkey so that we can have dinner at 7 p.m.? What do the statistics tell us about the two baseball players?*

★★★ 5. Complete the chart to show different ways to have 20 cents.

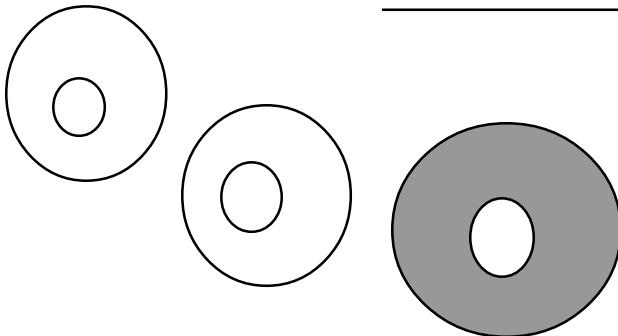
★★ 6. Mrs. Hill shopped at the grocery store. She bought milk for \$2.39 and bread for 99 cents. Her tax was 14 cents. How much change should she receive if she gave the clerk a five-dollar bill?

★★★ 7. The 192 second grade students at Greene Elementary School are planning a trip to the History Museum. If each bus hold 52 passengers, how many buses should they order?



★★★★ 8. The chess team served refreshments at their last meeting. There were two dozen doughnuts for the two teams. When all the doughnuts were eaten, it was discovered that the winning team had eaten twice as many doughnuts as the losing team.

How many doughnuts did the winning team eat?



# 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. (**54 cards**) This problem can be solved by "adding up" with numerals, number blocks or other manipulatives. If students choose subtraction it can be completed with regrouping, the calculator, manipulatives or number blocks. A discussion of the different operations and strategies can encourage students to try more than one approach.

2. (**eight miles**) Here is another example where using a chart can help students organize their information. 15 minutes--two miles; 30 minutes--four miles, etc. A discussion of the number of 15 minute periods in an hour can be facilitated by the use of a clock with moveable hands. Modeling or acting out will also help many students. Again, this is an early experience with a problem that will later be solved by ratios.

3. (**24**) Students should be encouraged to list and then eliminate numbers as they hunt for the mystery number. The hundred board is a good place to anchor students' thinking to solve this problem. Students should be encouraged to write their own mystery number trail for classmates to follow.

4. (**Bo (76), Lucky (67), Blacky (58), and Spot (48)**--**Note: Ascending order would also be correct**) Helping students situate the dogs' weights on a section of the number line is a good strategy for ordering a group of numbers. Another method might be to write the numbers on slips of paper and move them to establish ascending or descending order.

5. The use of coins to act out and trade will help students complete the table.

Pennies	20	15	10	10	5	5	0	0	0
---------	----	----	----	----	---	---	---	---	---

Nickels	0	1	2	0	3	1	4	2	0
---------	---	---	---	---	---	---	---	---	---

Dimes	0	0	0	1	0	1	0	1	2
-------	---	---	---	---	---	---	---	---	---



6. (**\$1.48**) This problem requires several levels of understanding. The costs must be expressed in dollars or in cents. The total cost including tax must then be calculated. Finally the difference between the total cost and five dollars can be determined. Students should feel free to use whatever manipulatives or tools will help them. At the end, a discussion of strategies will be especially beneficial to those who did not successfully complete the task.

7. (**four buses**) This problem provides a good opportunity to use rounding before attempting to solve the problem. The 192 students can be rounded to 200 and the capacity to 50. After students have settled on a number of buses they can check the actual number the buses will hold with a calculator to determine its reasonableness. The automatic constant feature on the calculator is especially useful.

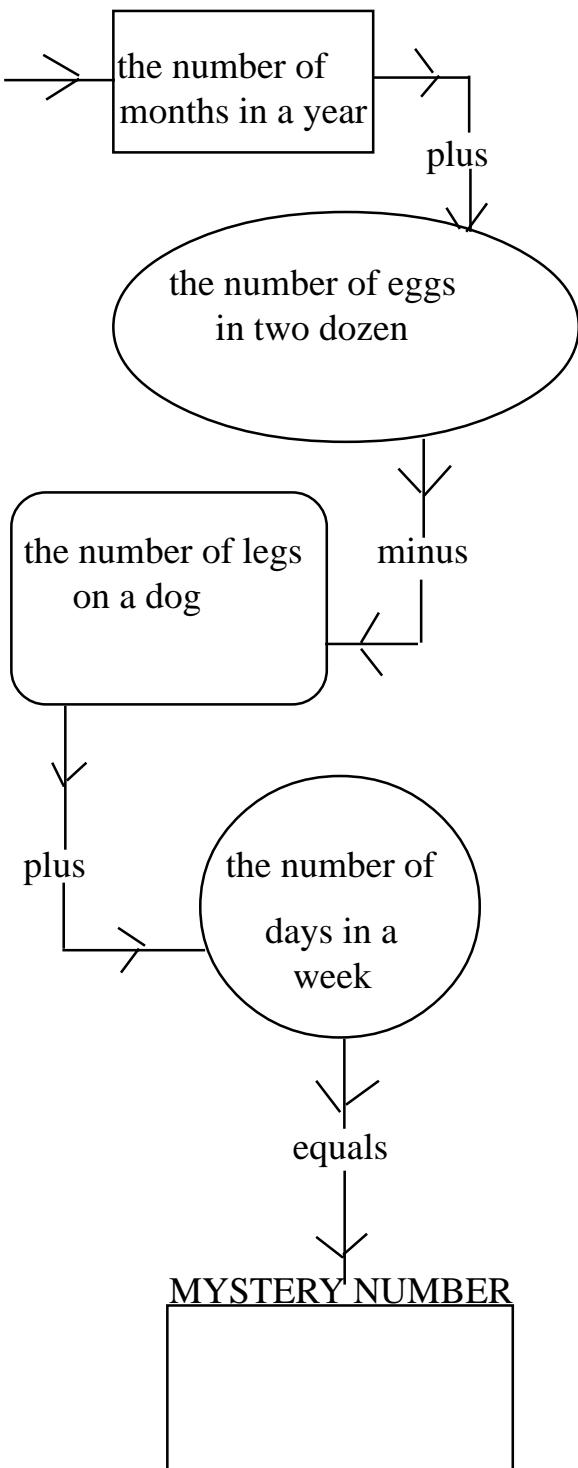
8. (**16 doughnuts**) This example requires a knowledge of "dozen" and "twice as many." Through modeling, manipulatives or drawing pictures students can experiment with solutions. The guess and check method works well because of the two conditions -- twice as many and two dozen. Again, a discussion of methods and strategies is important.

# MathStars

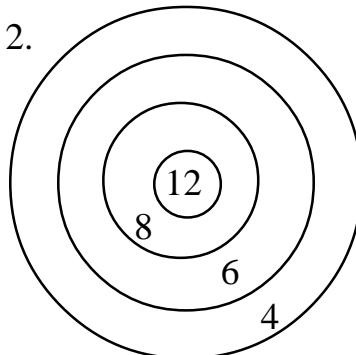
a problem solving newsletter

Vol. 2 No. 9

- ★★★ 1. Follow the flowchart to the mystery number:



- ★★★ 2.



Allen and Joe each threw three darts at the target.

Allen's score was 18; Joe's score was 14.

Allen landed on \_\_\_, \_\_\_, and \_\_\_.

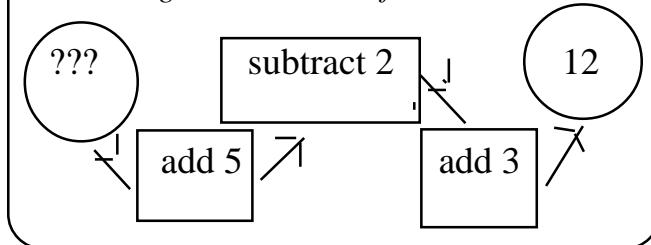
Joe landed on \_\_\_, \_\_\_, and \_\_\_.

Did Joe or Allen hit the bull's eye? \_\_\_\_\_

How do you know? \_\_\_\_\_

## 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.*

★★★ 3. Brad has 45¢ in his pocket. He counted eight coins. What coins did he have?

★★ 4. Pete is at the end of the ice cream line. Katie is between Ron and Jane. Ron is behind Paul. Write the names of the students in the ice cream line.



first    second    third    fourth    fifth

★★★★ 5. Tommy Turtle and Robby Rabbit are training for the big race. Tommy can go four feet in three minutes. How far can he go in a 15 minute race?

Robby can go seven feet in five minutes. How far can he go in a 15 minute race?

Who will win the race? \_\_\_\_\_

★ 6. Nora looked at a spider web with her magnifying glass. She counted 24 spider legs. How many spiders were on the web?

★ 7. Sally surveyed her friends about their pets. Here are the results:

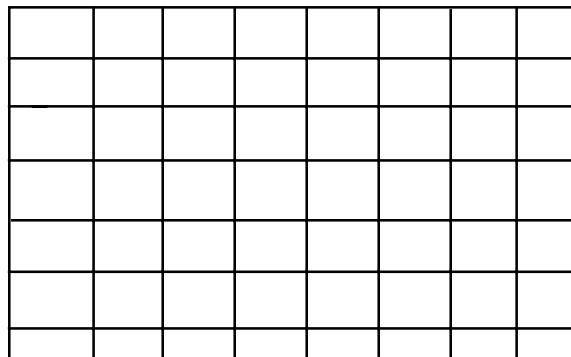
dogs 4

cats 1

fish 2

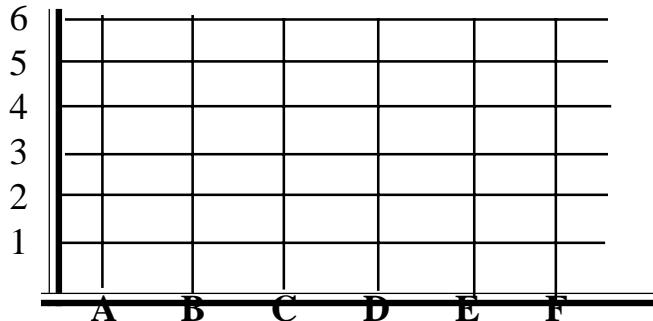
birds 3

Make a bar graph of the results.



★★★★★ 8. Anna designed a secret picture. She listed clues to help solve the mystery. Can you connect the points and discover her secret picture?

A,2 -> C,5-> E,2 -> A,4 -> E,4-> A,2



## 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!*



## 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. **(39)** This problem relies on the students' command of mathematics vocabulary and general knowledge to successfully complete. A discussion of the terms and a challenge to write their own mystery numbers would help all students strengthen their command of these vocabulary words.
2. **(Allen: 8, 6, 4; Joe: 6, 4, 4 ; no, because 12 could not be used to make their scores)** This example requires students to create a three addend problem. The scores do not permit an addend of 12, since all three darts hit the target, therefore no bull's eyes! This is also a good opportunity to reinforce the commutative property of addition - the order does not matter.
3. **(a quarter, a dime a nickel and five pennies or seven nickels and a dime)** Students should be provided with coins to manipulate as they "guess and check" to solve this problem. An extension that students might pursue would be to list all the different amounts of money they could make with eight coins.
4. **(Paul, Ron, Katie, Jane, Pete)** Another instance where trial and error or modeling are useful strategies. Creating their own descriptors would be an intriguing writing exercise that students could share and attempt to solve.
5. **(Tommy Turtle - 20 feet; Robby Rabbit - 21 feet; winner: Robby Rabbit)** This multi-step problem can be modeled or acted out to help students organize their approach to the solution. Creating a step-by-step table or race track is another way the problem can be made accessible to all students.
6. **(three spiders)** Students can draw pictures or use manipulatives to model the situation here. Counting by eights and keeping track of the steps is another strategy they can employ.



7. The labeling of the axes and title of the graph should be noted when discussing solutions to this problem. Horizontal and vertical graphs can be displayed and discussed.

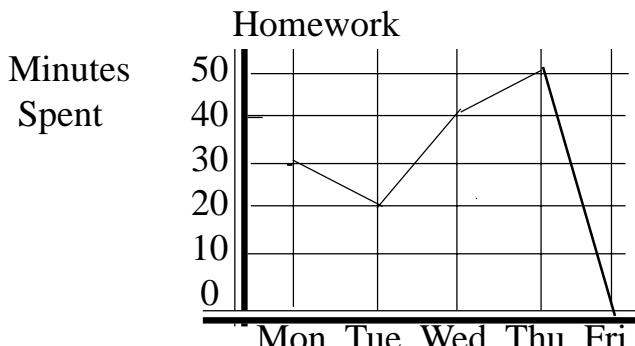
8. **(Star)** This exercise gives students an introduction to the coordinate graphing system. Finding each point in succession and drawing the segments mimics the connect-a-dot activity with which many children are familiar.

# MathStars

a problem solving newsletter

Vol. 2 No. 10

- ★ ★ 1. Robert made a broken line graph to show how much time he spent on homework last week.

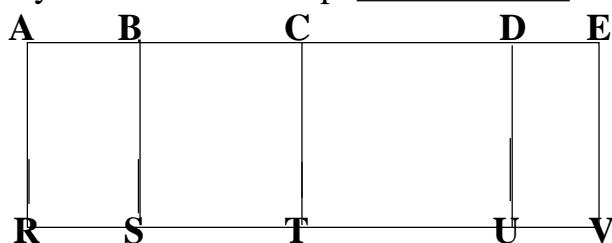


Which night did Robert spend the longest on his homework? \_\_\_\_\_

Which night did Robert spend the least time on homework? \_\_\_\_\_

How much time did Robert spend on homework during the week? \_\_\_\_\_

- ★★★ 2. How many different rectangles can you find in this shape? \_\_\_\_\_



Can you name them? \_\_\_\_\_

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- ★★★★ 3. Lee and his five friends are hungry for a snack. Circle the number of cookies his Mom needs to bake for all the children to have an equal number of cookies.

10      14      16      18      20

- ★★ 4. Mrs. Hill dumped a load of clean socks on the table and sorted them into piles. She had four brown socks, three green socks, five black socks, and five blue socks.

How many pairs of socks can she put in the dresser? \_\_\_\_\_

Which socks were lost? \_\_\_\_\_

## 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?

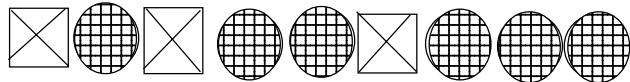
## MathStars Home Hints

*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. Terry's kitten was playing with a ball of yarn. How many centimeters long is the piece of yarn unrolled from the ball?



★★ 6. What are the 21st, 22nd, and 23rd shapes in this pattern?



★★★ 7. Riders and horses are in the field. There are 32 legs in the field. The number of riders is one more than the number of horses. How many horses and riders are in the field?

horses \_\_\_\_\_ riders \_\_\_\_\_

★★★★ 8. Six rabbits had a race. Peter and another rabbit tied for second place. Pokey came in last. Flopsy was ahead of Cottontail. Cottontail beat Hopper. Mopsy was beaten by only one other rabbit.

Who won the race?

Show the order in which they crossed the finish line:

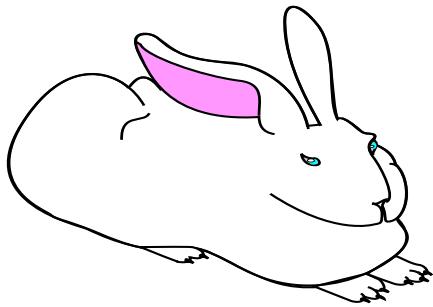
First: \_\_\_\_\_

Second: \_\_\_\_\_ and \_\_\_\_\_

Third: \_\_\_\_\_

Fourth: \_\_\_\_\_

Fifth: \_\_\_\_\_



## 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. **(Thursday; Friday; 140 minutes or two hours and 20 minutes)** This problem gives students practice reading and interpreting a broken line graph.
2. **(Eleven; ABSR; ACTR; ADUR; AEVR; BCTR; BDUR; BEVR; CDUT; CEVR; DEVR; DEVU)** Completing this exercise reinforces the concept of rectangle. Students will need to use visual skills to see the various rectangles contained in the diagram. The labelled vertices may suggest a strategy to some students and will help them organize their responses.
3. **(18 cookies)** Students need to remember that Lee and his friends (six children) are going to share the cookies. Multiples of six can be explored through skip counting or manipulatives.
4. **(seven pairs; black, blue and green socks were lost)** Recognition that a pair of socks implies two of the same color will help students complete this problem. The odd numbers indicate the colors of the missing socks.
5. **(27 to 28 cm)** This problem requires students to devise a strategy to measure the length of an object that is curved. They may choose a piece of string to follow the diagram and then measure the string with a ruler.
6. **(square, circle, circle )** This is a repetitive pattern with one "growing" part. Students can extend the pattern by drawing or using manipulatives.
7. **(five horses and six riders)** Students can use guess and check, trial and error with manipulatives or drawings to find the solution to this problem. The condition of one more rider than horses guarantees a unique solution.
8. **(Flopsy, Peter and Mopsy; Cottontail, Hopper, Pokey)** Students may choose to model this problem with manipulatives or drawings. Checking that all conditions are satisfied requires careful reading and decisions about order.