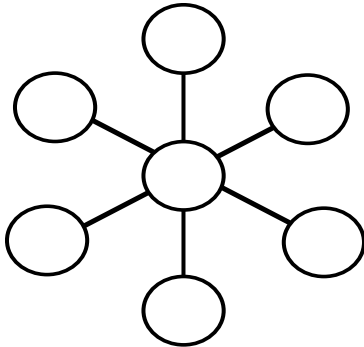
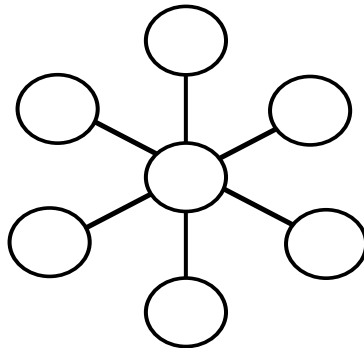
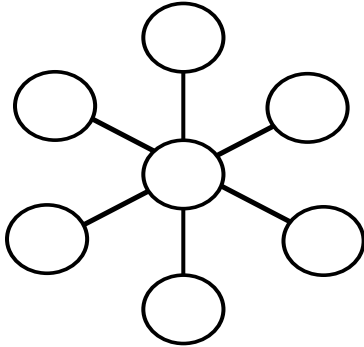


★ 1. What number could be added to 150 so that the sum would be between 500 and 525?

Answer: _____

★★★★ 2. Find three ways that the sum of three digits in a line equal 17. Don't repeat the digits within a design.



★★★ 3. If you begin with a certain two-digit number and follow the arrows, you will end with 45.

$$\bigcirc \xrightarrow{\div 3} \bigcirc \xrightarrow{+ 8} \bigcirc \xrightarrow{\times 2} \bigcirc \xrightarrow{- 1} = \textcircled{45}$$

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:

Every bike slot in a bicycle rack was filled. Donna's bike was in the middle. There were six bikes to the right of Donna's. How many bicycles were in the bicycle rack?

MathStars Home Hints

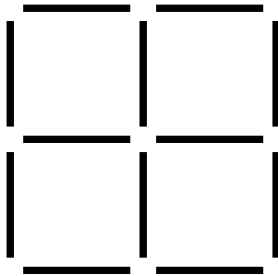
Every year you grow and change in many different ways. Get someone to help you measure and record these data about yourself. Be sure to save the information because we will measure again in two months!

How tall are you? _____

How much do you weigh? _____

What is the circumference of your head?

- ★★ 4. How can you remove two toothpicks from the square shape below and leave two squares of different sizes? Cross out the two that should be removed.



- ★★★ 5. Miss Black's class began a stem and leaf graph of the following data. Complete the graph.

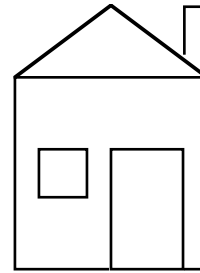
Number of organisms	1	1, 7
in each person's square	2	0, 1, 2
foot of space on the		
playground.		

28, 29, 17, 21, 36, 20,
33, 11, 22, 33, 35, 41

- ★★★ 6. John is twice as old as his sister Mary. Mary's age is $\frac{1}{6}$ the age of her mother. Their mother is 30. How old are John and Mary?

John _____ Mary _____

- ★★ 7. Find all the right angles on the house below. Put a square on each one like this:



- ★★ 8. Use the digit **8** four times to make **89**.

- ★★★ 9. Place the other letters of the alphabet above or below the line given below using the same rule that was used for **A** through **I**.

A	E F	HI
B C D	G	

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...

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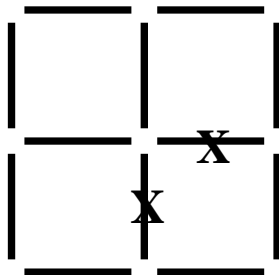
Discussion of problems.....

1. **(any number between 350 and 375)** This problem is two-step in that students must find the difference between 150 and 500 and then 150 and 525. By having the word *between* in the problem, 350 and 375 are not considered correct.
2. **(Combinations of digits that work are 6-9-2, 3-9-5, 1-9-7, 5-8-4, 6-8-3, 7-8-2, 6-7-4, 9-7-1, 8-7-2.)** The combinations listed all add up to 17. The middle digit should be in the middle circle of each design. Digits smaller than 7 will not work in the middle because of having to repeat.

3. $\textcircled{45} \div 3 \textcircled{15} + 8 \textcircled{23} \times 2 \textcircled{46} - 1 = \textcircled{45}$

This problem requires working backwards and the use of inverse operations to determine the unknowns. Students should check to be sure their answers work when they work from left to right.

4. **(The diagram below shows one possible answer)** Some students have difficulty with visual imagery; manipulatives should be available for those who wish to construct the figure.



5.

1	1, 7
2	0, 1, 2, 8, 9
3	3, 3, 5, 6
4	1

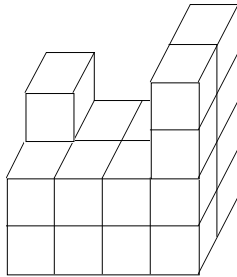
 Students should be able to use their number sense to figure that a stem and leaf graph divides each piece of data into tens and ones. The data is placed in ascending order.
6. **(Mary is 5 and John is 10)** This is a two step problem but has easy computation. Students need to find a number that is already known--the mother's age. Mary is $\frac{1}{6}$ of 30 or 5 years old. It is easy then to figure that John is twice as old as Mary--10 years old. Students need to be able to divide 30 into 6 equal parts to figure $\frac{1}{6}$ if they do not know how to divide mentally.
7. **(17 right angles)** There are two squares and one rectangle making 12 right angles. The bottom of the door meets the bottom of the house forming two more. The chimney has two obvious right angles at the top but also forms a right angle where the right vertical line meets the horizontal line on the top of the house. Students may think the roof forms a right angle but if you measure with the corner of a piece of paper it is a little larger than a right angle.
8. **($88 + 8/8 = 89$)** Encourage students to create similar problems to challenge their classmates.
9.

A	E F	H I	K L M N	T	V W X Y Z
B C D G	J	O P Q R S U			

Letters made from straight line segments go above the line while those with a curve go below the line. Two reasons for including such problems in your regular classroom routine are: A. They help break up the mind set established by an abundance of patterning problems (showing that in fact, there may not be a numerical pattern to explain all logical arrangements of symbols). B. A small percentage of students will see the solution to this problem immediately. These are students who perhaps have trouble with patterning problems but can be rewarded for seeing something that most students have difficulty with.

★★★ 1. What is the volume of the solid figure below? If the outside were painted blue, how many cubes would have only three sides painted blue?

_____ cm^3 is the volume
 _____ cubes are painted blue on three sides



★★★ 2. Principal Greene orders pencils for the school store by rounding the number of students in each grade to the nearest 10 and doubling that number. What is the total number of pencils he will order?

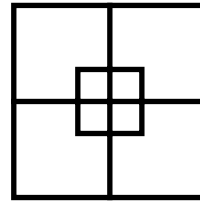
Answer: _____ pencils

Grade	K	1	2	3	4	5
# of students	87	94	97	78	72	84

★★ 3. A digital clock shows either three or four digits. At what time do the digits have the greatest sum?

★ 4. How many squares are in the figure below?

Answer: _____ squares



★★ 5. Three friends shared some cookies. They each got two and two-thirds cookies. How many cookies did they have altogether before they divided them?

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:*

If you must use 15 or fewer coins, how many different combinations of coins can be used to make \$1.00?

MathStars Home Hints

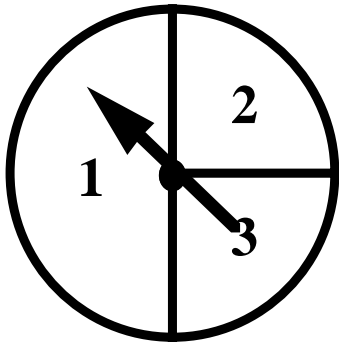
Sometimes the hardest part of solving a problem is just getting started. Having some steps to follow may help you.

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.

★★★★ 6. Given y is two times x , z is three times x , and $x + y + 3z = 12$. What are the values of x , y , and z ?

$$x = \underline{\quad} \quad y = \underline{\quad} \quad z = \underline{\quad}$$

★★ 7. On this spinner, the probability of getting a one is $\frac{1}{2}$ or 1 out of 2. What is the probability of getting a 2?



★★ 8. Circle the whole number below that is closest to the sum of these numbers:

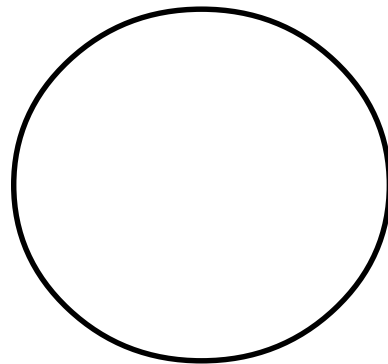
$$2\frac{1}{73} + 6\frac{40}{44} + 8\frac{3}{58} + 1\frac{15}{17} =$$

17 19 21 23

★★★★ 9. Katie gave a number problem to Jenny. She told her to pick a number, double it, add 10 to it, and then subtract 2. Jenny's answer was 34. What number did Jenny pick?

Answer: _____

★★★ 10. Show how you could divide a circle into 11 pieces using only 4 straight lines.



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?

Practice asking good questions!

About these newsletters...

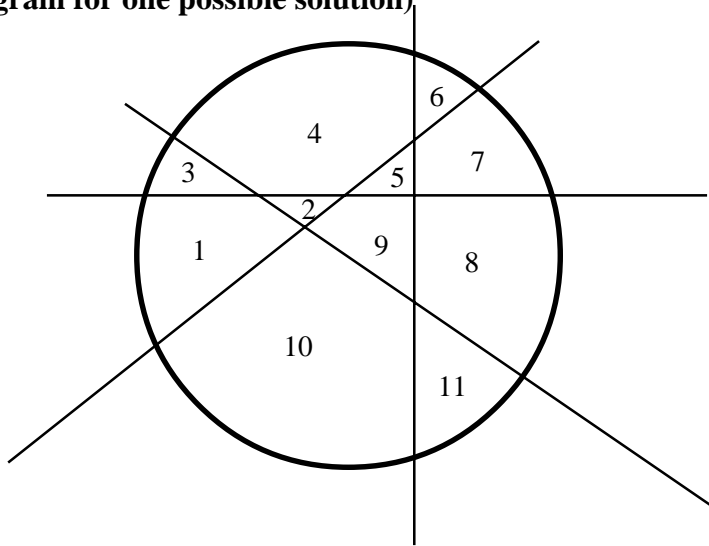
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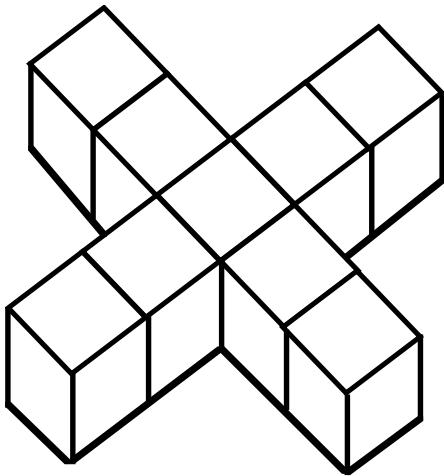
Discussion of problems.....

1. **(21 cm³ and 7 have 3 faces painted)** This will be a very challenging problem for students who have difficulty visualizing the blocks that aren't visible. It is helpful to build the figure. It is also helpful to mark the faces on the cubes with 3 faces painted.
2. **(1,020 pencils)** Students will either round off, add, then double or double the number in each grade level as it is rounded. If by chance they add all the numbers, double, and then round off they will get the same answer.
3. **(9:59)** At 9:59 the sum of the digits is 23. Students who answer 12:59 may be assuming that the sum of any four numbers is greater than the sum of three numbers.
4. **(10 squares)** If students have never solved this type of problem they will count the most obvious squares. It is helpful to count and tally squares by their size working from smallest to largest or largest to smallest.
5. **(8 cookies)** Most students will draw a picture of this problem since they do not know how to multiply $(2 \frac{2}{3}) \times 3$.
6. **(x = 1, y = 2, z = 3)** Picturing algebra makes for a good beginning and substituting values for x, y, and z to make a true statement is not a bad approach to this problem. Assigning a value to x may be the key to solving this problem. Substituting centimeter cubes for numbers could provide a hands-on-approach.

7. **(1/4 or 1:4)** This problem will help students to "get a feel" for probability. If a line is extended across the circle they will see that 1 has 2 out of 4 chances (2:4 or 1:2) and 2 and 3 each have a 1 out of 4 chance (1:4).
8. **(19)** In a small group explore a similar problem. The denominators should be large enough to discourage computation and the fractions should be close to 1 or 0 in value. They would see that two of these fractions are close to 1 and two are close to 0.
9. **(13)** Working backwards using opposite operations is a key to this type of problem.
10. **(See diagram for one possible solution)**



★★★ 1. Nine cubes form to make an X. If the complete figure is painted red, how many cubes have exactly four faces painted red? How are the remaining cubes painted? Write on each cube the number of its faces that are painted.



★★★ 2. November 8 is on Wednesday. Gary's birthday is in November. This year his birthday is on a weekend. The date has two digits. You say the date when you count by twos. The sum of the digits is 8. What is the day and date of Gary's birthday?

Day of the week _____

Date _____

★★ 3. Lila saw a shirt on sale at 25% ($\frac{1}{4}$) off. It's original price was \$12. How much is the shirt now?

★★★ 4. On a 20 question math test, your teacher gives you five points for every correct answer and takes away one point for each incorrect answer. If you score 70 on the test, how many did you get correct?

Answer: _____ correct

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:*

I am a 2-digit number over 50. When you put me in groups of 7, 2 are left over. The sum of my digits is 11. What number am I?

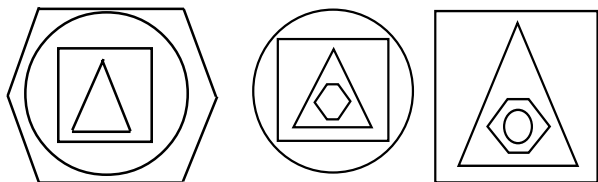
MathStars Home Hints

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 ($7 \times 6=42$, $6 \times 7=42$, $42 \div 6=7$, $42 \div 7=6$).
- 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.

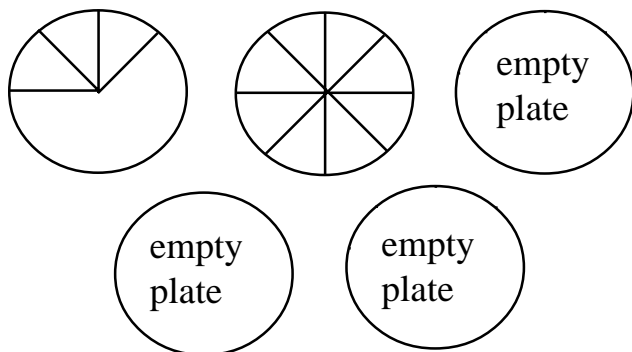
★★ 5. What would the next shape look like?

Draw it on the line.



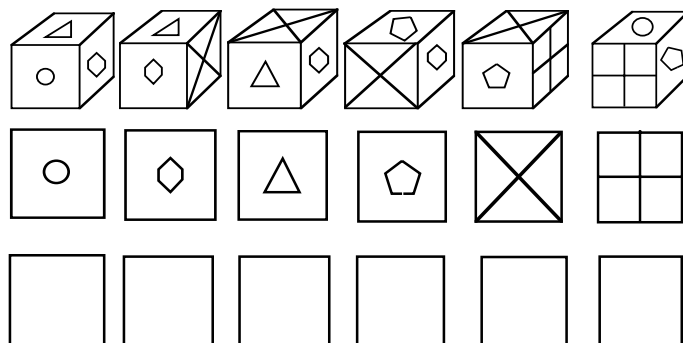
Answer: _____

★★ 6. Allison's mom baked five pies for her birthday party. Each person who came to the party ate one piece, and all the pieces were the same size. The pies that were left over are shown below. How many people came to the party?



Answer: _____ pieces

★★★★ 7. The pictures below all show the same block, but seen from a different view each time:



Draw the design that is opposite these sides.

★ 8. It's now 12:10 p.m. What time was it 15 minutes ago?

Answer: _____

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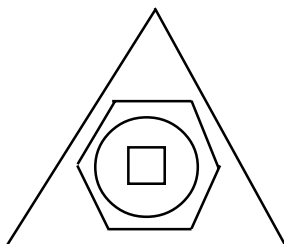
As with all good problems, the solutions and strategies suggested are merely a sample of what you and your students may discover. Enjoy!!

Discussion of problems.....

1. **(4 cubes have 4 faces painted red. The middle cube has two faces painted and the outer cubes have 5 faces painted.)** Marking small cubes to check this would help some children who have trouble visualizing this problem. Different shapes and numbers of cubes could also be used to explore this type of problem.
2. **(Sunday, November 26)** Clue A (birthday on a weekend) does not help as much as B, C, and D. If we consider clue D we know that 17 and 26 are the only numbers to fit this condition. Clue C indicates an even number--26. Clue B is a further check. Some students may want to draw a calendar to determine and check their answer. Children need calendar practice and enjoy making up this type of problem.
3. **(\$9.00)** This is an introduction to percents. Discuss the idea of finding $\frac{1}{4}$ of 12 and subtracting it. Introducing other familiar percentages compared to fractions in newspaper ads or other real life examples will help students understand percentages.
4. **(15 correct)** It may be easier for some students to make a table for this problem. A sample follows:

Problems Correct	Points	Points Taken Away	Score
20	100	0	100
19	95	1	94
18	90	2	88
17	85	3	82
16	80	4	76
15	75	5	70
14	70	6	64

5. **(See diagram below)** The shapes move from the inside out as you move from left to right with this geometric pattern and the outside shape becomes the innermost shape of the next picture to its right. You might want to have the students share what they noticed about the pictures as they go from the left to the right.



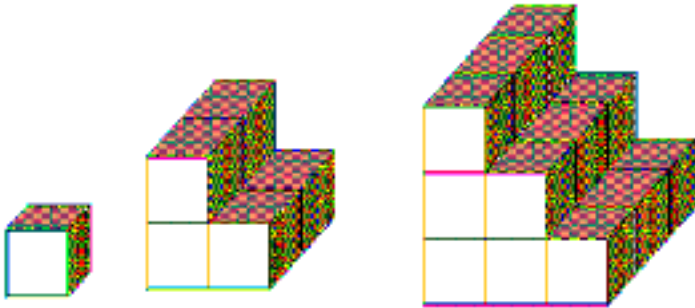
6. **(29 people)** There are different ways to solve this problem. Two possible solutions follow:
- A. I counted 8 pieces in each pie and did $(8 \times 3) + 5$.
 - B. I knew there were 8 pieces in each pie and that there were (8×5) pieces altogether. I could see 11 pieces left, so I found $(8 \times 5) - 11$.

7. ()

It would be a good idea to have manipulatives available for the students to use with this problem. Some students would probably find it helpful to actually mark the faces of a box or cube with pictures to match the block in the example.

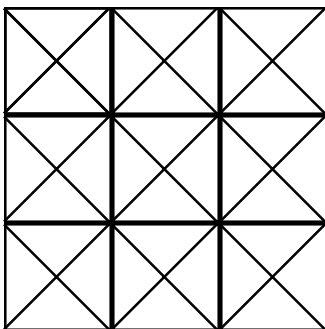
8. **(11:55 A.M.)** It is important that the students indicate A.M. to make this problem correct. A follow-up question might be, "Is that at night or in the daytime?"

★★★★ 1. How many cubes will it take to build the next figure in the pattern below?



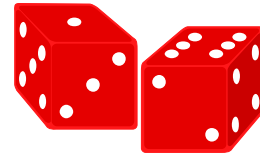
★★ 2. At Henry's Restaurant, a customer gets a free lunch after paying for six. Caroline ate lunch at Henry's 50 times last year. How many of those 50 lunches were free?

★★★★ 3. Color the square below so that 50% is red, 25% is green, and 25% is yellow.



★★★ 4. Which sum is most likely to be rolled on a pair of dice, 3 or 7?

_____ is most likely. Why would this be true?



★ 5. What fraction of the letters in the word MULTIPLY are also in the word PRODUCT?

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?*

If the first day of a year is a Friday what day of the week is February 19 of the same year?

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.

★★ 6. This recipe makes four servings of lemonade. How many lemons are needed to make ten servings of lemonade?

LEMONADE

2 lemons
2 quarts of water
1/2 cup of sugar

Squeeze lemon juice into a pitcher.
Add water and sugar. Stir well and pour over ice.

★★★ 7. Sam and Sue have only nickels and dimes. Sue has 35¢. Sam has the same number of dimes as Sue has nickels, and he has half as many nickels as Sue has dimes. How many nickels does Sue have?

★★ 8. There are 12 pages in Bill's football card album. Each side of the page holds 12 cards. When his book is half full, how many cards will Bill have collected?

★★★ 9. If you must use two quarters and a total of 8, 9, or 10 coins, how many different combinations of coins can be used to make a dollar? Use the table below to find your answer.

# of coins	Quarters	Dimes	Nickels	Pennies
8				
9				
10				

★★★ 10. A cereal company puts a 10¢ coupon in every other box of cereal it packages. It puts a pencil in every fifth package and a coupon for a free hamburger in every eighth package. Out of the first 100 boxes, how many will have all three items: a 10¢ coupon, a pencil, and a free hamburger coupon?

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. **(40)** The pattern is 1, 6, 18, 40. It would be helpful to have manipulatives available so students could build these models. Some students may be able to figure out how many cubes have been added to the "steps" each time without using models.
2. **(7 lunches if the first lunch of the year was paid for, or 8 lunches if the first lunch of the year was free because it was earned the previous year.)** Students will probably make a diagram to solve this problem. Regardless of the number of lunches the customer "carries over" from the previous year (1- 5), the number of free lunches will still be 7 if the first lunch of the year is not free.
3. **(Answers may vary)** Most students will realize that there are 36 small triangles (4 for each small square) in the large square. 50% or 18 of them must be red, 25% or 9 of them yellow, and 25% or 9 of them green.
4. **(7 is most likely)** Using a pair of dice there are more ways to roll a sum of seven: 1 and 6, 2 and 5, 3 and 4. The only combination that will give 3 is 1 and 2.
5. **(3/8)** Three letters, *u*, *t*, and *p* are in both words, and there are 8 letters in *multiply*.
6. **(5 lemons)** It is important to recognize that there are half as many lemons as there are servings. So for 10 servings it would take 5 lemons. The problem would become more challenging if the recipe called for 3 lemons.

7. **(Sam: 3 dimes and 1 nickel, Sue: 2 dimes and 3 nickels)** Finding combinations of nickels and dimes to make 35¢ yields several possibilities, but only one satisfies all of the conditions.
8. **(144 cards)** Half of the football card album would be 6 pages. Since there are 2 sides to each page there would be a total of 12 sides. Then you would multiply that times the 12 cards to get 144 cards. An alternative might be to multiply 24 (the number of cards per page) times the six pages.
9. **(See table below)** This would be an excellent place to use real coins; however, "play money" would also be an acceptable manipulative.

# of coins	Quarters	Dimes	Nickels	Pennies
8	2	4	2	0
9	2	3	4	0
10	2	2	6	0

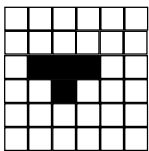
10. **(2 boxes, the 40th and the 80th boxes)** Students can solve this problem by finding the least common multiple of 2, 5, and 8. The next common multiple of these three numbers greater than 40 and less than 100 is 80.

★★ 1. Draw a picture of what the tetromino would look like after it is turned or rotated 90 degrees.

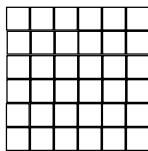
★★ 3. Fill in the missing numerals.

$$\underline{\quad} \times \underline{\quad} \times 2 = 42$$

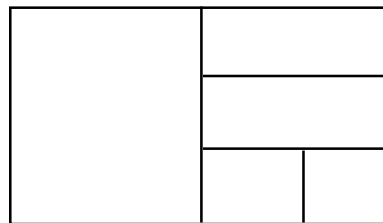
Before 90 degree turn



After 90 degree turn



★★ 4. If the area of each small square is 10 centimeters, what is the area of the entire figure?



★★★★ 2. Find the products of the following problems. Look for a pattern in the products. Write a rule for the product. Do you think it will always work?

$$\begin{array}{r} 44 \\ \times 11 \\ \hline \end{array} \quad \begin{array}{r} 23 \\ \times 11 \\ \hline \end{array} \quad \begin{array}{r} 32 \\ \times 11 \\ \hline \end{array}$$

Rule: _____

Strategy of the Month

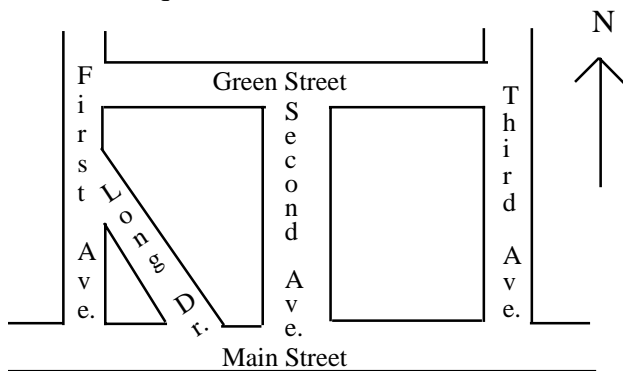
*Sometimes mathematical ideas are hard to think about without something to look at or to move around. Drawing a picture or using objects or models helps your brain "see" the details, organize the information, and carry out the action in the problem. Beans, pennies, toothpicks, pebbles, and cubes are 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:*

Twenty-seven cubes are placed together to make a large cube that is painted on the outside. How many small cubes will have 2 and only 2 faces painted?

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 at your house.

- ★★★ 5. Below is a map of Centerville. Use it to answer the questions below it.



Name a road that is perpendicular to Main Street

Name a road that is parallel to Main Street

If you drove east on Main Street, which way would you turn to enter Second Avenue?

- ★ 6. Complete the following to make a true subtraction example.

$$\begin{array}{r} 406 \square 9 \\ - \square 2 \square 9 8 \\ \hline 18031 \end{array}$$

- ★★★ 7. List the possible pizza combinations Mary Beth can pick that have only one topping. List the combinations using letters. The first one is done for you.

Size

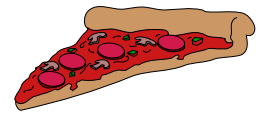
- A. small
- B. medium
- C. large

Crust

- D. thick
- E. thin
- F. pan

Toppings

- G. cheese
- H. pepperoni
- I. hamburger



Possible combinations: ADG,

- ★★★ 8. There are five people at a meeting. If each person shakes hands with each of the others once, how many handshakes are exchanged?

Setting Personal Goals

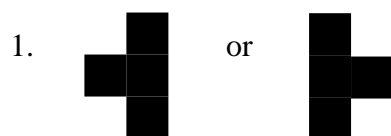
Mathematics is all around us. We use it every day in personal living and in all of our school work. When we read graphs in social studies, gather and use data in science investigations, or count in music or physical education, we are using mathematics. We make connections in our math classes also, for 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.....



Help students understand how to do this by cutting out the T and actually turning it 90 degrees. Orienting it on a large right angle and then turning it may be helpful. The most common mistake will be just flipping the shape horizontally, vertically or rotating it too far.

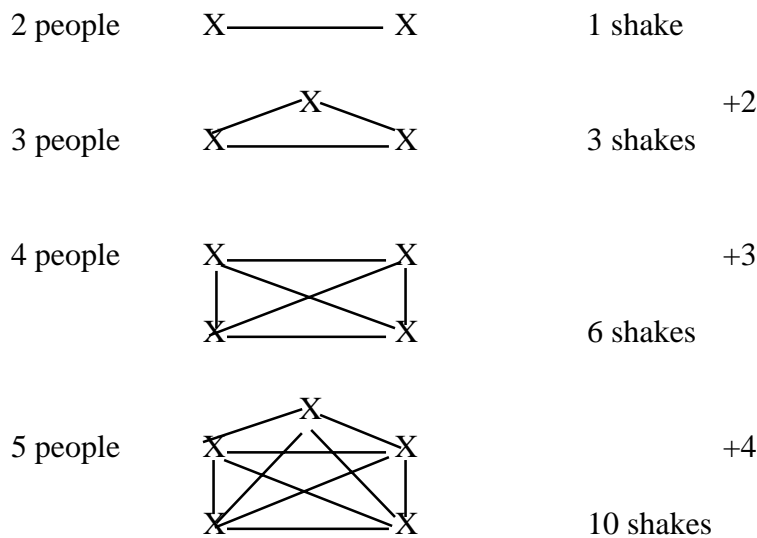
2. **(484, 253, 352 The pattern students should recognize is that the hundreds and the ones place of each product make the original number and the middle digit of each product is the sum of the other two digits in the product.)** Early in the fourth grade students may not have been able to multiply by two digits; however, with the use of number sense they can come up with the answer. Ex. "44 one time is 44 and 44 ten times is 440 so $440 + 44 = 484$ "
3. **($7 \times 3 \times 2 = 42$ or $21 \times 1 \times 2 = 42$)** Students can either guess/check/revise or work backward by saying "what did I have to have before multiplying by 2 to get 42?" Then, "what would I have to multiply together to get 21?"
4. **(120 square centimeters)** Each small square represents $\frac{1}{12}$ of the entire figure, so the area of the figure is 12×10 or 120 square centimeters.
5. **(First, Second or Third Avenues; Green Street; You would turn left off of Main St.)** This example gives the students practice in map reading. Possibly this would be a good time to introduce other city or state maps.

6.
$$\begin{array}{r} 40629 \\ - 22598 \\ \hline 18031 \end{array}$$

Many students will probably use the method of checking a subtraction problem by addition to solve this example. It would be interesting to have the students explain their procedure. Students might enjoy making up similar problems for other classmates to solve.

7. **(ADG, AEG, AFG, ADH, AEG, AEH, AEI, AFG, AFH, AFI, BDG, BDH, BDI, BEG, BEH, BEI, BFG, BFH, BFI, CDG, CDH, CDI, CEG, CEH, CEI, CFG, CFH, CFI--27 DIFFERENT COMBINATIONS)** Taking an organized approach to this problem will help the students. A good extension to this problem would be to add one more topping.

9. **(10 handshakes)** Two effective strategies are drawing a diagram or using simpler problems to help find a pattern.



Each X represents one of the five people. Each line connecting two X's represents a handshake. The handshake between person 1 and person 2 is the same as the handshake between person 2 and person 1.

MathStars

a problem solving newsletter

Vol. 4 No. 6

★★★ 1. Show how the shapes below can be divided into four congruent triangles.



★★ 2. Julie wants to order a present from a catalog for Marcie's birthday on April 14. If delivery takes four weeks, what is the latest date she can order the present for it to arrive on the 14th?



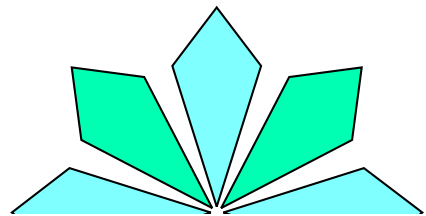
★ 3. What is missing in this pattern?

$$\frac{2}{5}, \frac{4}{10}, \frac{6}{15}, \underline{\quad}, \frac{10}{25}$$

★★★ 4. One section of a book contains five pages. The sum of all the page numbers in the section is 125. What are the page numbers?

_____, _____, _____, _____, _____

★★★ 5. The drawings below are erased at their line of symmetry. Complete the drawings by drawing the missing parts.



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:

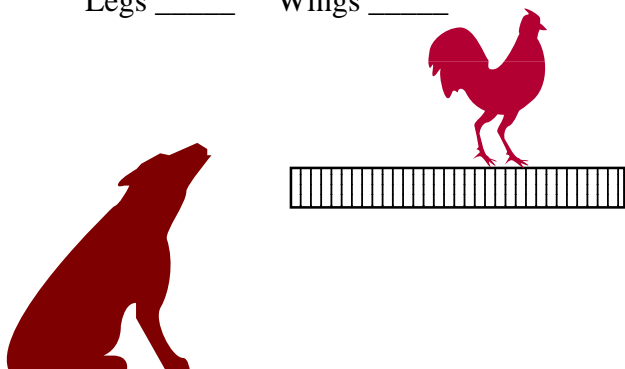
A school cafeteria sells popsicles for 50¢, nutty buddies for 80¢, and ice cream sandwiches for 60¢. If a student spent \$6.00 in May for frozen snacks, what could the student have purchased?

MathStars Home Hints

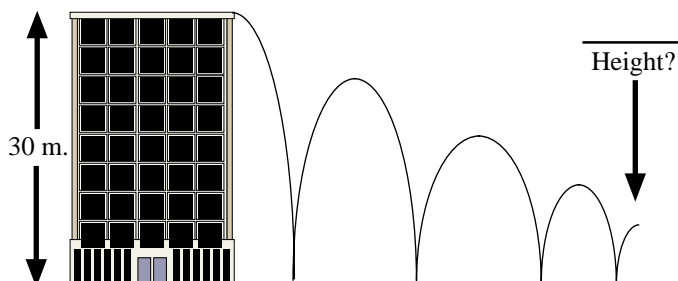
Everyone learns from sharing, and you can teach others about the new mathematics ideas you are learning. Show someone at home the work you are doing in school and explain how you figured out the problems. Become the teacher and help a younger student. Explain what you have learned and what else you want 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.

- ★★★ 6. Old MacDonald had a farm. On this farm he had 3 ducks, 15 chickens, 4 mice, 17 cows, 5 horses, and 2 dogs. How many legs and wings were on his 46 animals?

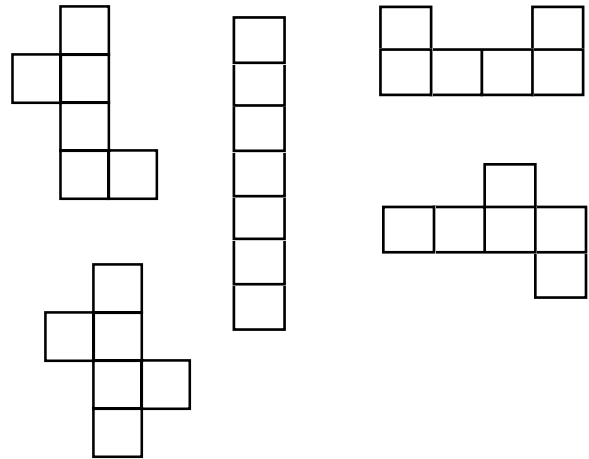
Legs _____ Wings _____



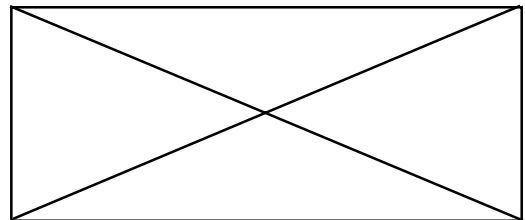
- ★★★★ 7. Roy bought a ball that bounces exactly half the height from which it is dropped. He drops it from the top of a building that is 30 meters tall. How high will the ball bounce after its fourth bounce? You may choose to use a calculator for this one.



- ★★ 8. Circle the figures below which would fold up into a cube if you cut them out and folded on the lines shown. You might draw these and practice folding to check your answer.



- ★★ 9. This quadrilateral has two diagonals. What polygon has 20 diagonals?



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 strategy and try again using a different strategy.

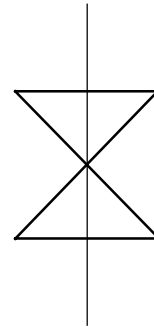
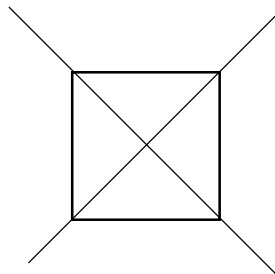
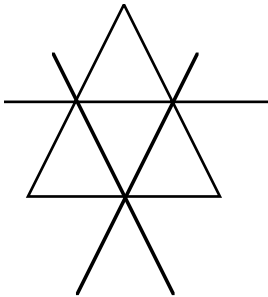
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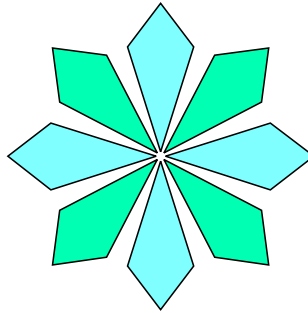
Discussion of problems.....

1. **(See diagrams below)** Students may need help with the meaning of congruent--same shape and same size. Many will use spatial sense to solve this problem; others will just guess and check by drawing lines.



2. **(March 17)** This problem requires that the student knows there are 31 days in March and can subtract two weeks from the end of that month.
3. **(8/20)** This problem has a pattern in the numerator, counting by twos, and in the denominator, counting by fives.
4. **(23, 24, 25, 26, 27)** If students have a sense for averaging numbers, this will not be too difficult, because 125 divided by the five pages is 25. Since the numbers must be in consecutive order, the page before 25 is one less while the page after is one more, etc. Some of the students will guess and check on this one.

5. (Credit good attempts)

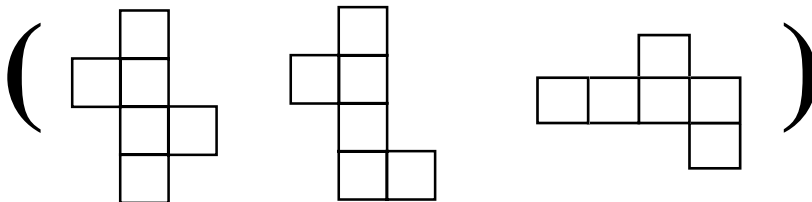


6. **(148 legs, 36 wings)** This problem involves addition and multiplication with an understanding of animals. Three ducks have six wings and 15 chickens have 30 wings for a total of 36 wings. The number of legs per type of animal follows:

<u>Animal</u>	<u># of animals</u>	<u>Total legs</u>
ducks	3	6
chickens	15	30
mice	4	16
cows	17	68
horses	5	20
dogs	2	8
Total		148

7. **(1.875 meters)** Students should have access to a calculator for this example. After the first bounce the ball bounced 15 meters, 7.5 meters after the second, 3.75 meters after the third, and 1.875 meters after the fourth.

8,



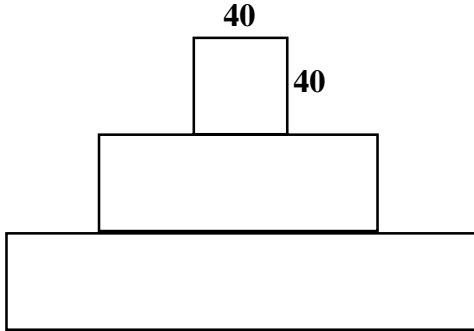
Only these three nets will fold into a cube. The nets could be drawn and folded to check the results. It might be helpful to provide graph paper for the students to use in drawing the nets.

9. **(Octagon)** Students will probably solve this problem by drawing all the diagonals of polygons in an organized fashion, i.e., start with 3 sides and then add one additional side with each new polygon. Some students might notice the pattern involved.

Polygon	Number of diagonals
triangle	0 ↘ +2
quadrilateral	2 ↘ +3
pentagon	5 ↘ +4
hexagon	9 ↘ +5
heptagon	14 ↘ +6
octagon	20 ↘

You can extend this problem by asking how many diagonals could be drawn in a 9-sided polygon. (27)

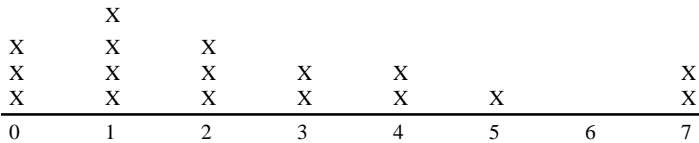
★★★ 1. Label each line segment with its missing length. Two are given for you.



★★ 3. Farmer Greene is building a fence. He places 15 fence posts 8 ft. apart. What is the distance from the first fence post to the last?

★★★ 4. If you write the numbers from 1 to 99, how many times would you write the digit 1?

★★★★ 2. Students made a line plot of the number of pets they had at home.



How many pets are there altogether? _____

What is the median number of pets? _____

What is the mode? _____

How many students participated in this survey? _____

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:

There are four boys in the Grant family. Alex is older than Terry and younger than Stuart, Ross is not the oldest or the youngest. Alex does not have two older brothers. Write the names of the boys from oldest to youngest.

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 soda goes up 4¢... What if we travel 547 miles for 4 days..."

★★ 5. Jesse wants to make a pot of tomato soup that holds eight bowls. To make two bowls, he needs two tomatoes, $1\frac{1}{2}$ cups of milk, and $\frac{1}{2}$ teaspoon salt. How much of each ingredient will he need for his pot? Jesse made a drawing to help him figure this out. What would his drawing look like?

Tomatoes ___ Milk ___ cups Salt ___ teaspoons

★★★ 6. In the problem above, how much of each ingredient would Jesse need if he were making 80 bowls of soup?

Tomatoes ___ Milk ___ cups Salt ___ teaspoons

★ 7. In a fourth-grade class, two out of four students bring their lunches to school. There are 28 students in this class. How many students in the class bring their lunches to school?

★★★ 8. Round off each amount to the nearest dime.

\$.59 _____ \$.46 _____ \$.21 _____

\$.68 _____ \$.74 _____ \$.87 _____

★★★ 9. It takes Jerry 12 steps to go across the classroom. It takes Mary 16 steps. If Jerry has taken nine steps, how many steps has Mary taken?

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. If work is worth doing, it is worth doing well.

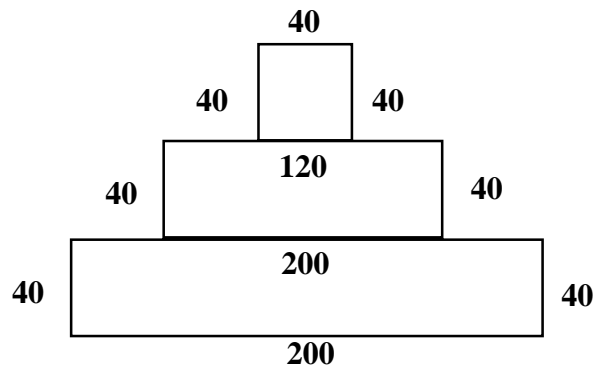
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Discussion of problems.....

1. **(See the labels below)** The problem requires estimating and number sense using the information given. The diagram is drawn to scale. Note that the 120 and 200 refer to the entire length of the segment.



2. **(a. 43, b. 2, c. 1, d. 17)** If students have never gathered data using a line plot, it can be confusing. Each X represents one piece of data and represents the number underneath, i.e., there are 14 pets represented above the number 7. The median is the middle number counting from each of the ends, 0 and 7. The mode is the number most often represented which is 1. Seventeen students participated since there are 17 Xs.

3. **(112 feet)** Since there are 15 fence posts, there are 14 spaces between posts. Each space is 8 feet wide, so the total distance is 14×8 , or 112 feet. If the students have difficulty visualizing this problem, suggest that they draw a diagram.

4. **(20 times: 1, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 31, 41, 51, 61, 71, 81, 91)** An extension could be to ask the students how many times the digit 1 (or another digit) is written when writing the numbers from 1 - 199.

5. **(8 tomatoes, 6 cups of milk, 2 teaspoons of salt)** This problem deals with ratios in a real setting. Based on the given information, four times the amount of each ingredient should be used.
6. **(80 tomatoes, 60 cups of milk, 20 teaspoons of salt)** This problem is similar to the above, but all of the ingredients need to be multiplied by 10.
7. **(14 students)** 2:4 is a ratio that is the same as one half. One half of 28 is 14. Some students may divide 28 by 4 and then multiply that by 2.
8. **($\begin{matrix} \$0.60 & \$0.50 & \$0.20 \\ \$0.70 & \$0.70 & \$0.90 \end{matrix}$)** This problem gives students a chance to learn how to round a decimal to the tenths place. The decimal point is necessary because \$ is used. Students should know intuitively whether 46¢ is closer to four dimes or five dimes.
9. **(12 steps)** For every three steps Jerry takes, Mary takes four steps. Nine steps is three times three and 12 steps is three times four.

Math Stars

(a problem solving newsletter)

Vol. 4 No. 8

★★★ 1. Hop in place for 10 seconds while counting the number of hops. Wait 5 seconds and repeat. Record the number of hops for 5 trials. Make a bar graph of the results; be sure to title and label your graph.



★★ 2. Mary is ironing shirts for her father. He pays her 50¢ for the first shirt and increases her pay by 25¢ per shirt. How many shirts will she have to iron to earn \$5.00? _____

★★★★ 3. Sam, Nancy, Becky and Jimmy all eat lunch in the same restaurant. All of them are eating there today and Sam eats there every day. Nancy eats there every other day, Becky eats there every third day and Jimmy eats there every fourth day.

The next time they are all together in this restaurant they will have a big celebration. How many days from today will the celebration take place? _____ days.

★★ 4. Fill in the chart:

Number A	Number B	Sum	Product
		15	36
	3		27
9		21	

Strategy of the Month

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

The pages in a book are numbered from 1 to 256. How many times is the digit 4 printed?

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 7p.m.? What do the statistics tell us about the two baseball players?

- ★★ 5. Jordan plans to cut a board into equal-sized pieces by making 12 cuts in the board. There will be a 10-inch interval between cuts. How long is the board?



- ★★★ 6. List the amount of each of the ingredients if the following recipe is tripled.

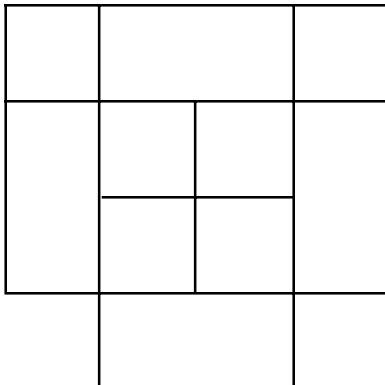
PLAY DOUGH

Mix together:

- 1 1/2 cups flour
- 1 1/3 cups water
- 1 1/4 tsp. cream of tartar
- 3/4 Tbsp. oil

Cook at medium heat until it turns solid.

- ★★ 7. How many different squares are in this picture?



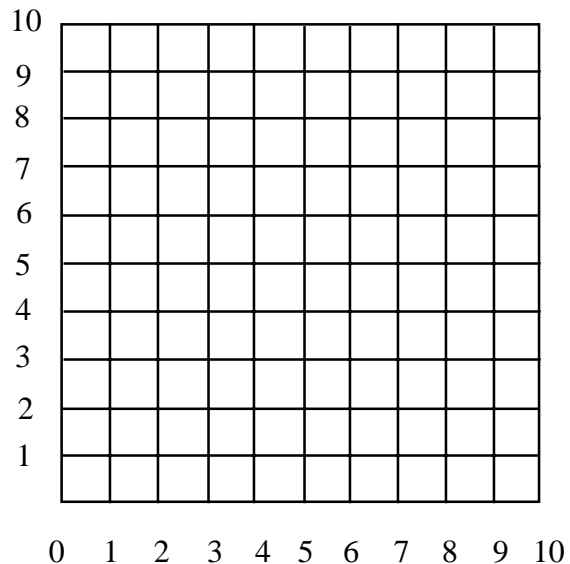
- ★ 8. What is the closest estimated answer to this problem?

$$\begin{array}{r} 43 \\ + 8 \\ \hline 59 \end{array}$$

- a. 12,000
- b. 13,000
- c. 14,000

- ★★ 9. Begin at (9,6) to find a mystery dot-to-dot picture. Draw it by connecting in order with straight line segments the points having the given coordinates.

(9,6) (1,6) (8,1) (5,9) (2,1) (9,6)



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.

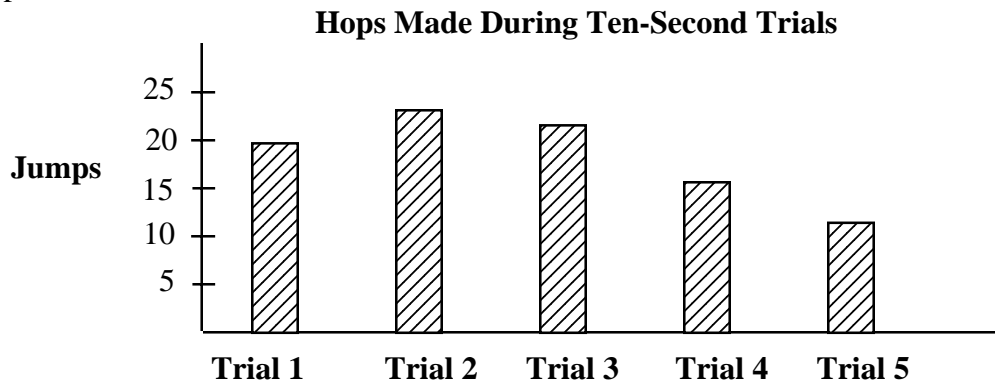
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Discussion of problems.....

1. (Answers will vary. Graph should have the axes labeled and a title.) An example of a graph follows:



2. (5 shirts) Making a table would be a good way to work this problem.

Shirt number	Amount Per Shirt	Total earned
1	\$.50	\$.50
2	\$.75	\$1.25
3	\$1.00	\$2.25
4	\$1.25	\$3.50
5	\$1.50	\$5.00

3. **(12)** Making an organized list/chart of the days each person eats at the restaurant would be one method for solving this problem.

Days from Today	People Eating			
	S	N	B	J
1	X			
2	X	X		
3	X		X	
4	X	X		X
5	X			
6	X	X	X	
ETC.				

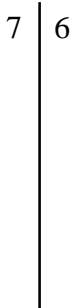
4.

Number A	Number B	Sum	Product
12	3	15	36
9	3	12	27
9	12	21	108

The second and third examples in the chart require that the students determine a missing addend /factor when given one addend/factor and the sum/product. The first example requires the students to find two numbers with the given sum and product. Some students will probably use the "guess and check" procedure for this first example; however, others might make a list of factor pairs of 36 and numbers whose sum is 15 to determine which numbers satisfy both requirements.

5. **(130 inches or 10 feet 10 inches)** Students will probably draw a sketch of the board and the cuts and realize that the number of 10-inch pieces is one more than the number of cuts.
6. **(4 1/2 cups flour, 4 cups water, 3 3/4 tsp. cream of tartar, 2 1/4 Tbsp. oil)** Some students will need to draw pictures to solve this problem. Additionally it would be helpful to provide measuring cups and spoons.
7. **(13 squares)** The diagram is drawn to scale with small (1 x 1), medium (2 x 2), and large (3 x 3) squares. There are six small squares, five medium squares, and two large squares.
8. **(b. 13,000)** The part of the problem that can be seen shows a sum of at least twelve thousand, five hundred something. This number would be rounded off to the nearest thousand.
9. **(The coordinates connect to form a five-pointed star)** This example provides students with an opportunity to use ordered pairs to locate points on a coordinate grid.

★★ 1. Record these grades on a stem and leaf plot. The first one is done for you.
95, 83, 76, 99, 93, 92, 93, 88



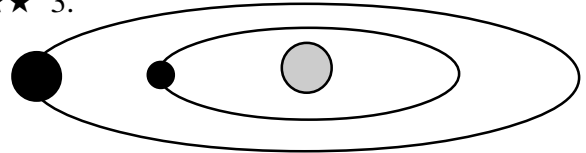
What grade is the mode? _____

★★★★ 2. ✓, ☆, ▲, and * each stands for a digit. Find what each stands for using these clues:

$$\begin{array}{r}
 * \quad \checkmark \\
 + \quad \star \quad \blacktriangle \\
 \hline
 61
 \end{array}
 \quad
 \begin{array}{r}
 \star \\
 + \quad \blacktriangle \\
 \hline
 9
 \end{array}
 \quad
 \begin{array}{r}
 \checkmark \\
 + \quad \blacktriangle \\
 \hline
 11
 \end{array}
 \quad
 \begin{array}{r}
 * \\
 + \quad \blacktriangle \\
 \hline
 8
 \end{array}$$

- ✓ = _____
- ☆ = _____
- ▲ = _____
- * = _____

★★★ 3.



Mercury = ● Earth = ● Sun = ○

Mercury takes 88 earth days to go around the Sun. About how many times does Mercury revolve around the sun in one earth year? _____

★★ 4. Shemeka owns a guitar store. She is buying new strings to put on her guitars. She has 9 guitars that need 6 strings each. She has 4 guitars that need 12 strings each. Each string costs \$1.65.

A. How many strings does Shemeka need to string her guitars? _____

B. How much will all these strings cost? _____

Strategy of the Month

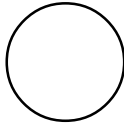
*What if you know the result of a situation, but you don't know the beginning? For example, you might know that you end up with thirteen baseball cards after doing a certain number of trades and you want to figure out how many cards you had before the trading started. In that case you need to work backwards; 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 solve this problem:*

Jo gave a number problem to Nelda. She told her to pick a number, add 10 to it, double that sum, and then subtract 5. Nelda's answer was 39. What number did she start with?

MathStars Home Hints

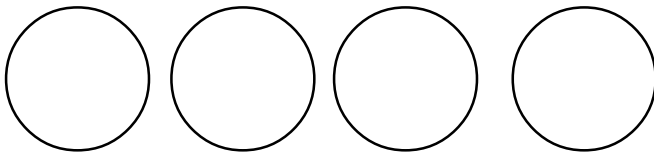
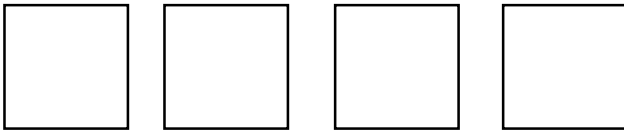
Mathematics can make life easier for you when you become a good estimator. Spatial estimation helps you plan how you will rearrange your furniture or how far to jump to cross a puddle of water. Using estimation helps you know if you have enough money for your purchases before you get to the check-out 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. Mental Math: Add the even numbers between 2 and 14. Put your answer in the circle.

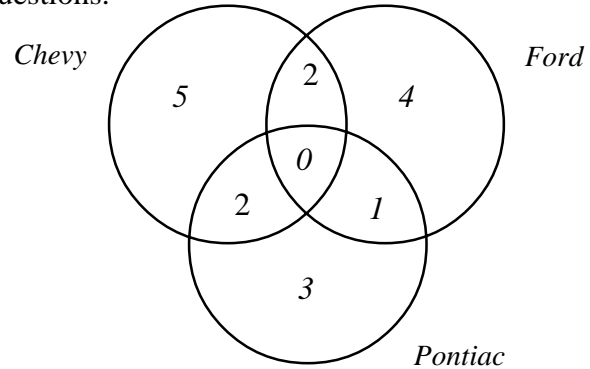


- ★★ 6. Draw line segments to show these parts.

HALVES THIRDS QUARTERS SIXTHS



- ★★★ 7. The students in Ms. Ortega's class took a survey to find out about their favorite race cars. Then they made a Venn diagram of this information. Use the Venn diagram to answer the questions.



How many in the class like only Chevys? _____

How many like Fords? _____

How many like all three? _____

- ★★★ 8. Michael Jordan scored 39 points against the Knicks in one game. He didn't score any foul shots. Find 6 combinations of 2- and 3-point shots he could have made; he did score at least one of each shot. Fill in the table below to organize your answers.

TWO-POINT SHOTS	THREE-POINT SHOTS

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!!

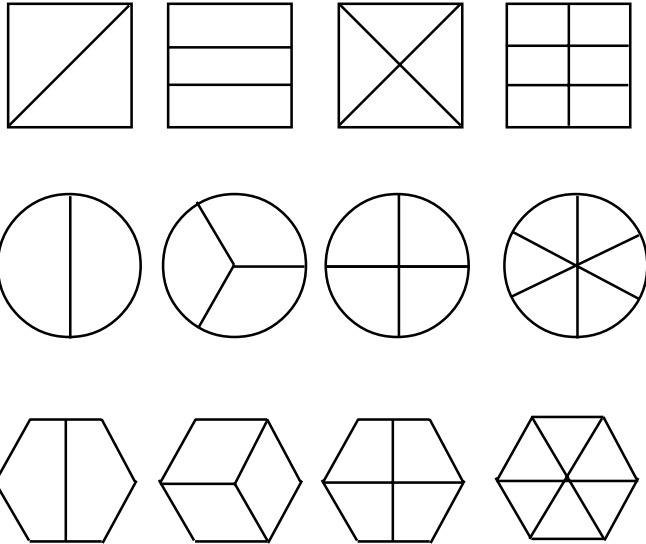
Discussion of problems.....

1. (The mode is the grade that appears most often--93. Correct stem and leaf plot is below.)

7		6
8		3 8
9		2 3 3 5 9

2. (✓ = 5, * = 3, ▲ = 6, ✱ = 2) One way to do this problem is to guess and check by substituting different numbers for the symbol ▲ since it appears in each problem. Students might enjoy making similar problems for each other.
3. (4 times) Students need to know that there are 365 days in a year in order to do this problem. They then can use estimation skills to determine that 4 times 88 is close to 365. An exact answer is unnecessary since 88 earth days is also an approximation.
4. (A. 102 strings B. \$168.30) This two-part problem involves multiplication and addition. The students could multiply to determine the cost for each type of guitar (6 string or 12 string) separately and then add, or they might determine the total number of strings needed and then multiply by the cost per string. It is important to stress the labeling of the dollar amount. A calculator should be used for this type of problem.
5. (40) The term *between* means you cannot include 2 and 14. So you have to add 4, 6, 8, 10, and 12.

6. (Below are some possibilities)



7. (5 students like Chevys only; 7 students like Fords; no students like all three.) Using a Venn diagram to show results of a poll can quickly demonstrate the results. The question about the Fords illustrates the need to include all the students who liked Fords as well as other cars.

8. (See table below) It is hoped that many of the students will realize/verbalize the reason that it was not possible to score an even number of three-point shots and have a final total of 39 points.

Two-point shots	Three-point shots
18	1
15	3
12	5
9	7
6	9
3	11

Math Stars

(a problem solving newsletter)

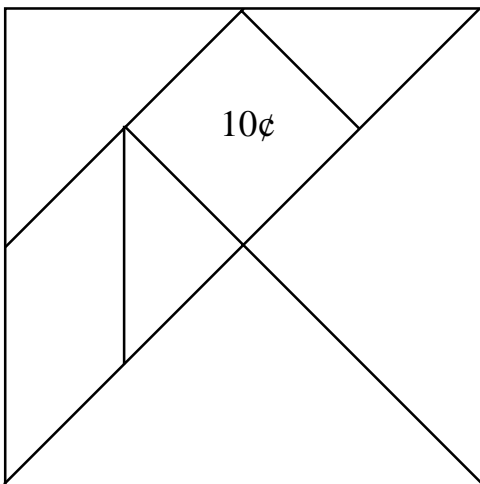
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- ★ 1. Place the missing digits in the boxes below.

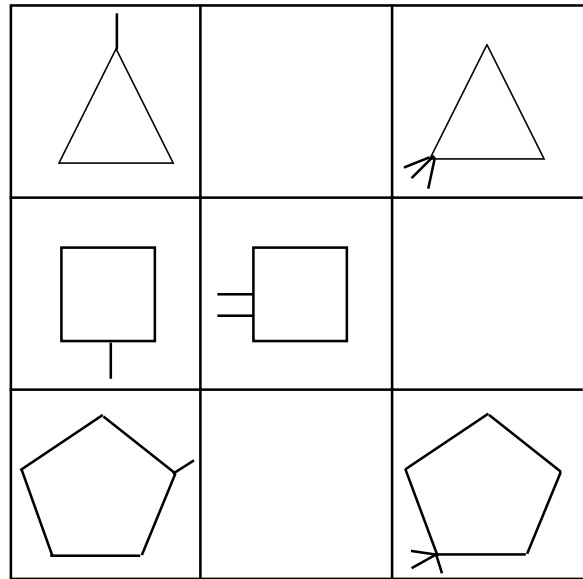
$$\begin{array}{r}
 3, \square 8 6 \\
 1 \square 2 \\
 + \square, 6 7 \square \\
 \hline
 8, 1 5 5
 \end{array}$$

- ★★ 2. Nine years ago a 10-ounce candy bar cost 25¢. That same candy bar costs twice as much now. How much does the candy bar cost per ounce now? _____

- ★★ 3. Use the Tangram puzzle below. Suppose the square costs 10¢, how much will the other pieces cost? Put your answers inside each piece.



- ★★★ 4. Draw the missing shapes in the boxes below.



Strategy of the Month

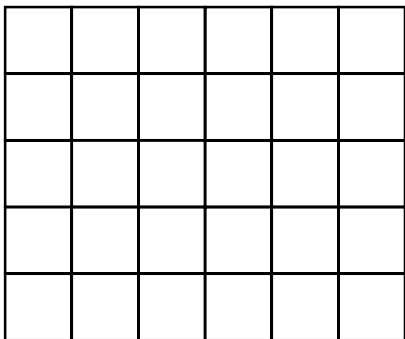
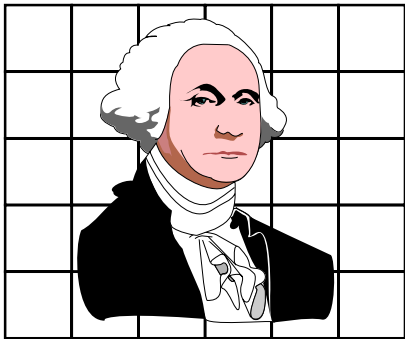
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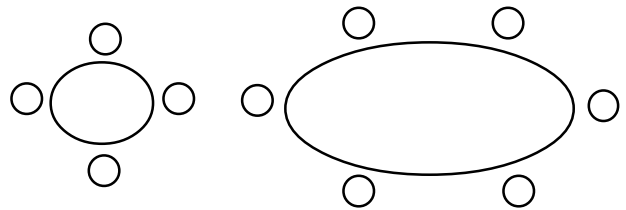
- ★★★ 5. Copy the drawing below using the given grid.



- ★★★★ 6. In the school library 26 students can sit at the 5 tables with no empty seats. There are small tables for 4 people and large tables for 6 people.

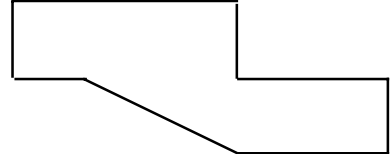
A. How many small tables are in the library? _____

B. How many large tables are in the library? _____

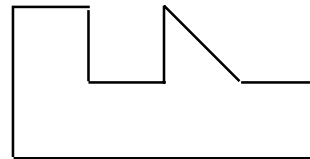


- ★★★ 7. For each figure below circle the best estimate of the area of the figure. Hint: Place some cm^2 graph paper over the figure or "draw in" some square centimeters.

- A. 4 cm^2
B. 5 cm^2
C. 6 cm^2



- A. 4.5 cm^2
B. 5.5 cm^2
C. 6.5 cm^2



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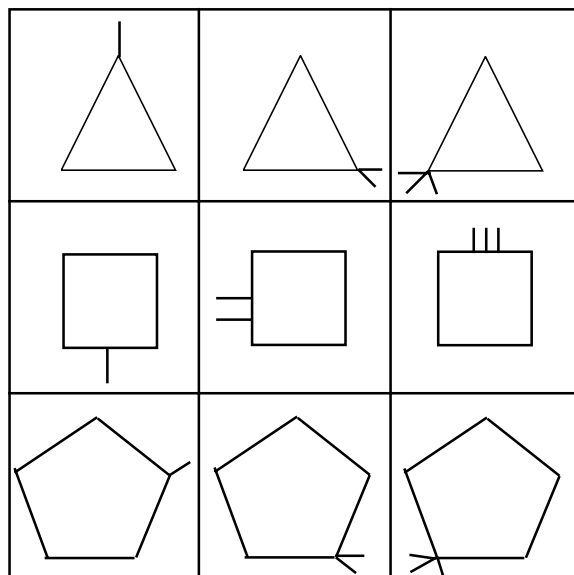
Discussion of problems.....

$$1. \begin{array}{r} 3, \boxed{2} 8 6 \\ 1 \boxed{9} 2 \\ + \boxed{4} 6 7 \boxed{7} \\ \hline 8, 1 5 5 \end{array}$$

2. (5¢) The candy bar costs twice as much or 50¢ now. Since it is 10 ounces in weight each ounce costs 5¢.

3. (The small triangles are worth 5¢, the parallelogram is worth 10¢, the medium triangle is worth 10¢ and the large triangles are worth 20¢ each.) A discussion about the cost of all seven peices may be a good extension.

4. (These figures are turning clockwise and adding an "arm" each time.)



5. **(Accept good attempts.)** Students will enjoy using this procedure for making copies of a given diagram/picture. A good extension of this would be to discuss how this procedure can be used to make enlargements of a picture.

6. **(2 small tables and 3 large tables)** Making a chart of the possibilities would be a good way to approach this problem.

Small tables	Large tables	Total students
1	4	28
2	3	26
3	2	24
4	1	22

7. **(6 cm² in the first figure and 5.5 cm² in the second figure)** Students should realize that most measurement is not exact and we occasionally have to guess at the closest measurement.