Math Reader

COSMIC MATH!

Math Reader

Contents

SWT

Benjamin Banneker

Benjamin Banneker, the grandchild of an African slave and an English indentured servant, was born in 1731 in Maryland. He grew up on the family farm where his grandmother Molly taught him to read from the family Bible. Later he attended a Quaker school where his interest in mathematics began.

At the age of twenty-one, Banneker saw a watch. He was so fascinated by this new watch that the owner gave it to him. Banneker took apart the watch to figure out how it worked. He began to carve clocks out of wood. Soon he invented a clock of his own, which was the first striking clock in America. Banneker's clock was extremely accurate. It told the time correctly, striking every hour for the next forty years. He began to repair watches, sundials and clocks. Joseph Ellicott, another clock maker and Banneker became friends. Together they built a more complex clock. Joseph Ellicott and his brother lent Banneker books on astronomy (the study of the stars and planets) and mathematics and instruments for gazing at the stars. Banneker taught himself advanced mathematics so he could understand more about astronomy and clock making.

After his parents died, Banneker built a "work cabin" on the farm that they left him. He calculated things such as the stars' distances and published his observations in an almanac. Soon Banneker had another new project, surveying or measuring the "Federal Territory" with Major Andrew Ellicott and Pierre L'Enfant, the architect in charge of planning the new capital Washington, D. C. L'Enfant was fired from the project because of his temper. In a rage, he took the plans for the project with him. Banneker recreated the plans from memory, saving the U. S. government countless hours and dollars.

Banneker had a reputation for being a great problem solver and could work any math problem given to him. He achieved great things and has been referred to as the first African American man of science and mathematics. He said: "The color of the skin is in no way connected with the strength of the mind or intellectual powers."

by Laura Chavkin, who attends Yale University

Source: www-history.mcs.st-andrews.ac.uk/history/Mathematicians/Newton

PROBLEMS OF THE MONTH

1. A strange country has 5 cent coins and 8 cent coins and no other form of money. How could you pay for an item that costs 14 cents at a store and receive the correct change?

2. At a book sale some books are selling for $4 and others are selling for $7. Dan spends $37 on some of these books. How many of each kind did he buy?

3. Find the next numbers in the sequence:
   2, 4, 3, 6, 4, 8, 5, __, __, __ ...

4. A zoo has an equal number of one hump camels and two hump camels. The zoo keeper computed that there are 57 camel humps at the zoo. How many camels are at the zoo?

5. How many 3-digit numbers contain the digit 2? How many 3-digit numbers contain the digit 5. How many 3-digit numbers contain both a 2 and a 5?

6. There are 23 students in Ms. Garcia's class. 16 students each have a dog and 18 each have a cat. 14 of the students have both a cat and a dog. How many students have neither a cat nor a dog?

7. Light travels at 186,000 miles per second. How far does it travel in 1 minute? in 1 hour? in 1 day? in 1 year?

8. The sun is a distance of about 93,000,000 miles from the earth. If there were a solar flare on the sun, how soon would we on earth see the flare occur? In other words, how long will it take light to travel from the sun to the earth?

Model for Neighbor

A scale model is like a photograph that has been either reduced or blown up to show something more clearly. For example, a globe of the Earth is a scale model -- it's as if you reduced the Earth to a size where you (like a giant alien!) can look down and get an idea where things are, and you can compare the relative sizes of objects. In real life, Texas is just a little bigger than two New Mexicos, and if you look at a globe you'll notice that you should be able to put two New Mexicos (with some cutting!) to fit inside of Texas. If you were able to climb aboard your spacecraft and get out into space, then the Earth really would look pretty much like what you see on the globe. Most television weathercasts include satellite photographs of the United States where you can get an "alien's eye view."

One of the most amazing things about the solar system (our Sun with its planets, asteroids, and comets) is how much space there is among the planets. You may have seen posters of the planets or a diagram of the solar system, but usually these do not accurately model both the sizes of the planets as well as their distances. So, what would an accurate model of the Earth's neighborhood look like? To get an idea of this, let's get into our alien spaceship and back away from the earth until we get a good view of the Earth and the moon.

Visualizing the near-Earth environment

We will assume the globe you found is 1 foot in diameter (12 inches or 30 centimeters). Imagine the Earth turning once around in 24 hours -- it would not appear to be spinning unless we watched it for a while. After all, the hour hand on a clock moves twice as fast as our globe would because it has to go around twice in 24 hours.

Look at the globe. How far above the Earth's surface do you think the air goes? How far above the Earth's surface does the Space Shuttle go (it travels above the air when it's in orbit around the Earth)? Using a ruler with metric markings, find out how long a centimeter is, and find the millimeter markings. How far above the earth's surface would the outer limit of the atmosphere be? With an earth this size, the atmosphere, which in reality extends out to about 100 miles, would be only 4 millimeters tall. All the clouds, rain, snow, mountain peaks, and jet planes would occupy that thin layer. The layer we live in on the Earth's surface is amazingly thin.

The Space Shuttle flies at about 200 miles above the Earth's surface, which corresponds to 8 millimeters on the globe. Imagine a tiny speck 8 millimeters above the globe that goes completely around in an hour and a half -- that's the Space Shuttle! Place the "Space Shuttle" over your town -- remember-- 8 millimeters above it. Find some nearby cities -- could they see the Space Shuttle? Imagine you were an astronaut on the Space Shuttle and were directly over your home town. Put your eye 8 millimeters above the surface of the globe. What would it look like? You certainly could not see the whole ball of the Earth at once!

If you watch the weathercast on television, you will see "satellite pictures" taken of the Earth's clouds. These pictures were taken by a satellite which, using our globe, is about 3 feet away from

the Earth's hood

by Kevin Jones

Earth directly over the equator. Satellites over the equator at this distance go around the Earth in 24 hours, so they seem to be above the same spot of the equator all the time. Put your eye 3 feet away from the Earth and imagine you were that satellite looking at Earth. How much of it could you see?

Visualizing the Earth's place in the Solar System

The Moon is the Earth's natural satellite. If the Earth were a 1-foot globe, then the Moon would be about the size of a baseball. Take a baseball and step away from the Earth until you think you are the distance that an alien in a spacecraft would see the Earth and the Moon. The correct distance should be about 30 feet, or just over 9 meters away from the Earth globe (this corresponds to the actual distance of 240,000 miles). Mark off this distance, stand where the Earth globe is, and look at the baseball Moon. Did you know that the REAL Moon looks THIS small as seen from Earth? If you are like most people, you will find that hard to believe -- you would think the Moon looks larger than THAT. Don't take my word for it -- try it! Stand where the baseball Moon should be. Imagine you are an astronaut walking on the Moon and you looked at the Earth -- that's how big it would look to you. Can you pick out the continents?

If we sat in our spaceship for a whole day watching the Earth and Moon, we would see the Moon move in an arc about the Earth. Have someone hold the string at the Earth and you at the Moon. Walk about a meter (3 and a half feet) keeping the string (representing gravity) tight, in the direction "west to east." For example, if you started over California, walk in the direction of Florida. If you did this for about 27 days, then you would see the Moon completely circle the Earth. In fact, our word "month" comes from the word "moon." The astronauts travelled for three days to get to the moon, which means on our model they traveled about 3 meters per day towards the Moon, which moved 3 meters while they were traveling. They had to anticipate where the Moon would be, and to make everything come out just right they had to use a lot of mathematics.

If we wanted to show the Sun accurately, it would be a ball about 110 feet (33 meters) in diameter (bigger than just about anyone's house!). Go outside and mark off that distance, and compare it to the Earth.

Equipment needed: standard (1-foot) globe of the Earth, small ruler marked in millimeters, a yardstick or meter stick, ten meters of string.

Even though the Sun is very big, it is far away; with this model, it would be located about two miles (3,500 meters) away. At this distance, this great ball

Puzzle Page

A traveler arrived at a motel. On his way he was robbed of all his possessions except for a necklace made of 7 golden coins connected to each other by little rings. The owner of the motel offered bed and food for a coin every day. The traveler paid his bill every evening. How could they do this without having to cut off every coin from the necklace, even if the traveler stayed for 7 days?

MONEY MONEY MONEY
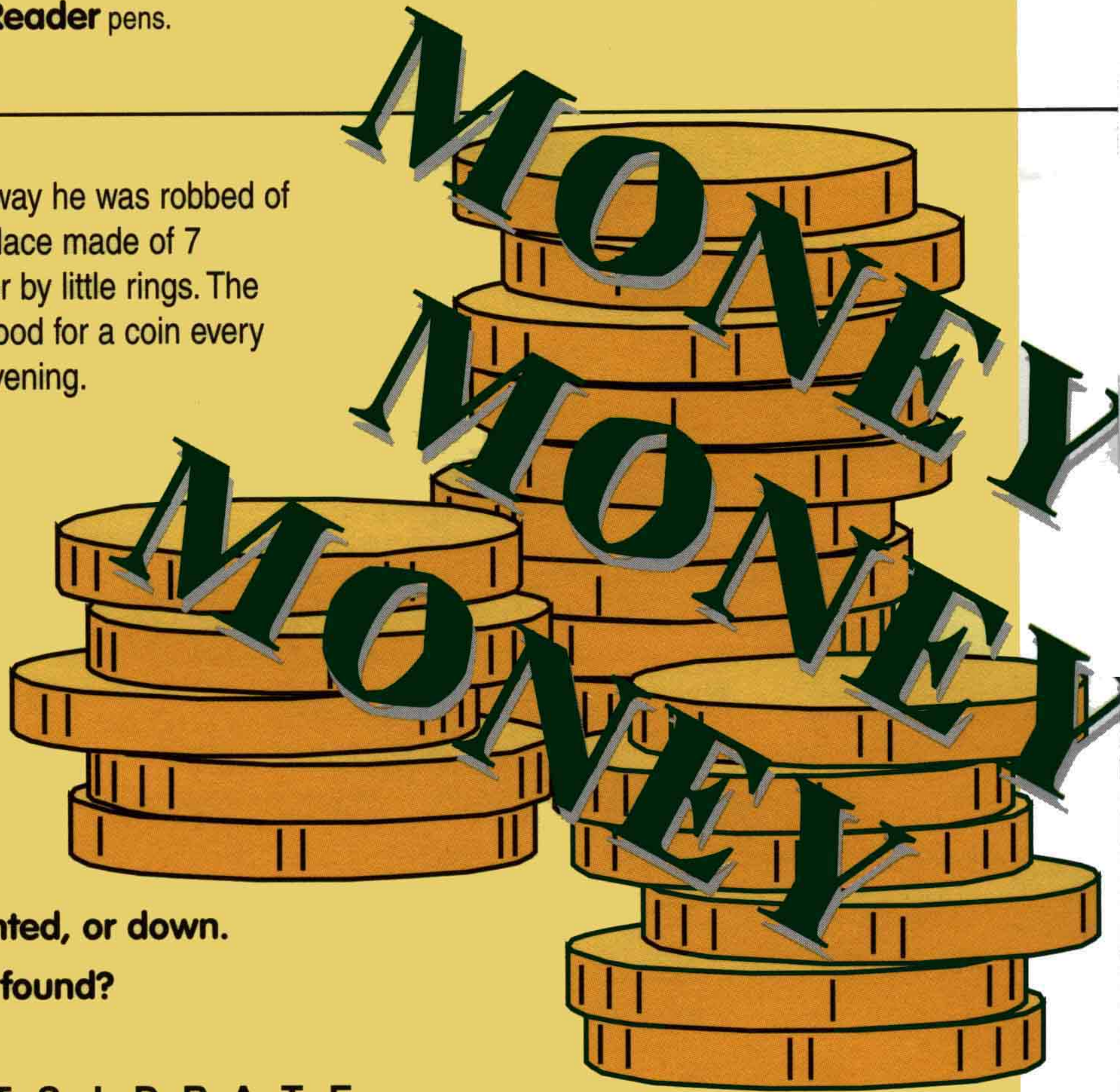
Word Search

Forwards or backwards, up, slanted, or down.

Where can the words in this puzzle be found?

TIME

DISTANCE

SPEED

RATE

STAR

PLANET

ORBIT

PARABOLA

GRAVITY

FORCE

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Q R E C N A T S I D R A T E
S T E I G I T I A E E P A T
P H T O S R I L F Q E A D R
E G R M M U O O U R O G A I
E I E N I B R E S S I R K J
D E O R A C N P L E E A I N
V H R R E C E C E R A V R U
T L A O E E M I T E N I L P
K P A T T A I O I L G T K B
P E R I M E T E B E L Y L E
R U V O A B L G R N R R A R
T E R G N L A O T M E W X
D I R G T E N A L P A T R M
Z N X I T C E L E S T A R I
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Relocate two toothpicks so that the house is facing in a different direction.
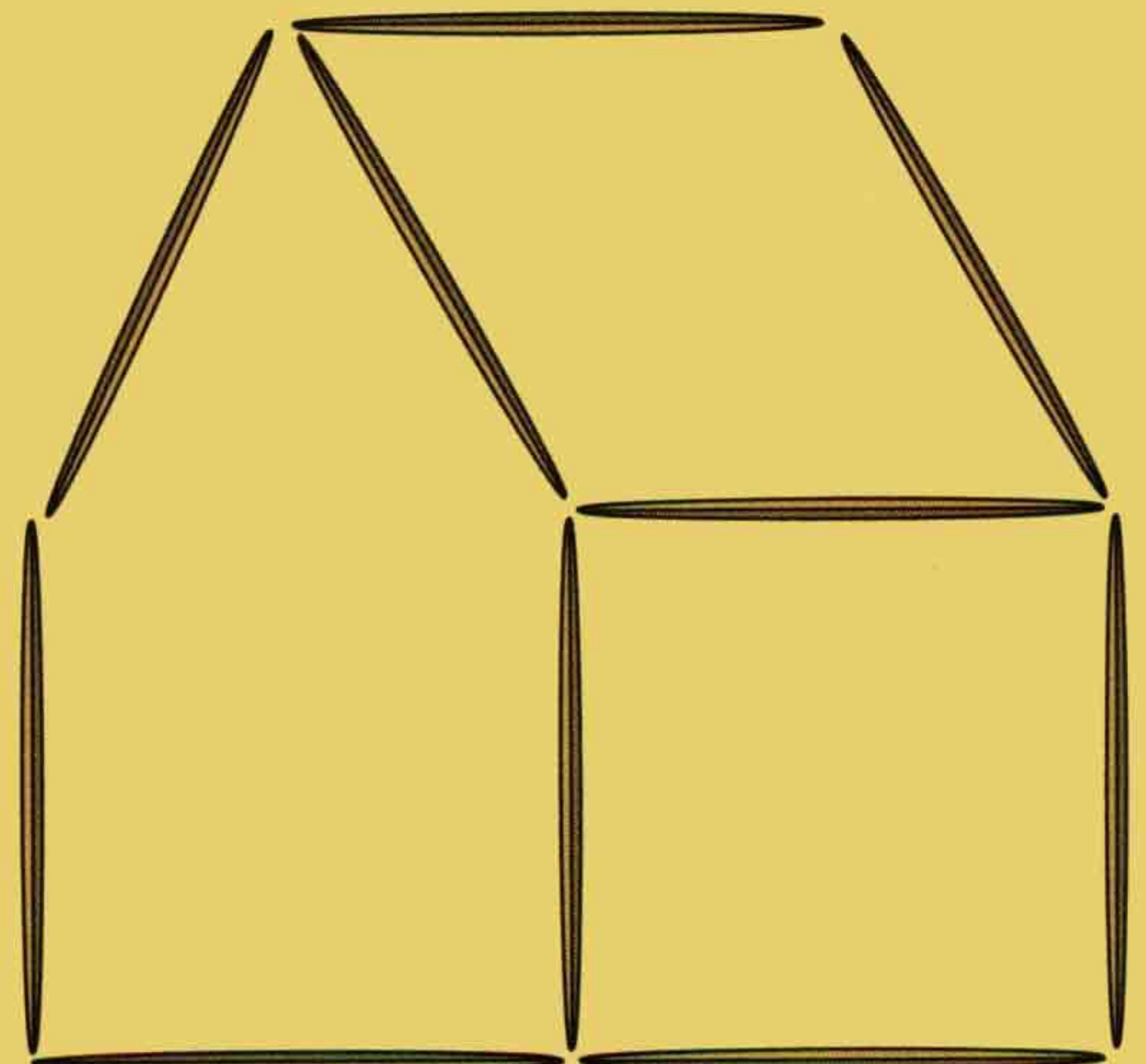
Bulletin Board

Check it out!

Did you know that there are over 50 workshops for teaching elementary/middle school mathematics? You can check them out on the internet at **http://www.nctm.org/information/mathforum-workshops.html**

Thanks to our Sponsors

Southwestern Bell Communications (SBC) Foundation sponsored the Rio Grande Valley Summer Math Program, which was coordinated by Adelina Alaniz from Mission. Participating school districts included McAllen, Donna, Progreso, and Mission. Welcome to our new partners! And a special thanks to SBC which made the program possible!

Earth's Neighbor's (cont'd)

would look almost exactly the same size as the Moon (the baseball) does when it is 30 feet from the Earth globe. That's why, during a total eclipse of the Sun, the Moon can just barely fit over the visible surface of the Sun as seen from Earth.

The planet furthest from the Sun, Pluto, would be over eighty miles away! If we want to imagine the Sun and planets with the proper sizes, we must "shrink" our model down a lot. But before we do that, let's compare the Sun and its planets: you can see why it's hard to put the planets on a poster where they are the correct distances apart -- the poster would have to be miles across!

Object	Actual diameter	Shrunken Diameter	
Sun	830,000 miles	110 feet	large house
Mercury	3000 miles	4 inch	softball
Venus	7400 miles	11 inch	globe like the earth
Earth	7900 miles	12 inch	globe
Moon	2100 miles	3 inch	baseball
Mars	4100 miles	6 inch	cantaloupe
Jupiter	88,000 miles	11 foot	average car
Saturn	73,000 miles	9 foot	small car
Uranus	31,000 miles	4 foot	washing machine
Neptune	30,000 miles	4 foot	dryer
Pluto	1400 miles	2 inch	tennis ball

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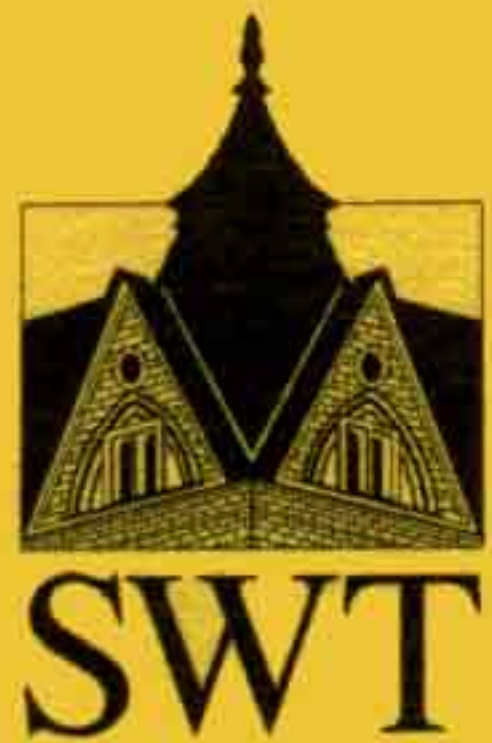
Dear **Math Readers**!

From the time of the Babylonians and earlier, mathematics and astronomy have been linked closely together. We at Math Reader hope you will enjoy reading about some of the connections in this issue. Write to us of other interesting connections that you discover!

Please continue to send us your ideas and solutions to puzzles and problems so that we can share them with our readers.

Sincerely,

Hiroko K. Warshauer

Hiroko K. Warshauer

Math Reader

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