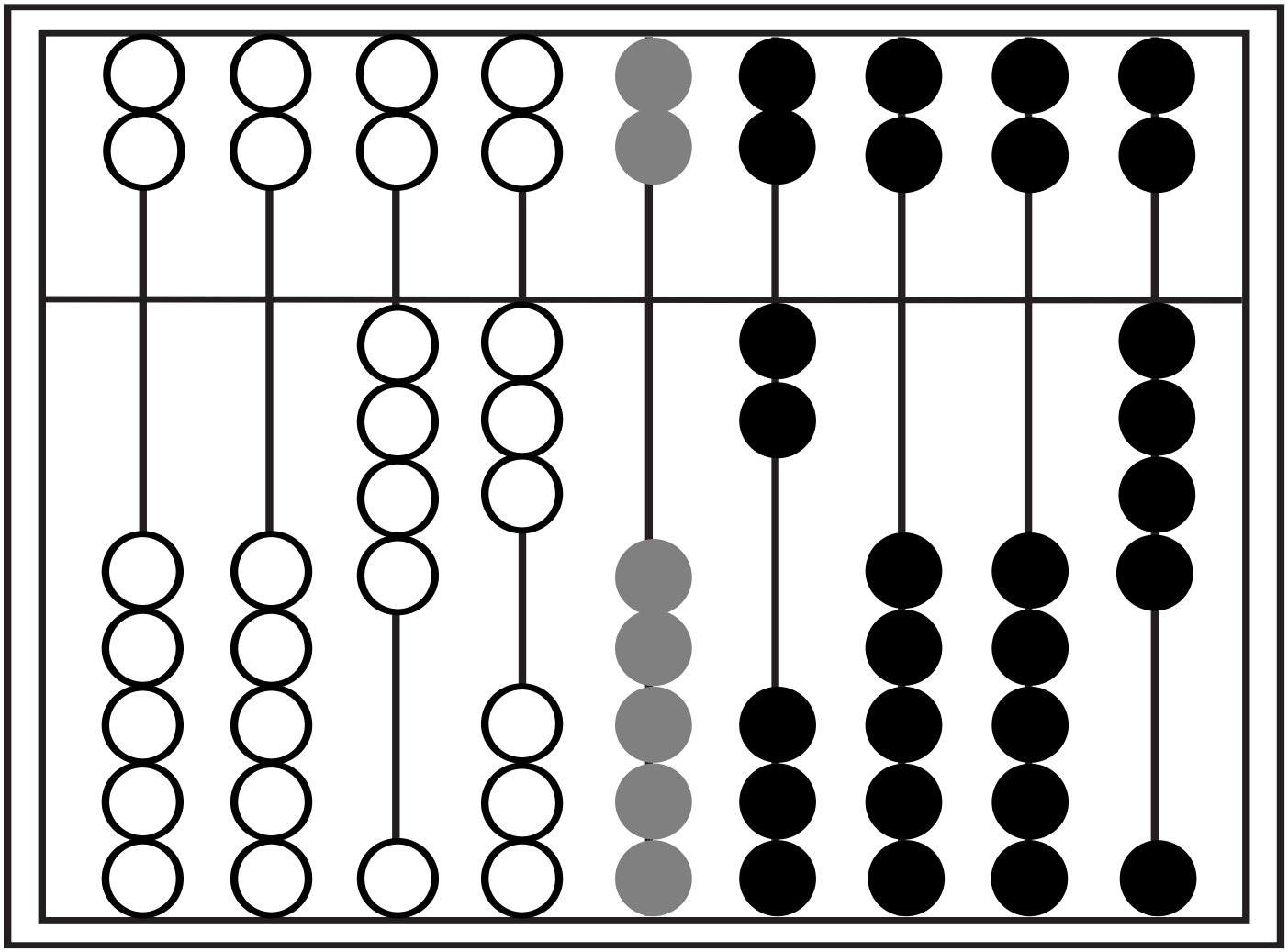
Abacus

Volume 43 2004



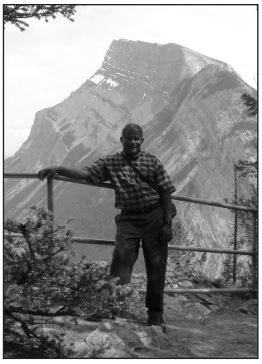
ONTARIO ASSOCIATION FOR MATHEMATICS EDUCATORS

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Edited by Trevor Brown

From the Editor's Desk

Trevor Brown



I received the following letter from a Grade Eight teacher who has been providing her students a set of rich mathematical tasks. My sense is that what she has to say will undoubtedly resonate with many of you.

"Below is a paragraph you have to read. My students have a math journal they write in periodically. One day I asked them to take some time to write me 'What Math Tastes Like' to them… they did this pretty early in the year so I could see what their past experiences with mathematics was like. The student whose work is shown below as you can see is a very creative writer. He is more into English and Art than mathematics… however, he has really come around and discovered he is a mathematician and has done brilliant work in geometry"

Here is what the student wrote:

"Math is a terribly bitter-tasting thing. Its rules and formulas can cause one to gag. It also requires a lot of understanding, so math is hard to swallow, let alone chew. It's like steak in that way, thick, and it takes many chomps to finally get it mushy enough to wolf down. To me, math is the vegetable of the academic world. It's good for you, but it tastes awful. Like Buckley's. *It gets stale easily, and if left out too long, it can rot and stink. The math-vegetable may, to some, be regarded as a delicacy. Math is a root vegetable… it needs to be yanked out of the earth so we can learn more about it."*

I thank Cynthia Dell for sharing this piece of writing with us. This student has given us much to think about. The questions abound. How do we present the subject to our students? How do they view mathematics?

We continually try to make the subject meaningful and 'relevant' to our students but it would appear that many students still view it as a strange and somewhat mysterious discipline, or maybe I should have said, area of study.

Our thanks go to Pat Margerm for submitting this issue's "Math and Literature Connections". We would like to make this a regular feature of the magazine.

You will also find in this issue many activities which will require the use of the geoboard and / or geopaper.

The Mathematical Eye

In the figure shown below, AB, AE, EC, and CD are straight lines.

AB and CD are parallel.

What is the sum of the following three angles?

Angle BAE, AEC and ECD?



▲ Number Sense / Numeration

Split the Number

Split the number 12

Multiply the parts together

12 = 9 + 3 9 x 3 = 27

12 = 7 + 3 + 2 7 x 3 x 2 = 42

12 = 6 + 3 + 2 + 1 6 x 3 x 2 x 1 = 36

1. a) Can you make a product of 36?
   b) How many different ways can you do this?

2. a) Can you make 40? If you can, show how this can be done
   b) What about 44?

3. What is the largest product you can make?

4. Try starting with different numbers. Investigate the largest product you can make.

Greatest Product

Use the digits 1, 2, 3, 4, 5 exactly once each to make two or more numbers.

For example:

4 21 53

Multiply these numbers together:

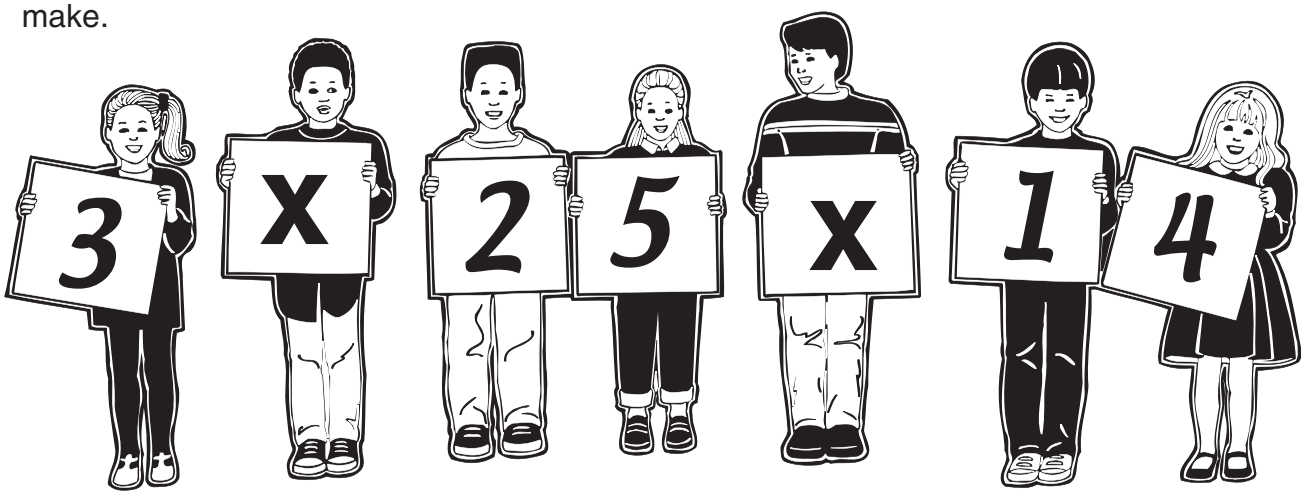
4 x 21 x 53 = 4452

Try other arrangements of the digits 1 to 5.

1. What is the greatest product that you can make?

2. What is the least product that can be made?

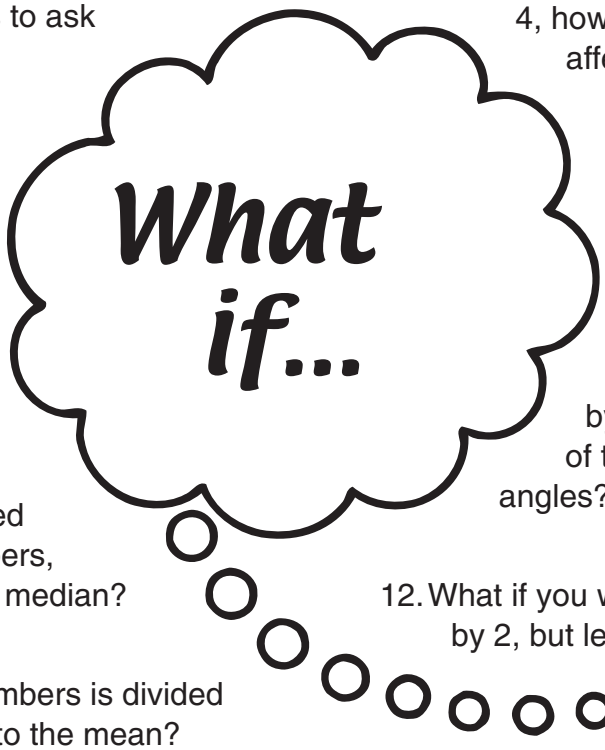
3. How did you arrive at your solutions?



▲ Questions to Stimulate Mathematical Thinking

One of the most effective ways to stimulate mathematical thinking is to ask "What if…" questions.

Here are some to get you started



1. What if 6 is added to each of 5 numbers, what happens to the mean?

2. What if 6 is subtracted from each of 6 numbers, what happens to the median?

3. What if each of 7 numbers is divided by 2, what happens to the mean?

4. What if you increase the length and width of a rectangle by 25%, how is the area affected?

5. What if you decrease the length of a rectangle by 75%, but leave the width alone, how is the area affected?

6. What if you triple the base of a triangle, how is the area affected?

7. What if you multiply the radius of a circle by 2, how is the area affected?

8. What if an item is reduced 10% and then 30% again, what single percent reduction is equivalent?

9. What if you divide the radius of a circle by 4, how is the circumference affected?

10. What if you halve each edge of a cube, how is the volume affected?

11. What if you increase the number of sides of a polygon by 1, what happens to the sum of the measures of the interior angles?

12. What if you were to multiply the numerator by 2, but leave the denominator alone, how is the fraction affected?



▲ Math and Literature Connections

"Using children's literature as a starting point for a mathematics activity gives students a sense of how mathematics is connected with the world that they engage in when they read stories"

Page 24 Early Math Strategy
The Report of the Expert Panel on Early Math in Ontario

The book *Ten Black Dots* by Donal Crews is a counting book which shows what can be done with ten black dots – one can make a sun, two a fox's eyes, or eight the wheels of a train. Asking students to identify the number of dots that are needed to make their own book is one example of a task that makes a connection between the mathematics of Gauss (what is the sum of the numbers from 1 – 100) and the world of the student. *Ten Black Dots* can be used to make connections between math curriculum expectations in the Number Sense and Numeration strand and the world of the student in all of the primary grades.

Curriculum Expectations	Tasks
Kindergarten	
• estimate and count to identify sets with more, fewer, or the same number of objects; • use simple grids correctly (e.g. , in games such as bingo, tic-tac-toe	Students estimate and count to compare pairs of numbers from the story (e.g., five dots can make the buttons on a coat and six dots can make marbles that you hold) using a ten frame. Which picture has more dots? How can we find out?
Grade One	
• investigate number meanings (e.g., the concept of 5) • represent addition and subtraction sentences (e.g., 5 + 6 = 11) using concrete materials (e.g., counters)	As the story is being read, students place counters on a ten frame to represent the number from the book. Students investigate number meanings by describing the number on the ten frame in a variety of ways e.g., I have 5 counters. 5 is 5 less than ten. 5 is 1 more than 4. 5 is 1 less than 6. What can you tell me about 5?
Grade Two	
• investigate the properties of whole numbers (e.g., addition fact families, 3+2=2+3) • use one fact family to find another (e.g., use fact families or adding on) • mentally add and subtract on-digit numbers;	Compare the strategies used (fact families, adding on) to keep a mental running total of the number of dots on the pages as the beginning pages of the book are read. How can you use fact families or adding on to find 1+2+3?
Grade Three	
• demonstrate and recall multiplication facts to 7 x 7 and division facts to 49 ÷ 7 using concrete materials	Students demonstrate and recall multiplications facts by using concrete materials to show the number of dots needed for the pictures on a page if the number of pictures were doubled, tripled, quadrupled, etc. What do you notice about numbers that are doubled and quadrupled?

▲ Geoboard Activities for Primary Mathematicians

On and In

Pegs that touch the elastic are ON.

Pegs that are inside the elastic but not touching are IN.

Build on your geoboard as many different shapes for each of the following.

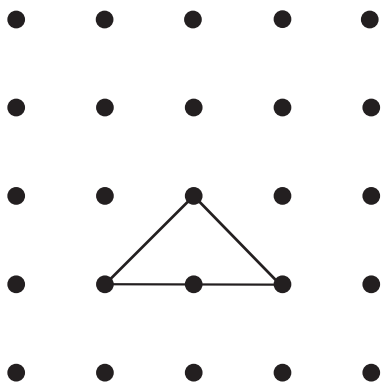
Record your answer on geopaper.

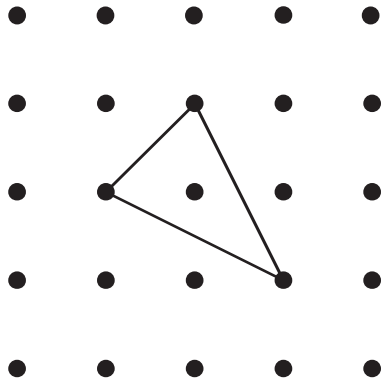
a) 4 on, 0 inside
b) 4 on, 1 inside
c) 4 on, 2 inside
d) 3 on, 0 inside
e) 3 on, 1 inside
f) 5 on, 0 inside
g) 5 on, 2 inside
h) 5 on, 3 inside
i) 4 on, 1 inside
j) 6 on, 0 inside
k) 6 on, 1 inside
l) 7 on, 0 inside
m) 7 on, 1 inside
n) 8 on, 0 inside
o) 8 on, 1 inside
p) 9 on, 1 inside

Have the students make up some of their own.

Triangles Galore

Make as many 6-peg, 7-peg, 3-peg triangles as you can.





Make as many 6-peg, 7-peg, 3-peg, 4 peg triangles as you can.

What is the greatest number of pegs you can get for a triangle on a 5 by 5 geoboard?

▲ What Do You see When You Look? Doing mathematics on the Geoboard

1. Shapes on the Geoboard

   How many different shapes can you make on a geoboard with an area of three square units?

   Now look at all the shapes you have made, in addition to the fact that all have the same area, what else do you observe?

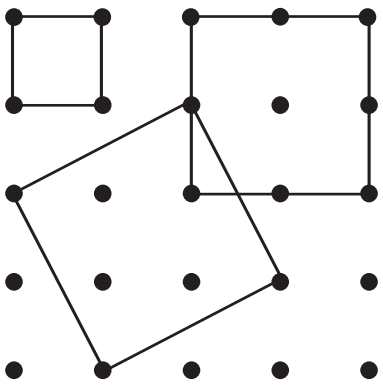
2. Triangles on a Geoboard

   Imagine an infinitely large geoboard.

   Would you be able to make triangles of area 1, 2, 3, 4, … square units on it?

3. Square on an N by N Geoboard

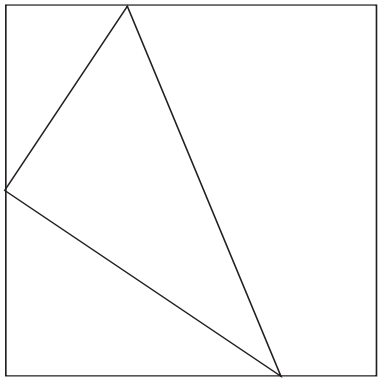
   The diagram below shows some non-congruent squares on a 5 by 4. What is the total number of squares that can be made on a 5 by 5 board?



4. We divided the sides of a square that was made on a geoboard into different numbers of equal sections.

   As the diagram below shows, we connected three points.

   Your task is to determine the fraction of the square that is the shaded triangle.

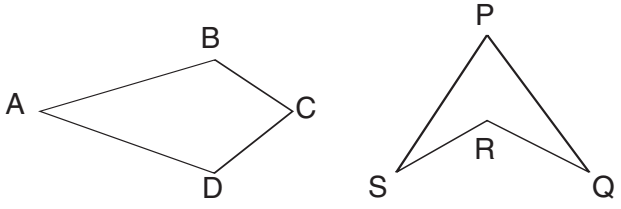


5. How many different 'types' of quadrilaterals can you make on your geoboard?

   You will first of all need to determine what "different 'types'" of triangles mean.

   Once you have made the triangles, classify them in as many different ways as you can.

6. Make some kites on your geoboard.

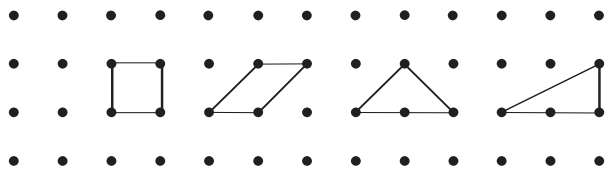


   Derive a formula for finding the area of any kite.

▲ Discovering Pick's Rule

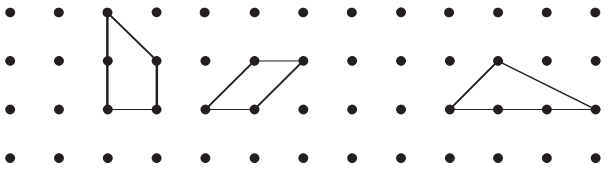
1. These shapes are each made by joining four points, with no points inside the shape.

   What is the area of each shape?

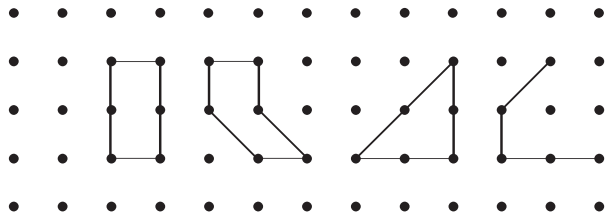


2. These shapes are each made by joining five points, with no points inside the shape.

   What is the area of each shape?



3. What is area of each of these shapes?



4. Investigate other shapes with different number of points on the shape.

5. What would be the area of the shape if you were to join:

   a) 22 points?

   b) 30 points?

   c) 100 points

   How did you arrive at your answers?

Pattern Blocks

1. Determine the angles of each of the pattern blocks.

2. Use pattern blocks to make a polygon such that the sum of its angles is the same as the sum for an octagon.

3. Use pattern blocks to make a polygon such that the sum of its angles is less than the sum for the decagon but more than the sum for the octagon.

4. Use pattern blocks to make a polygon such that the sum of its angles is greater than the sum for the octagon.

5. If a pattern block polygon had 15 sides, what would be the sum of its angles?

   How did you arrive at your answer?

6. If the sum of the angles of a pattern block were 41410˚, how many sides would it have?

   Use diagrams or words to explain how you arrived at your answer.

7. If the sum of the angles of a polygon block polygon were 450˚, how many sides would it have?

   Explain how you arrived at your answer.

8. What is the relationship between the number of sides of a pattern block polygon and the sum of its angles?

   Write a sentence or two to describe the relationship, or give a formula.