

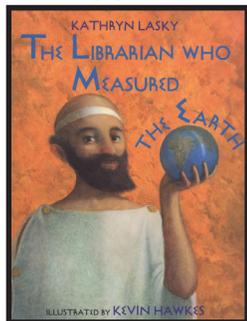


CRUCHLEY'S COLLECTION

Diana Cruchley is an award-winning educator and author, who has taught at elementary and secondary levels. Her workshops are practical, include detailed handouts, and are always enthusiastically received.

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THE LIBRARIAN WHO MEASURED THE EARTH



The biography of the ancient Greek mathematician and librarian who measured the circumference of the earth, with an error of only 200 miles, at a time when people didn't even know for sure the earth was round, using math alone.

Kathy Lasky, Little Brown and co., ©2004, ISBN 0-316-51526-4

ANCIENT LIBRARIES

The Library at Alexandria was the greatest library on earth for over 1000 years. There were over 700,000 rolls of papyrus in their collection of "books." You couldn't take a book out, so a librarian would help you find the scroll you had in mind.

For Rapid Research it would be great for students to find out everything they can about the following libraries or book collections and write their own "book" of 200-400 words:

1. The Library at Alexandria
2. The House of Wisdom
3. The Library at Ephesus
4. The Library of Constantinople
5. The Burning of the Mayan Books
6. Hitler's Book Burning
7. The Cordoba Library - Library of Al-Hakam III

LOSING YOUR ABILITIES

In his old age, Eratosthenes lost his eyesight. He was a great scholar, mathematician, and librarian. Rather than being forced to live without reading, he killed himself by refusing to eat. Ask students to decide which of their abilities they would keep if they had to lose all of them except one. For each ability, how would they cope? For the one left - why is that the most important?

LOOK LIKE A MATH GENIUS - THE 11 X TABLE

Teach students how to multiply a two-digit number, in their head, faster than a calculator.

$$43 \times 11$$

Answer:

The first number is **4**

The last number is **3**

The middle is their sum or **7**

The answer is **473**.

Tell them to say it slowly, to impress their friends.

But, what if the sum of the first and last number is more than 10?

$$56 \times 11$$

Answer

The first number is the number plus 1 or **6**

The last number is **6**

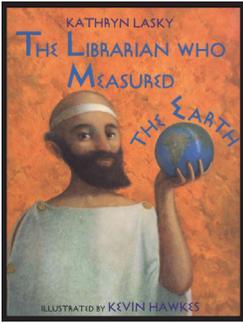
The middle number is 5 plus 6 -- take the **1**

The answer is **616**

PERSONAL WRITING

A springboard from a picture book to personal writing should provide at least three topics if possible. Here are some ideas:

1. My stories about going to the library, taking out books, reading on a tablet.
2. The future of books. Eratosthenes read on a scroll; scribes handwrote books, then came the printing press, now the internet and e-books. What is the future of the library? newspapers? magazines?
3. Eratosthenes had the nickname *Pentathlus* meaning champion in 5 contests - in his case intellectual ones. Talk about nicknames - yours, others, famous people's nicknames, opinion about nicknames, etc.



THE LIBRARIAN WHO MEASURED THE EARTH, CONT.

MATH VOCABULARY STORIES

Give students a list of math terms commonly used at their grade level. Ask them to make up a story using as many terms as they can in the story...minimum of 6. Ask them to highlight them in their finished story – so that you can count without having to hunt through the entire tale.

- | | | |
|--------------|--------------|-------------------------|
| • area | • diameter | • square |
| • circle | • triangle | • pyramid |
| • cube | • product | • add |
| • subtract | • divide | • multiply |
| • average | • decimal | • millimetre |
| • centimetre | • metre | • gram |
| • litre | • odd number | • even number |
| • fraction | • integer | • angle, and lots more. |

THE MATH OF ERATOSTHENES

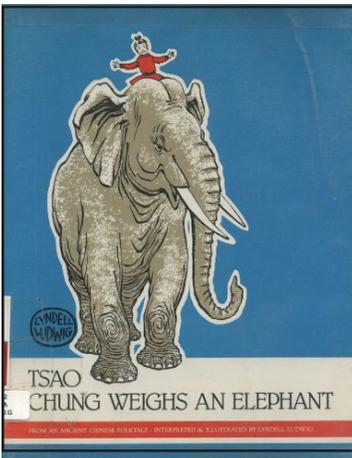
Eratosthenes contributed a great deal to science. Two of his contributions can be understood easily by students;

1. An easy way to find the prime numbers between 1 and 100. Call *The Sieve of Eratosthenes*.
2. *The Measurement of the Circumference of the Earth*. This seems to me to be truly astonishing when you consider that whether the earth was round or not wasn't "settled" until the 15th century. This is like, "Well, if the earth is round, then this is the size of it."

See the attached pages for an explanation.

OTHER BOOKS ABOUT MATHEMETICIANS

Here are a few interesting books about the work of mathemeticians (or scientists with a mathematical bent).

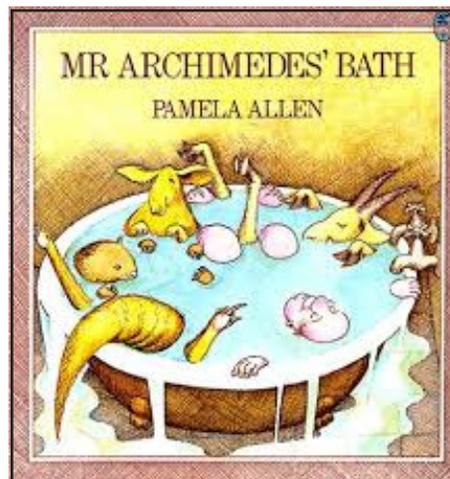


Ts'ao Chung Weights an Elephant...

is the story of the using the displacement of water to weigh an irregularly shaped object - like an elephant.

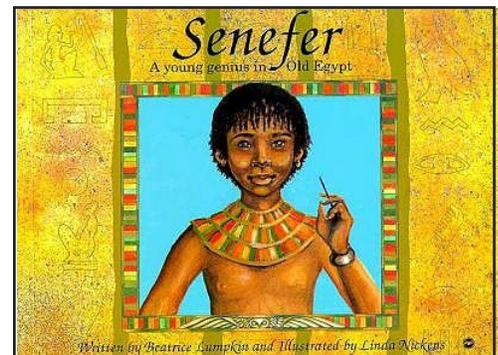
Mr. Archimedes Bath

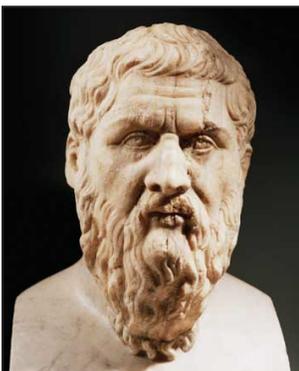
Archimedes has been charged with telling whether the king's crown is really made of gold. The "Eureka" moment famously occured in his bath.



Senefer – A Young Genius in Old Egypt

Senefer is an African child, who becomes a famous mathematician, and builder of obelisks and temples for Hatsephut. This book demonstrates the integration of math into "regular" life.





THE SIEVE OF ERATOSTHENES

FINDING THE PRIME NUMBERS BETWEEN 1 AND 100

A prime number is a whole number that can only be divided by itself and by 1.

The first four of the prime numbers are **2, 3, 5,** and **7**. Those are the only prime numbers you need to remember for the sieve.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- Cross out 1, because it is not classified as a prime number.
- Circle 2. Then cross out every second number after 2.
- Circle 3. Then cross out every third number after 3. Some numbers will be crossed out more than once.
- Circle 5. Then cross out every fifth number after 5. Again, some numbers will be crossed out more than once.
- Circle 7. Then cross out every seventh number after 7. Some numbers will be crossed out more than once.
- Circle every number not yet crossed out.
- Make a list of the primes.

QUESTIONS FOR UNDERSTANDING WHY THE SIEVE WORKS?

- Why do you cross out every second number after 2?
- Similarly, explain why you cross out every third number after 3? Every 5th number after 5? Every 7th number after 7?
- Why are prime numbers always odd numbers?



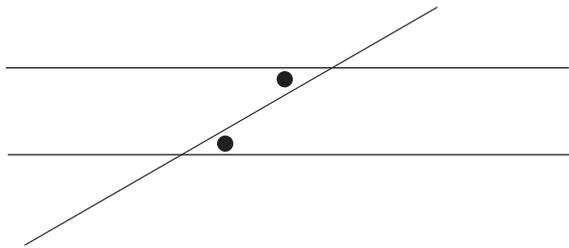
ERATOSTHENES MEASURES THE EARTH

Greeks were very interested in geometry and established many universal truths. One of these truths is:

**If two parallel lines
are cut by a transverse line,
the alternate interior angles
are equal.**

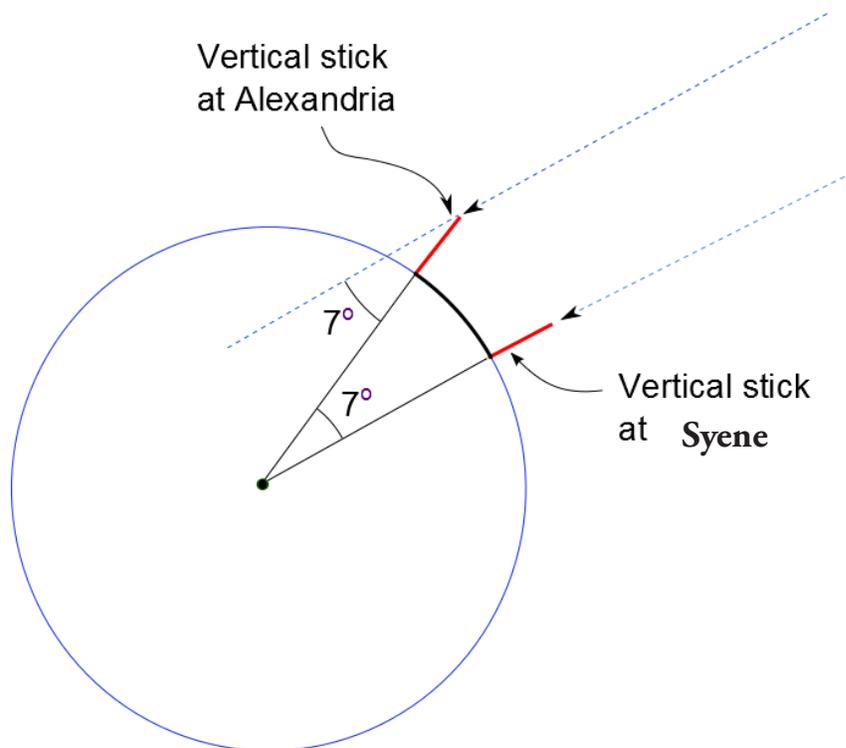
What do these words mean?

1. **LINE** is the shortest distance between two points. (In other words it is straight.)
2. **PARALLEL** means two lines that are equally apart and never meet
3. **TRANSVERSE** means a line that crosses another line
4. **ANGLE** is the measurement of the degrees between two touching lines.
There are 360 degrees in a circle.



Math doesn't always look practical at first, but look at how Eratosthenes used that simple fact to measure an object that might not even exist...and only be out by 200 miles.

We assume that sun rays are parallel. The first stick went down a well at exactly high noon - no angle was cast. Then he measured the angle of a shadow at high noon in a city further away. That was 7 degrees. He knew the distance between the two spots and said, "If the angle at the surface is 7 degrees, and the line of the stick in Alexandria transverses the centre of the earth, then the interior angle there is also 7 degrees. If the distance between the two places is 805 km and 7 degrees is 1/50 of the circle, then the earth will be 40,250 km in circumference. **AMAZING!!!!** (actually 40,008 km)



ANCIENT LIBRARIES AND WHAT HAPPENED TO THEM?

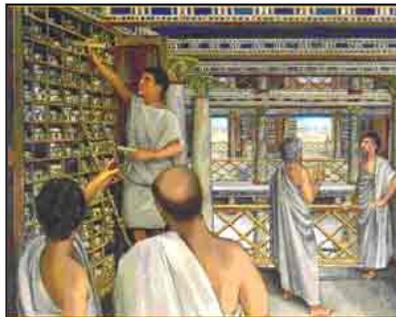
Here is a list of libraries, or destructions of libraries, for *Rapid Research*.

Choose a library. Using the internet, in a limited period of time find out:

1. What was this library, where was it located, why was it important? When did it exist?
2. What did the library consist of? - books, scrolls, papyrus, etc. How many?
3. Why is it an important library? - contribution to human progress (or destruction of progress)?
4. Who were the collectors of this library? How was this library destroyed or lost?
5. Include some images from the Internet of what the library and events around it might have been.



THE LIBRARY OF EPHEBUS



THE LIBRARY OF
CONSTANTINOPLE



THE LIBRARY OF
CORDOBA

ANCIENT LIBRARIES

1. The Library of Alexandria
2. The Library at Ephesus
3. The Library of Babylon
4. The Library of Constantinople
5. The Burning of the Mayan Books
6. Hitler's Book Burning
7. The Library of Cordoba - Al-Hakam III



HITLER'S BOOK BURNING



THE LIBRARY OF
CONSTANTINOPLE



BURNING MAYAN BOOKS