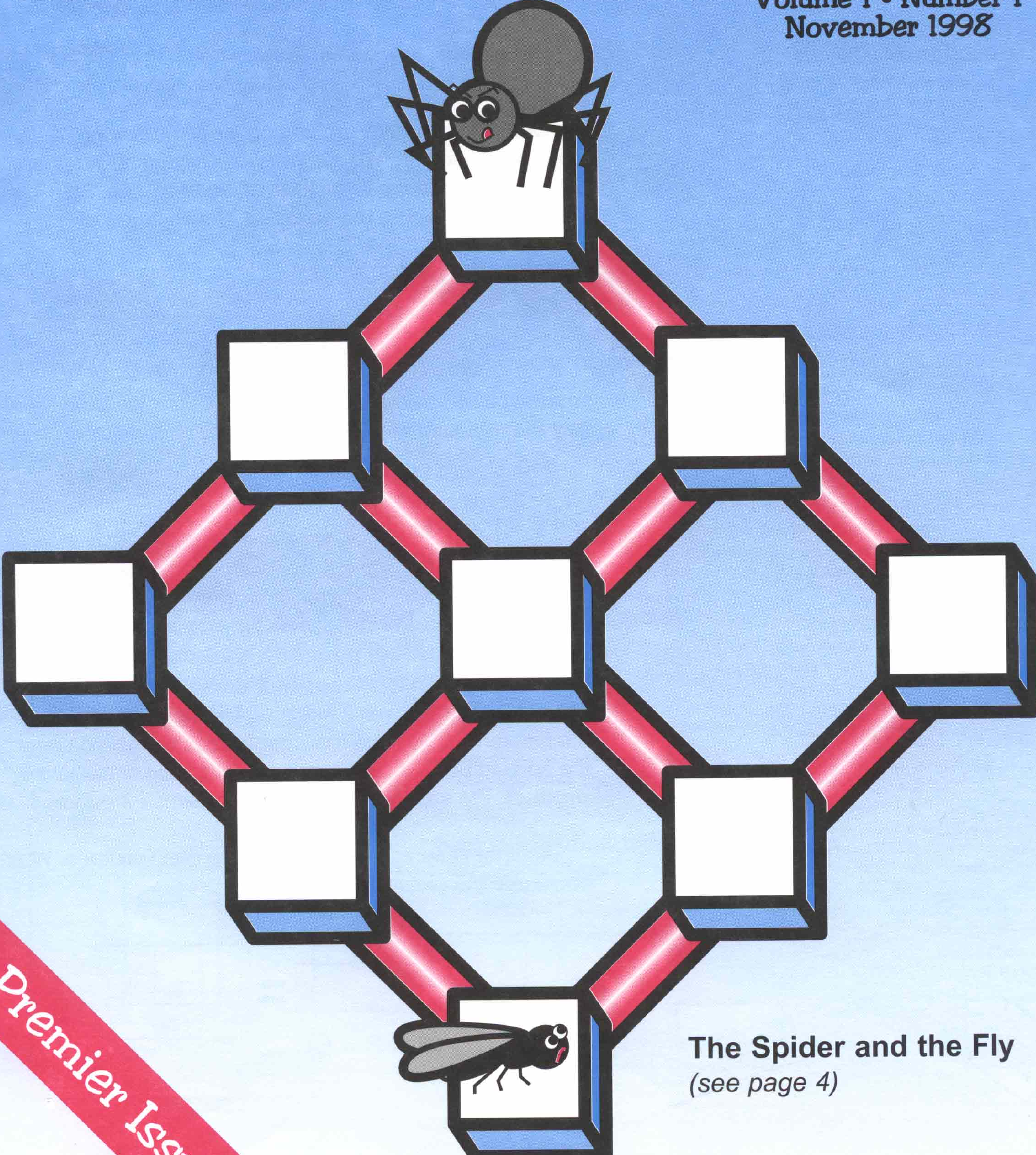
Math Reader

Volume 1 • Number 1
November 1998



The Spider and the Fly
(see page 4)

Premier Issue

Math Reader

Contents

Math Reader (elementary) and ***Math Explorer*** (intermediate) are published 8 times a year by the Southwest Texas State University Math Institute for Talented Youth (MITY). An annual subscription is $8.00 for individuals, $6.00 for group purchases of 25 or more, and $4.00 for school purchases of 100 or more. See the back cover for an order form or contact Math Reader at the address or phone below.

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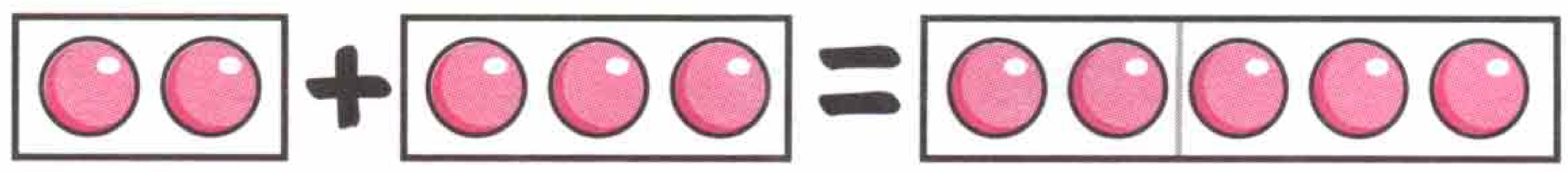
Published by
Southwest Texas State University
Math Institute for Talented Youth

Dots and Boxes

By Max Warshauer

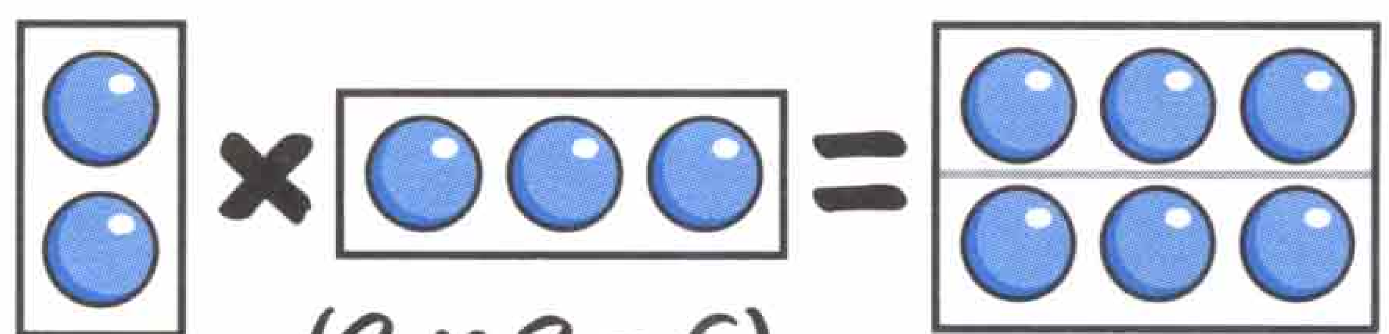
One way to think of adding and multiplying is by drawing a picture. We begin by representing numbers with boxes of dots. A picture of addition can then be drawn by combining the boxes as shown below:



$(2 + 3 = 5)$

The result of adding two numbers is called the **sum**. We say that the sum of 2 plus 3 equals 5.

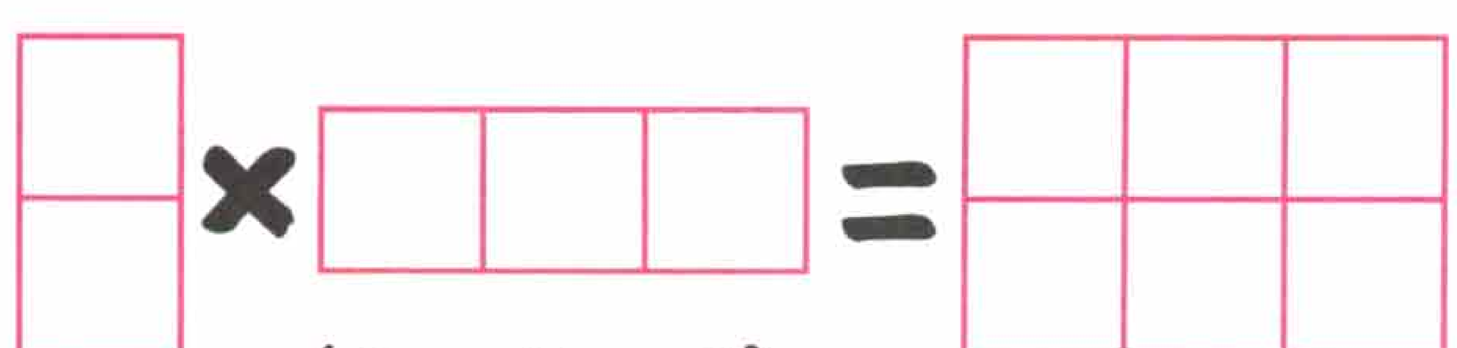
The picture for multiplying is trickier. It looks like:



$(2 \times 3 = 6)$

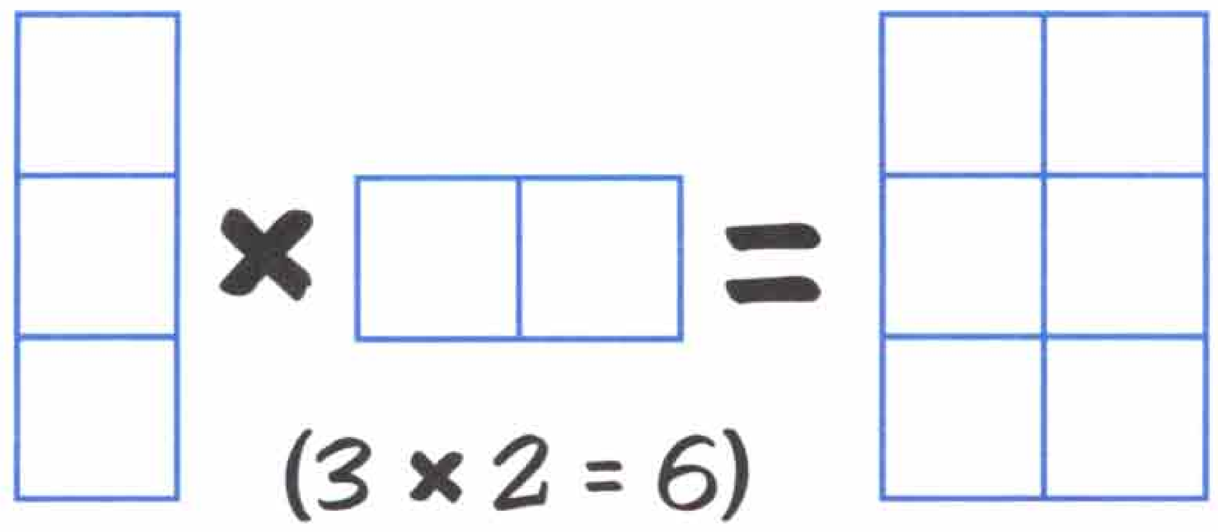
To multiply 2 times 3 we form 2 rows each with 3 dots. This gives the answer $2 \times 3 = 6$. The number of dots in the first term, 2, tells us how many times we will combine the second term, 3. The result of multiplying is called the **product**. We say that the product of 2 times 3 equals 6.

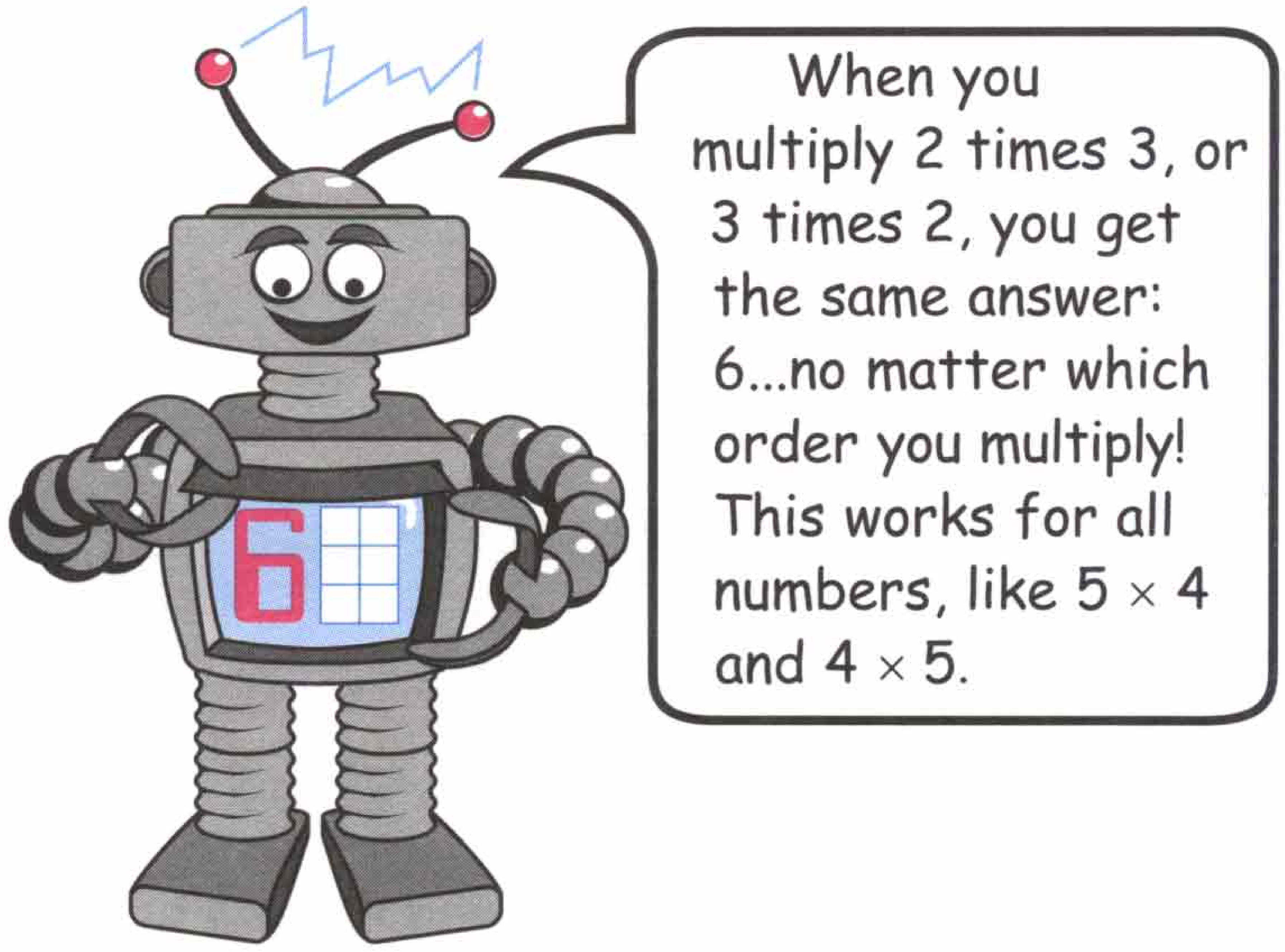
Another picture for multiplying is to draw squares. We could use the picture below:



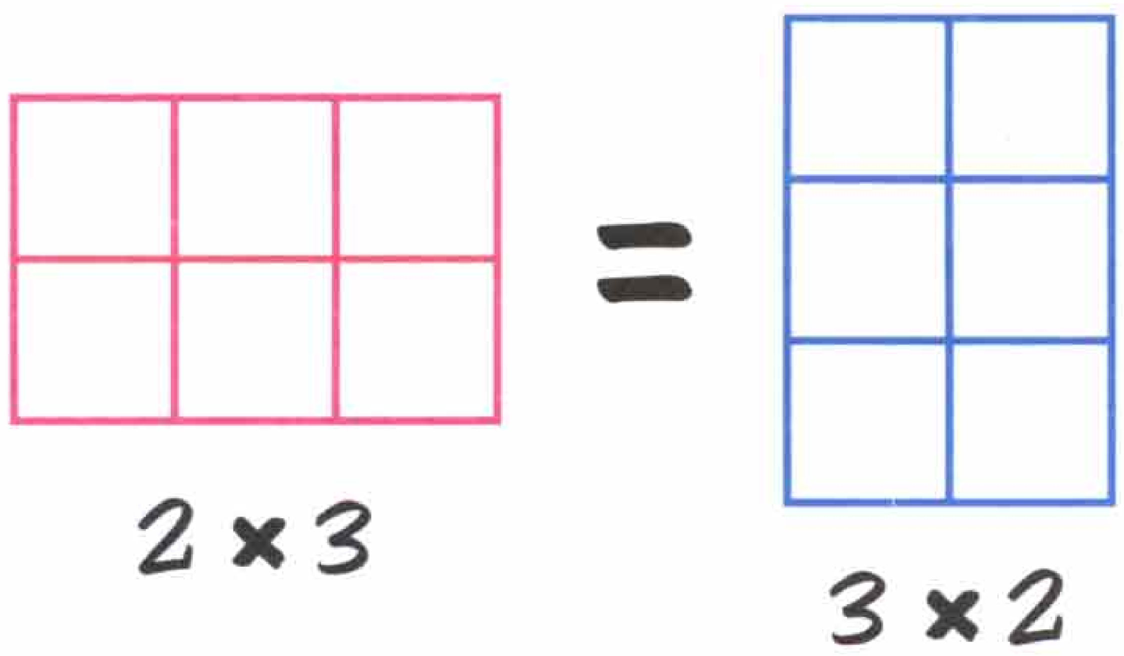
$(2 \times 3 = 6)$

We also have that:





These answers are the same since the first rectangle can be rotated to get the second rectangle.

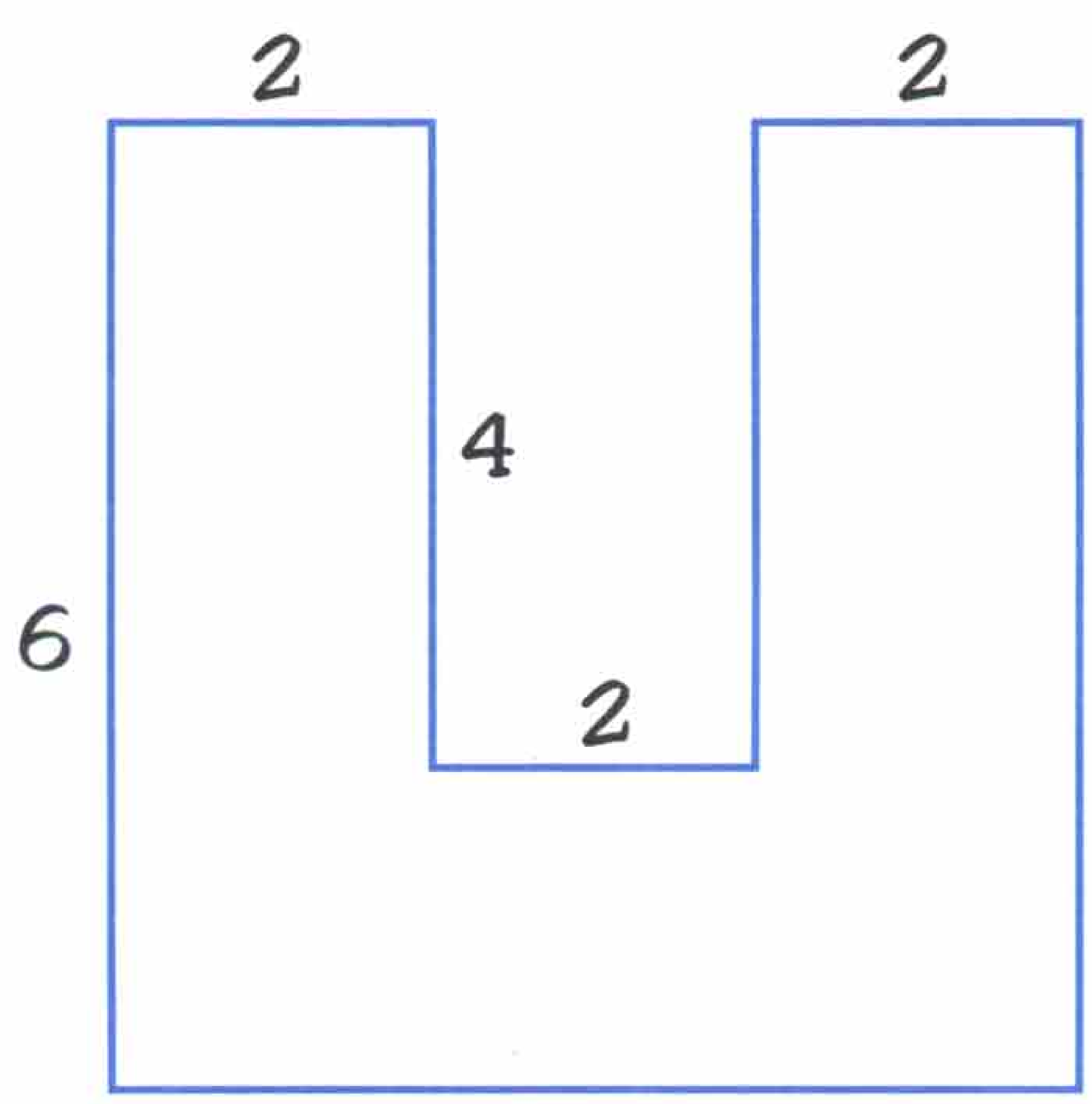


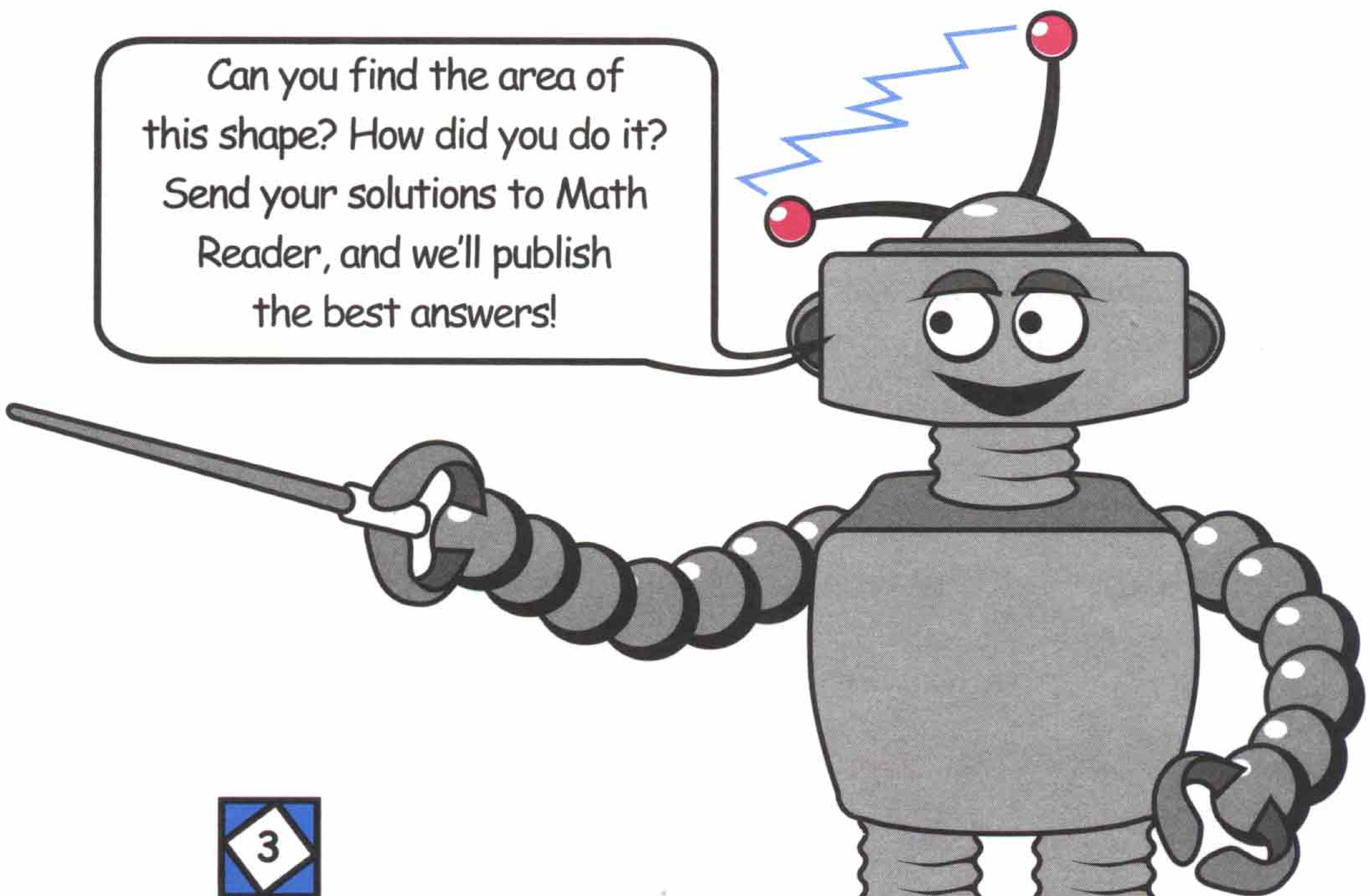
We now have a picture proof of the **commutative law** of multiplication, which says that multiplying in either order, frontwards or backwards, gives the same answer. Do you see why this is true?

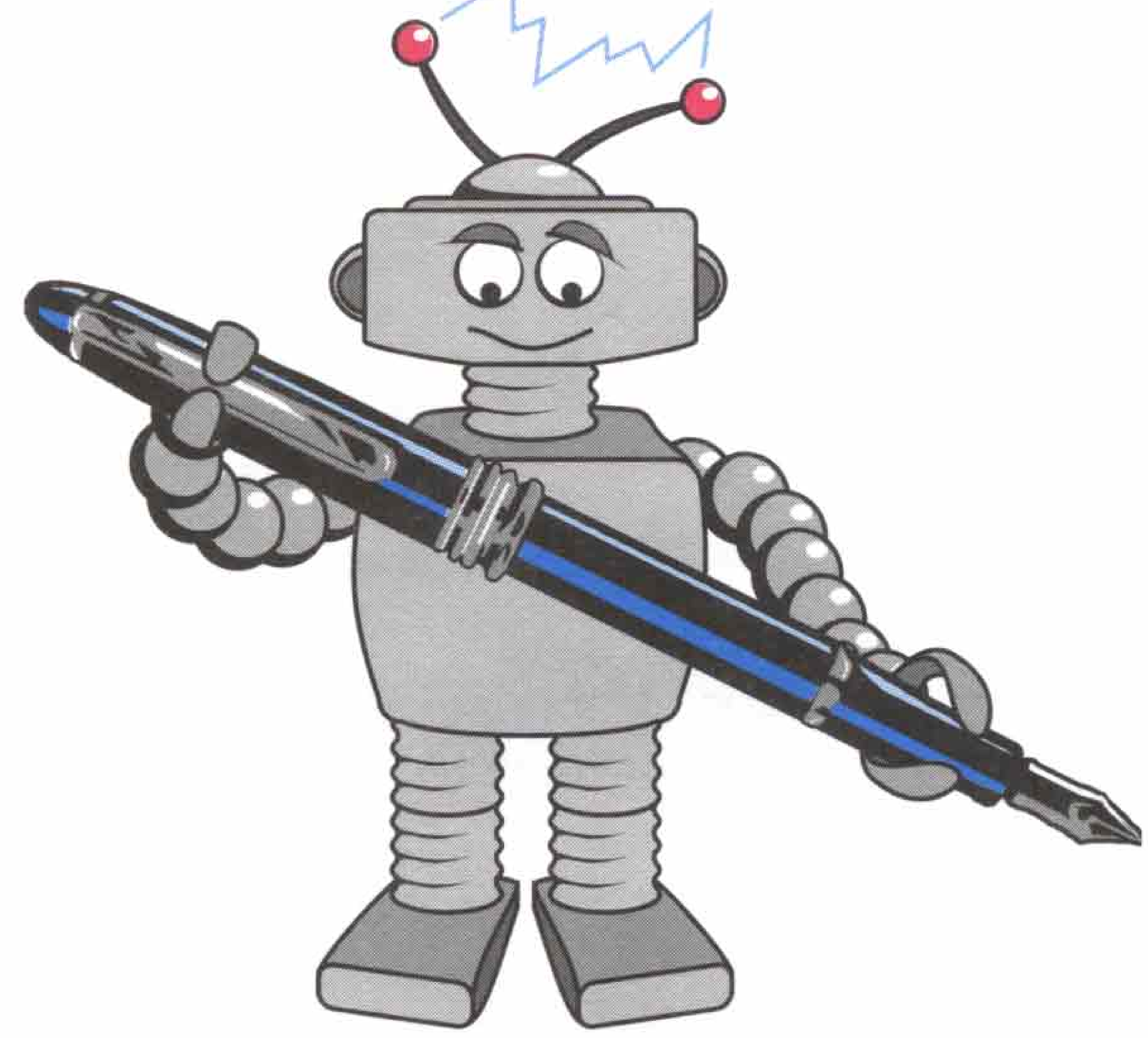
Area is a measure of the size of a region. The basic unit of area is a **square**, □ . This building block is one unit long and one unit wide, and has area **one square unit**. When we find the area of a region, we are finding the number of square building blocks it takes to cover the region without any overlaps.

The process of dividing a region into squares (called partitioning the region) enables us to find its area. Look at the picture of a rectangle which is 2 units wide and 3 units long. A picture for partitioning this rectangle looks like:

Since it takes 6 of our building block squares to cover this rectangle, we say that the area of this rectangle is 6 square units.

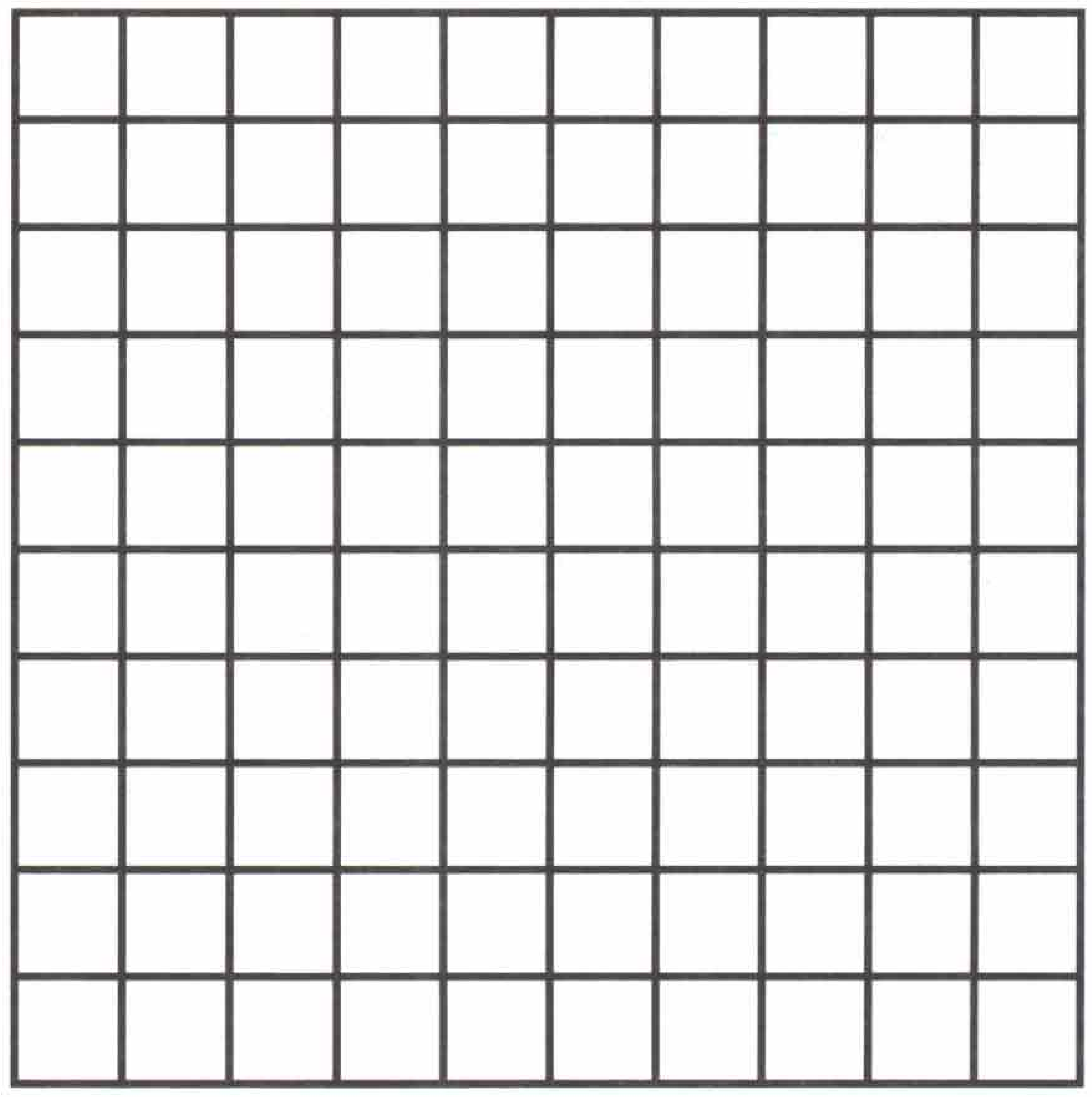






Directions

Use a grid like the grid on the right to draw the figures in the following problems. Send your solutions to Math Reader! We will publish the best solutions each month.



1. Make a rectangle with 12 square units. How many different rectangles with area 12 square units can you make?

2. Tova buys 28 feet of fencing and 4 posts to build a rectangular pen for her dog. What different size rectangles can she make? Which of these has the largest area?

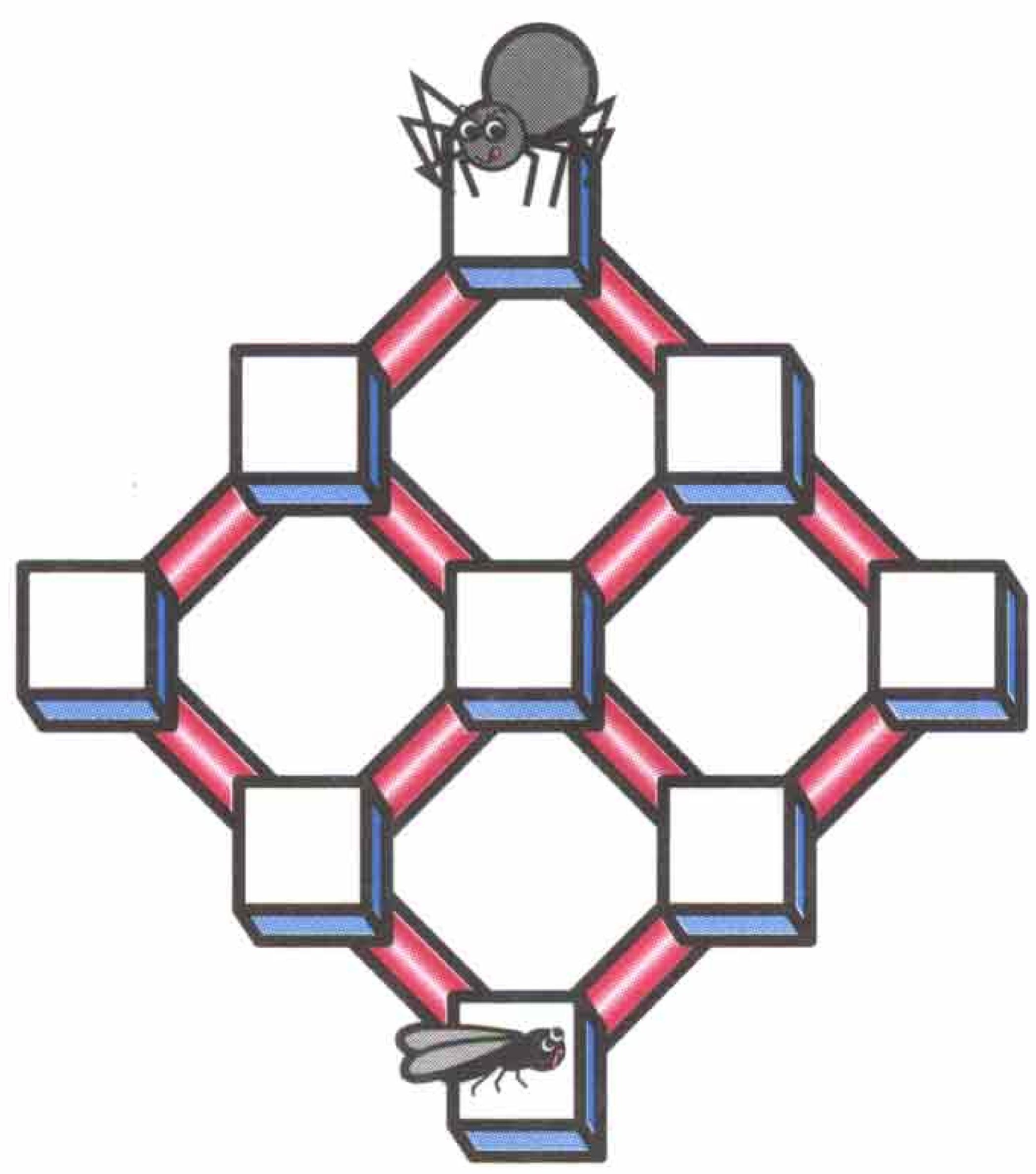
3. Eli's puppy needs an area of 36 square feet in which to play. What different size pens can he make? Which pen is cheapest to make? Why?

4. Draw a triangle with an area of 10 square units. How can you show that your triangle has the required area?

5. How many rectangles can you find in the 2×2 grid to the right? (Squares are rectangles.)

6. Draw your own 2×3 grid. How many rectangles can you find in your grid? How many rectangles can you find in a 3×3 grid?

7. **Ingenuity (The Spider and the Fly)**
   How many ways are there for the spider to go from the top to the bottom to catch the fly, with each step going down? Do you have a method to fill in bigger grids? Hint: Number each square with the number of ways to go from the top to that square.



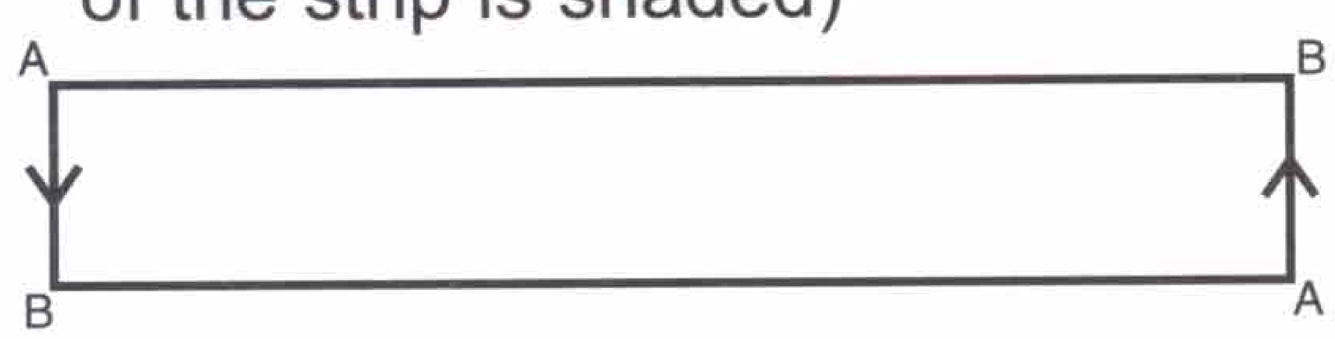
Mobius and More

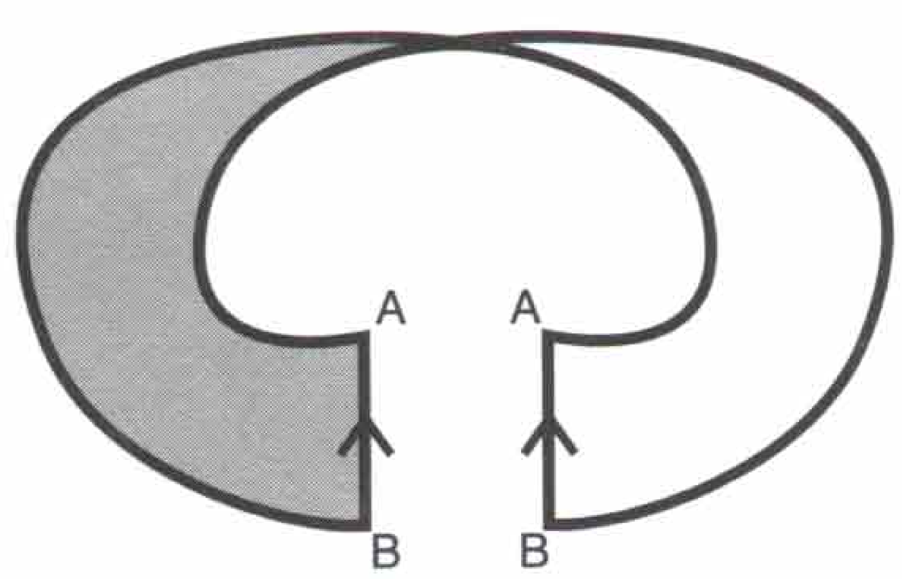
By Anne Sung

A mathematician confided
That a Mobius strip is one-sided,
And you'll get quite a laugh
If you cut one in half,
For it stays in one piece when divided.

Make the Mobius strip.

- Cut out a 1" x 11" strip of paper.
- Twist the paper once in a half-twist.
- Tape the ends together to make a loop, connecting the ends of the line segment AB to each other as shown. (the bottom of the strip is shaded)





Now let the fun begin!

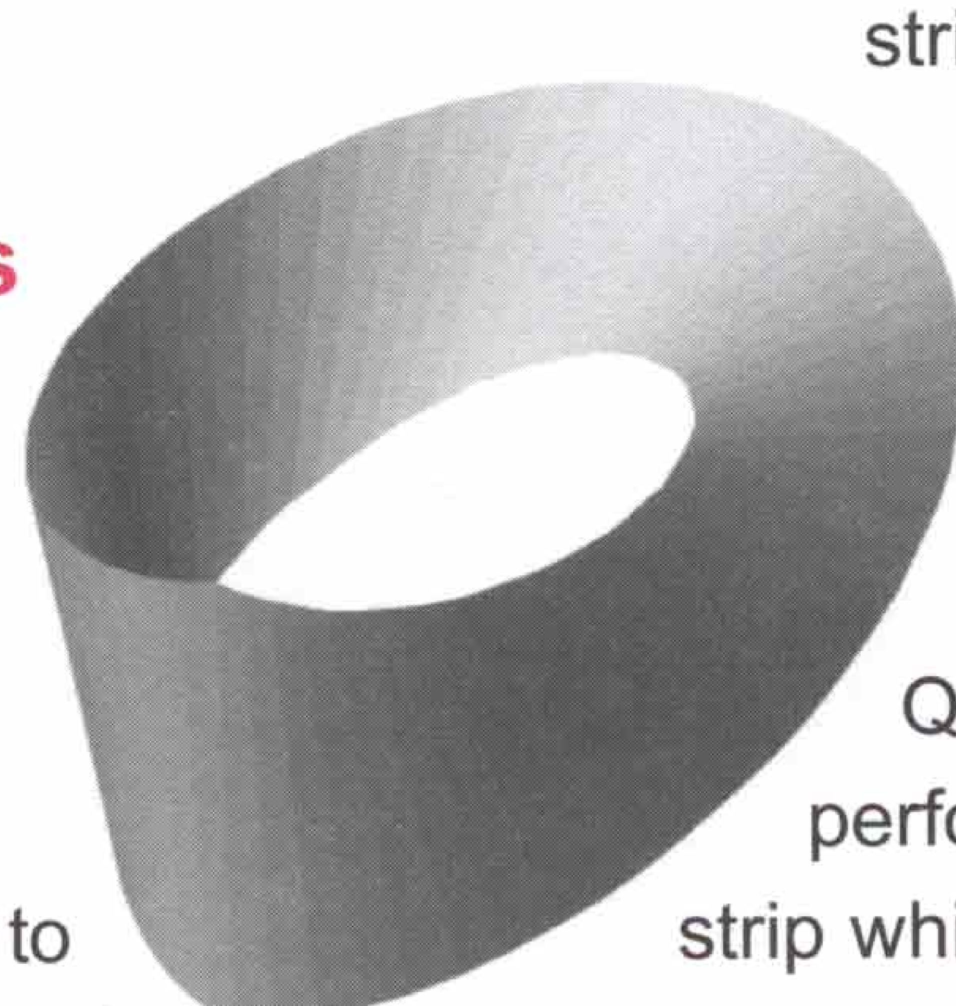
How many sides does this strip have?

Draw a line down the middle of the Mobius strip until you get back to where you started.

Q1: How many lines would it take to trace all the sides of a normal, untwisted loop?

Q2: How many lines does it take to trace all along the Mobius strip?

Q3: How many sides does the Mobius strip have? How many edges?



Slice the strip!

Now cut along your line down the middle of the strip. What happens?

Beyond Mobius

Take another 1" x 11" strip of paper. This time, instead of half a twist, give the strip a full twist before you tape the ends together.

Q4: How many lines does it take to trace all the sides for this loop?

Q5: How many sides does this loop have? How many edges?

Draw a line down the middle of your new strip and cut the strip along your new line. What do you think will happen this time?

Explorations: Mobius and More

Q6: What happens if you perform these experiments with a strip which has one-and-a-half twists?

Q7: Draw a line down a Mobius strip 1/3" from the edge. What happens if you cut along this line?

Can you think of other explorations to try? Send us what you enjoyed most!

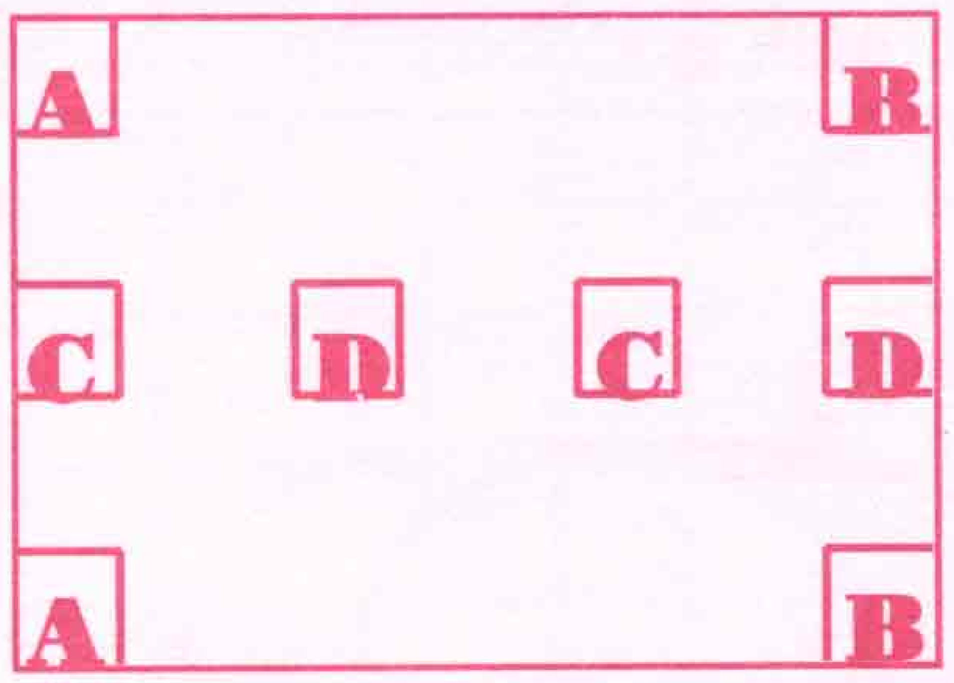
Puzzle Page

Math Readers,

We want to print your work! Send us your own math games, puzzles, problems, and activities. If we print them, we'll send you and your math teacher free *Math Reader* pens.

Line Dances

Can you connect the like letters, using four lines that never run into each other?



WORD SEARCH

Forwards or backwards, up, slanted, or down. Where can the words in this puzzle be found?

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

addition	gauss	rectangle
commutative	mobius	square
distributive	multiplication	triangle

JACK AND JILL

Jack: Have you seen all my hens and pigs?

Jill: Yes, I counted 25 heads total.

Jack: That's right – 25 heads, and 65 legs!

Jill: That's odd! How can that be?

Jack: Ah, didn't you notice? One of the pigs is missing a leg.

Jill: So *you* own the famous three-legged pig!

How many hens and how many pigs does Jack have? (And what did Jill find odd about a total of 65 legs?)

BULLETIN BOARD

Hey Math Readers!

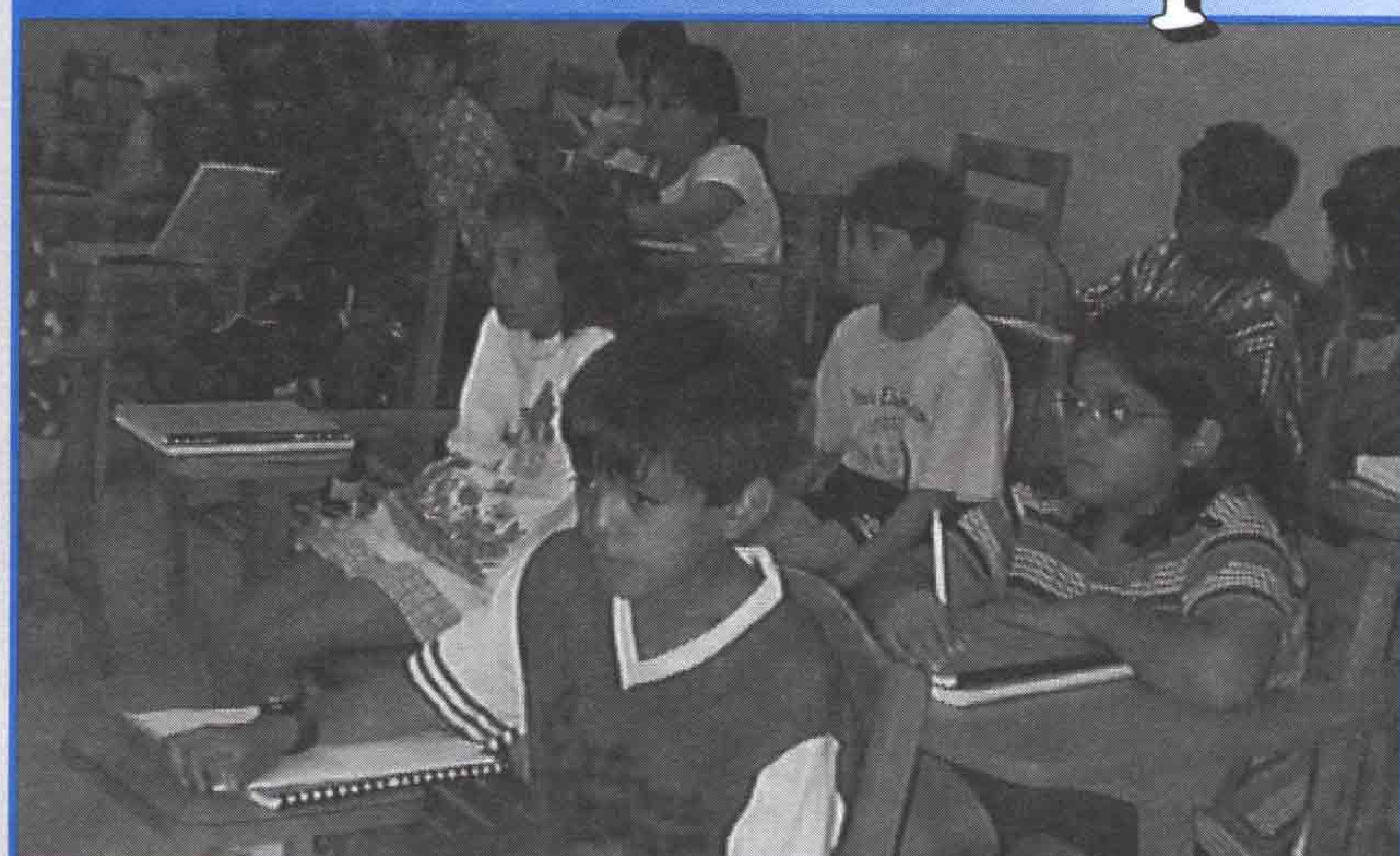
Our new robot has just arrived from the factory, and we need to find a name for him! Send your ideas to the address on page 2. Whoever thinks of the best name will win a Math Reader Pen.

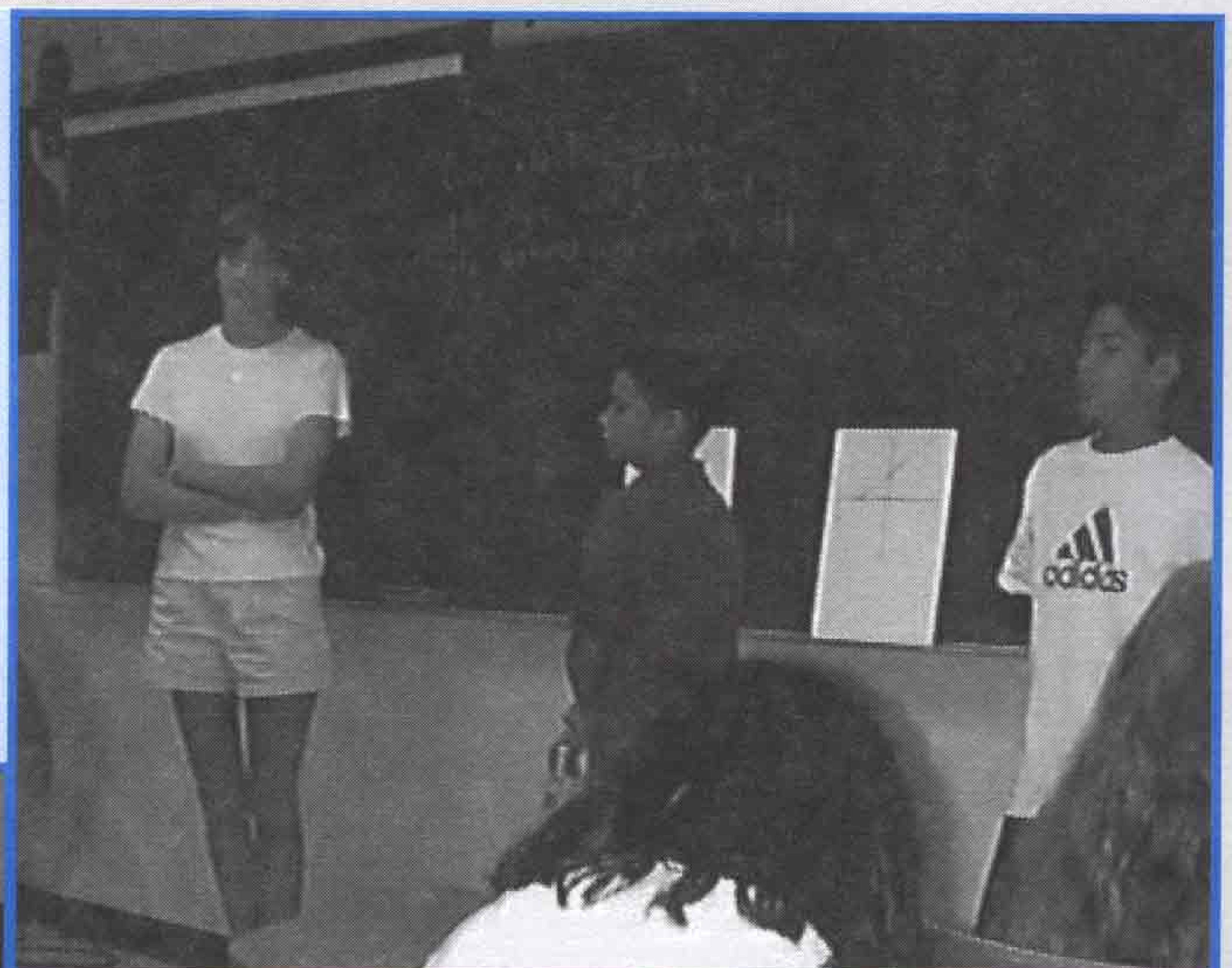
Math Explorer is another kid's magazine published by the SWT Math Institute for Talented Youth for intermediate students. Check it out!

SWT-STCC JUNIOR SUMMER MATH CAMPS

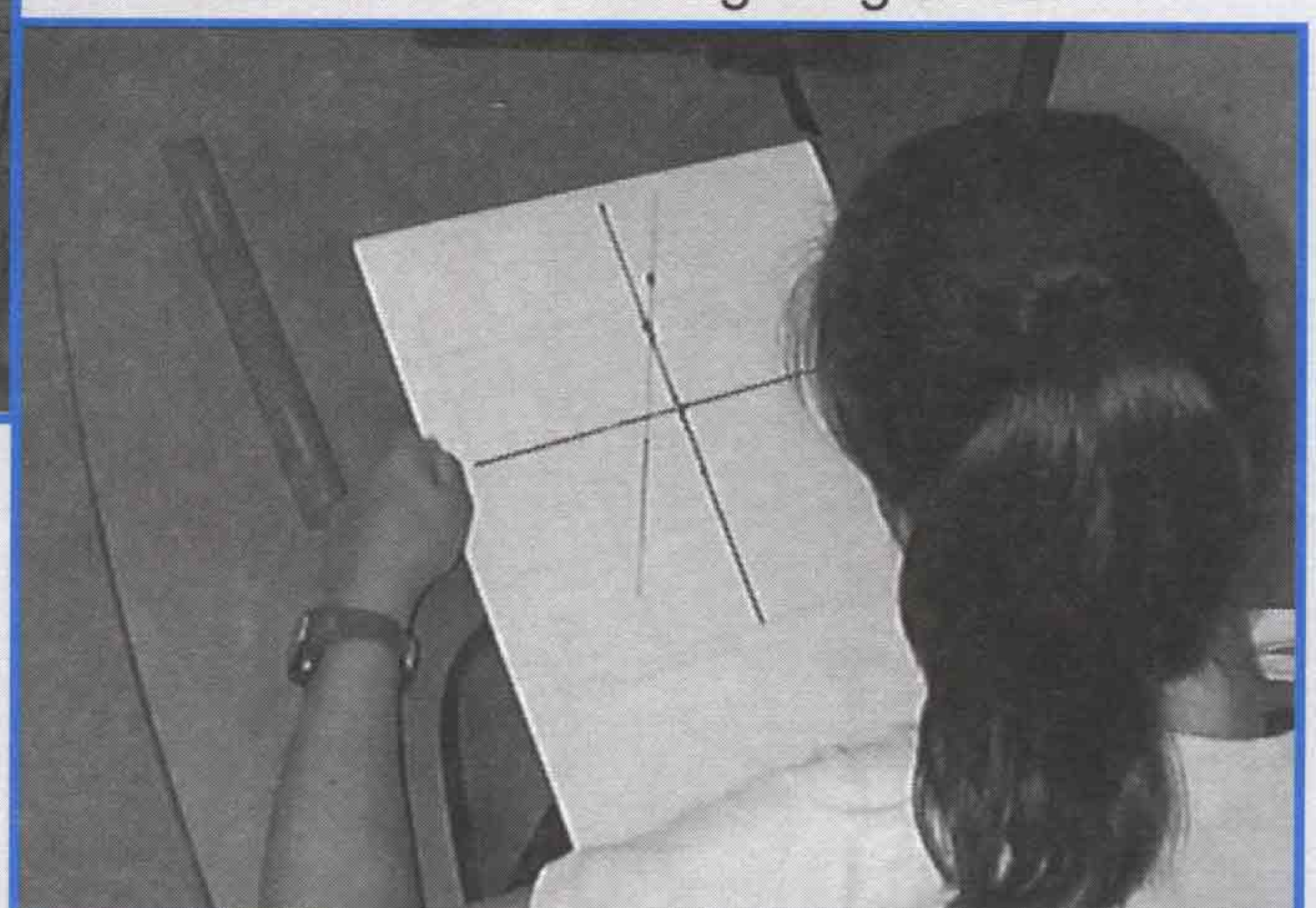
Donna, Rio Grande City, Progreso, McAllen, Mission and Port Lavaca began Junior Summer Math Camps as part of the Southwest Texas (SWT)-South Texas Community College (STCC) consortium, sponsored by an Eisenhower grant.

S.W.T. Junior Summer Math Camp





This summer 85 students attended the **Southwest Texas State University Junior Summer Math Camp**, a two-week program for students in third to eighth grades.



Students learned algebra fundamentals such as variables, fractions, functions, and applications. Kids learned how to discover concepts on their own and had fun explaining math to their peers. The Eisenhower program sponsored the summer camp and five satellite camps in the Rio Grande Valley, as well as Port Lavaca.

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Math Notes

Dear Reader,

Welcome to our new magazine! Math Reader is a magazine designed for elementary students. I hope you'll have an exciting time exploring new math problems and sharing ideas with each other.

Math Notes is our Reader's Showcase. Write us with news from your school; about math events you've enjoyed; or with your own puzzles, activities, and problems. Please include:

• Your name • Your teacher's name • Any related pictures.

We'll publish as many letters as we can each month. I hope to hear from you soon.

Sincerely,

Max Warshauer

Max Warshauer