July 7, 2008 *Test Day, The Sequel* Volume 5, No. 1

This issue

Quotes:

Anyone who cannot cope with mathematics is not fully human.Âă At best he is a tolerable subhuman who has learned to wear shoes, bathe, and not make messes in the house. –Robert Heinlein, [Ed. Note: I'm not necessarily condoning this. In fact, it sounds a little like something Hitler might have said.]

Proof is an idol before whom the pure mathematician tortures himself. – Arthur Stanley Eddington

Puzzles:

One: One of three switches on the ground floor of a building turns on a lamp in the attic. Your job is to find out which of the three switches works the lamp, but you are allowed only one trip to the attic to check the light. Can you figure out how to tell which light switch works?

Two: There is a secret word hidden in this matrix of letters. Can you discover it?

R	V	E	O	V	C
S	I	O	V	R	D
V	E	R	C	V	O
R	O	V	E	S	E
E	R	S	C	R	I
C	E	R	E	O	R

Mathematician of the Day

Srinivasa Ramanujan – 22 December 1887-26 April 1920, India

- S. Ramanujan was an Indian mathematician who studied under G. H. Hardy at Cambridge during WWI.
- Born poor in southern India, Ramanujan excelled in math as a child and earned a scholarship to study at Government College in Kumbakonam. He didn't enjoy subjects that were not math, however, and he failed most of them due to lack of study. He lost his scholarship as a result.
- Ramanujan tried twice and failed to receive his college degree, and he lived in poverty as he continued his mathematical research.
- In July, 1909, he married a nine year old. A little strange.
- Ramanujan took a ship from India to England in 1914, where he arrived to study at Cambridge with the mathematician G.H. Hardy. Ramanujan spent four unhappy years in England, away from his family and native India; but they were remarkably prolific years, mathematically speaking.
- A devout Brahmin, Ramanujan was required to give up his caste when he left Indian soil. This caused him great anguish and probably contributed to the poor health he developed while in England. The lack of fresh vegetables in wartime England also had something to do with his bad health, as Ramanujan was a vegetarian.
- In 1919, Ramanujan returned to India and he died shortly thereafter from tuberculosis and a vitamin deficiency. His notebooks, filled with mathematical results that are still being deciphered and studied, are seen as some of the greatest accomplishments ever achieved by an amateur mathematician.
- An interesting anecdote is told about the Ramanujan-Hardy number, which is the smallest number that can be written two different ways as the sum of two cubes. The R-H is a four-digit number that is Tim Weatherall's favorite number, and is, in fact, his ATM PIN.

Info From: `http://en.wikipedia.org/wiki/Ramanujan`

Mathematics Spotlight: Surfaces

A 2-manifold is what topologists call a surface. There are many types of surfaces, so mathematicians have a way to classify them. One classification system consists of four categories: number of sides, orientable/non-orientable, number of handles, and bounded / non-bounded.

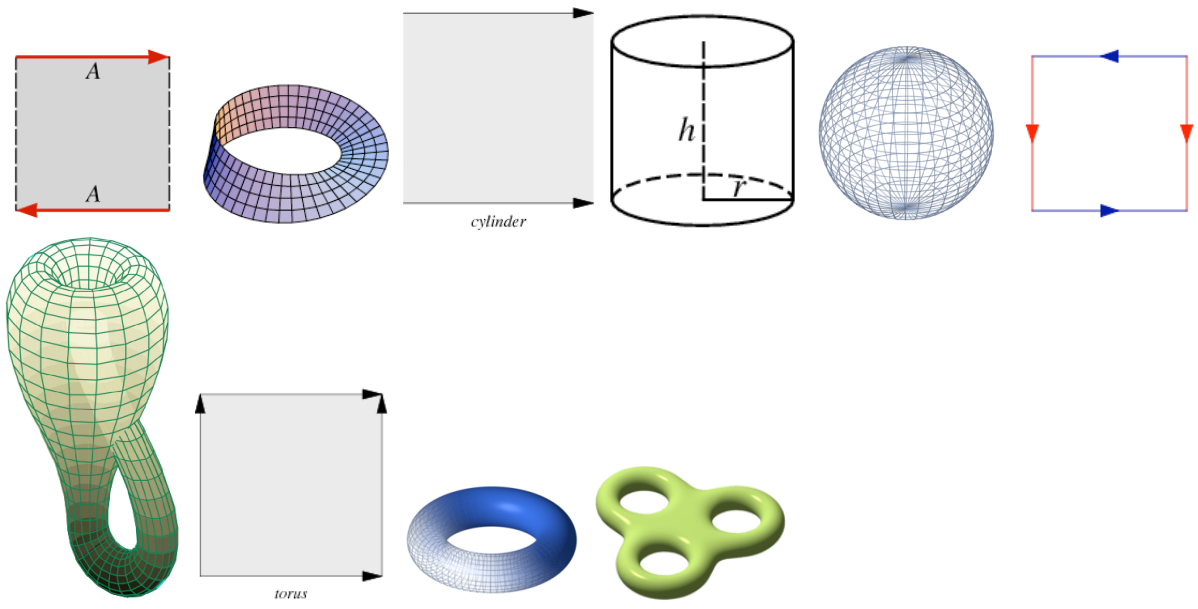
The first category depends on the number of sides a surface has, in our examples, they will have either one or two sides. But how can a surface have only one side you say? Easy! A Mobius strip has only one side to its surface. If you take a Mobius strip and trace a line along the middle of the strip, you will come back around to your starting point without lifting your pen. This demonstrates its one-sidedness. A cylinder, on the other hand, has two sides to its surface.

An orientable surface is one that has a definite inside and outside (must have two sides to do this). Since a Mobius strip has only one side, it is non-orientable. Another way to think about it is, if you filled the shape up with a liquid, would the liquid spill out? Clearly, if you fill the cavity of a sphere with liquid, none of the liquid could escape. However, the Klein bottle is not orientable. The Klein bottle is made from taking a square (as shown below) and gluing the opposite sides together so that the arrows match up. If you try to actually do this, you will notice that it is not possible in the 3rd dimension. The Klein bottle is a two dimensional surface embedded into the 4th dimension! If you tried to fill its cavity with liquid, it would flow right back out again, so it is not orientable.

A handle in a surface can be thought of like the handle of a coffee cup. It is a "hole" in a surface (like a coffee cup handle), but it is not a break in the surface. A torus is a great example of this. Topologists think of a torus as taking a square and gluing the opposite sides together. A surface can have more than one handle, as shown in the 3-handled figure below. A sphere does not have a handle since you would have to puncture the surface to reach your hand through, and a cylinder does not have a handle because you would have to reach through the "inside" to reach through it. If I reach my hand through a torus, my hand stays on the outside of the surface.

A bounded surface is one that has an edge, i.e., if you trace your finger over the surface, you will come to a stopping point somewhere. A cylinder has two edges, a Mobius strip has only one edge. So both of these surfaces are bounded. A sphere has no edge (while tracing your finger across the surface, you will never meet a stopping point), so it has no boundary. What other shapes have no boundary?

From a topologists stand point, if two surfaces have the same classification in all four categories, then they are the same. For example, the surface of a cube and the surface of a sphere are "topologically equivalent." What other surfaces that we would normally think of as different, turn out to be equivalent to a topologist?



http://en.wikipedia.org/wiki/Torus
http://en.wikipedia.org/wiki/Kleinbottle
http://en.wikipedia.org/wiki/M%C3%B6biusstrip