A Magic Trick
Amaze Your Friends

Pick any three-digit number.

Then turn it into a six-digit number by writing it twice. (For example, if your three-digit number is 289, your six-digit number is 289,289).

I don't know what number you have created, but I think it is divisible by 13. Am I right? Check and see.

After you divide by 13, I bet the quotient is divisible by 11. Check this out.

And I bet that quotient is not a prime number. In fact, I bet it is divisible by 7. Right?

Pick another three-digit number and repeat. Does it work now?

What is going on here? Will this always work? Convince your friends that it will always work – or find an example where it doesn't.

Strawberry Ice Cream Problem

Mr. Smith has three daughters. Some friends come to visit, and they want to know how old the daughters are.

Mr. Smith, a bit of a joker, says that the product of his daughters' ages is 72. The friends think about this for a while, and realize this is not enough information.

So Mr. Smith, who likes math very much, tells his friends that the sum of his daughters' ages is the same as his house number. The friends go look at the house number.

This helps, but the friends still do not know how old the daughters are.

Mr. Smith finally reports that the daughter who has lived the greatest number of years likes strawberry ice cream.

"Ahhhh," said the friends. "Now we know your daughters' ages."

How old are the three girls?

The Sums of Odd Numbers

Here is a pattern that seems to emerge from observing square numbers. The sums of odd numbers produce square numbers:

1 = 1 (a square number)

1 + 3 = 4 (another one)

1 + 3 + 5 = 9 (yup!)

1 + 3 + 5 + 7 = 16 (hmmm....... interesting.......)

1 + 3 + 5 + 7 + 9 = ____________ (well?)

Check a few more. Will this always be true?

If you don't think this will always work, come up with a counterexample (in other words, find a case where it does not work).

If you think it will always be true, find a way to show that it will always work (in other words, find a way to convince a skeptic.)

Paper Folding
(Big Time)

You are given a piece of paper (a very, very big piece) and a challenge:

Fold the piece of paper in half, then in half again, then in half again, and so on. You can see what is happening: the paper is getting thicker and thicker with each fold.

On which fold will the paper be thick enough to reach the moon?

It will help you to know that this piece of paper is 0.1mm thick (very typical paper).

Oh! It might also help you to know that the average distance from the earth to the moon is 384,003km. But since the earth and the moon are slinging around in space, the distance varies a bit. At its apogee (you can look that up), the maximum distance is 405,696km.

For simplicity, let's just say the moon is 400,000km away, and your folded paper needs to reach that high, OK?

Paper Folding
(Your Chance to Make a Guess)

Fold the piece of paper in half, then in half again, then in half again, and so on. You can see what is happening: the paper is getting thicker and thicker with each fold.

After which fold will the paper be thick enough to reach the moon?

The piece of paper is 0.1mm thick (very typical paper).
We will assume the moon is 400,000km away, and your folded paper needs to reach that high, OK?

Name:________________________________ Date:____________

Now that you have read the problem, make a guess!
Mathematicians do a lot of guessing!!!

a. Between 10 and 50 folds

b. Between 51 and 500 folds

c. Between 501 and 1,000 folds

d. Between 1,001 and 1,500 folds

e. Between 1,501 and 5,000 folds

f. Between 5,001 and 10,000 folds

g. Between 10,001 and 50,000 folds

h. More than 50,001 folds

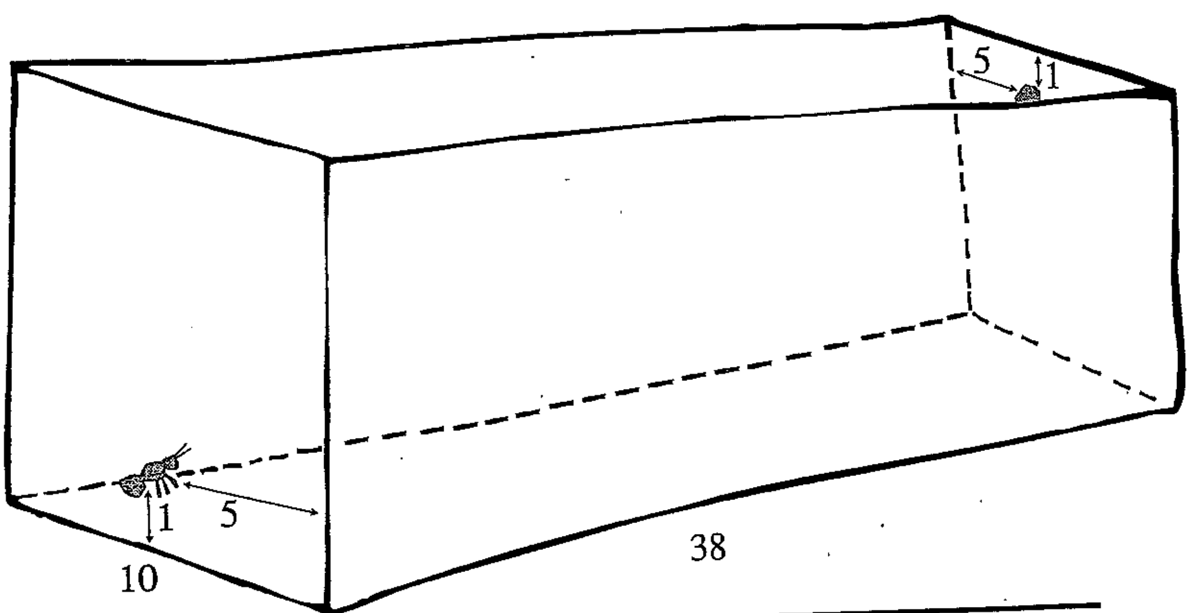
The Ant and the Crumb

There was once a very large, rectangular room. It contained only two things: an ant and a cookie crumb. The room had these dimensions:

It was 20 feet tall.
It was 38 feet long.
It was 10 feet wide.

The ant sat 1 foot above the floor in the middle of one of the small end walls. The cookie crumb is stuck on the middle of the opposite wall, one foot below the ceiling. The picture below will help you imagine how this looked.

The ant crawls to the crumb along the shortest possible path. How far did the ant crawl?



thought **PROVOKERS**
By Doug Rohrer
Drawings by Joe Spooner

Big hint: The shortest path includes both the floor and the ceiling. Hmmmm.......

A Supermagic Magic Square

This square with these numbers appeared in a famous painting exactly 500 years ago! Do you see where the painter hid the year 1514 in the pattern? Cool, huh?

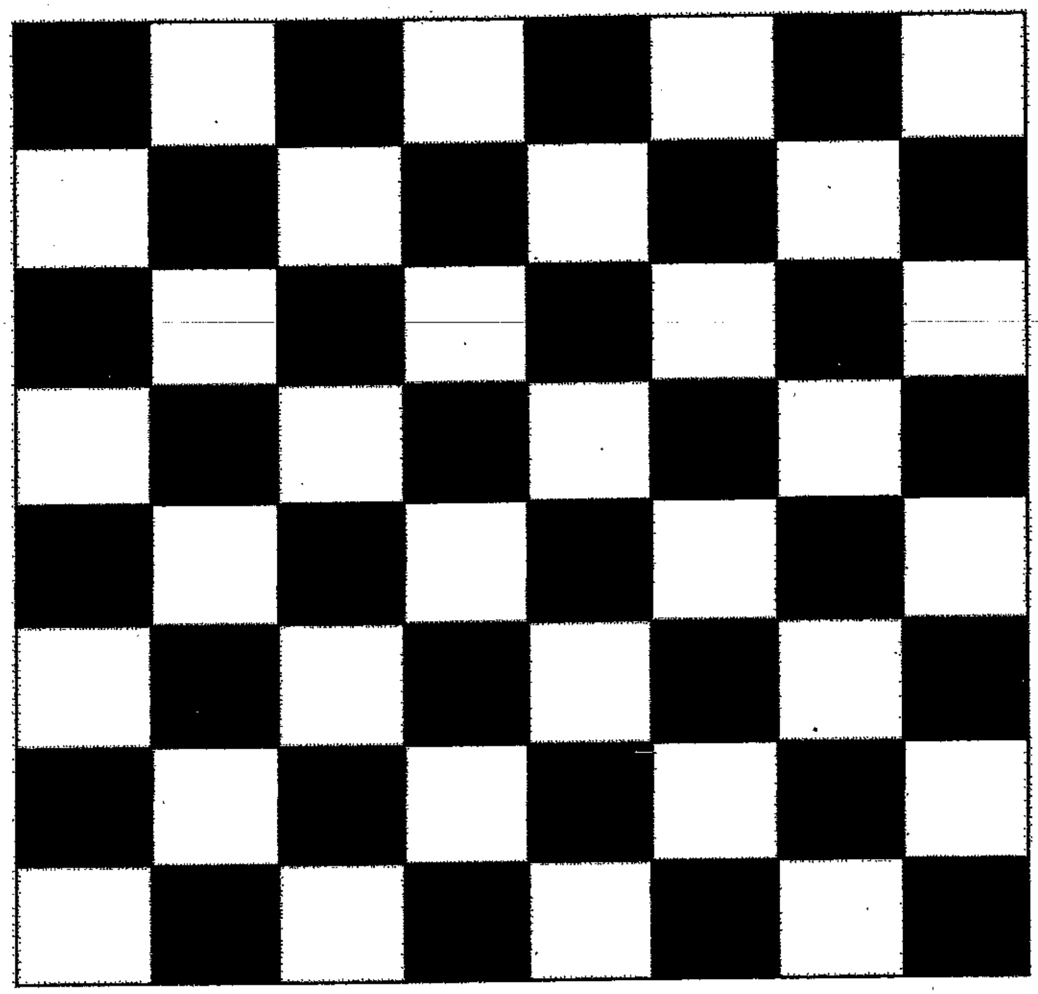
16	3	2	13
5	10	11	8
9	6	7	12
4	15	14	1

But that is not what makes this square magic, or supermagic. It is a magic square because it has a mystery number hidden in it many, many times.

The mystery number is 34. How many ways can you add together four squares to get 34? There are many. Try to count how many ways you can get 34 by adding four squares together. Try to find a way to keep track, and record all the different patterns.

Count the Squares

Look at this checkerboard. How many squares do you see?



In one class, a student saw one square.
Another student saw 64 squares.
Another student said 65.
Another student saw more.

Explain what each student was seeing.

How many squares do you see? Explain your answer completely.

Look for patterns. Explain the patterns that help you count efficiently.