ERATOSTHENES' COMPUTATION

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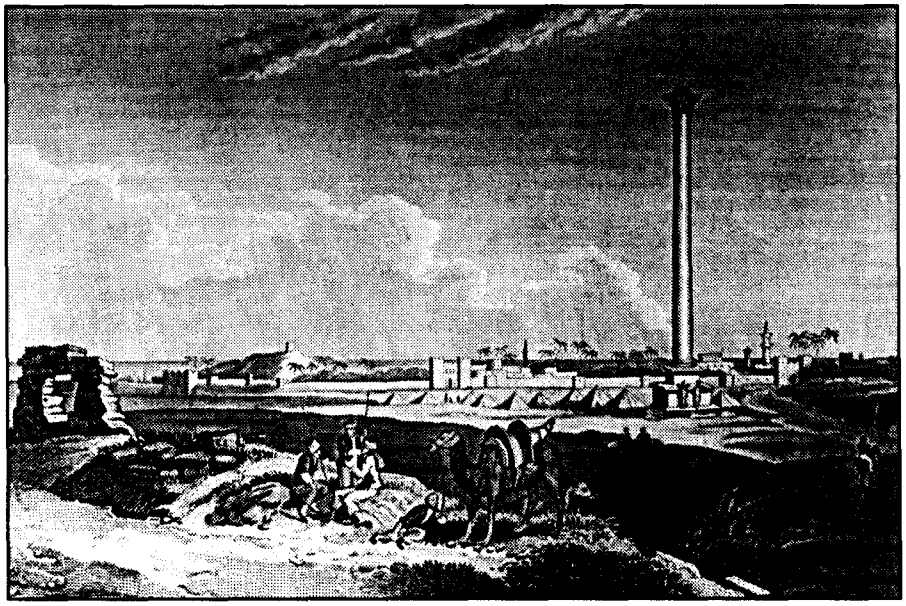
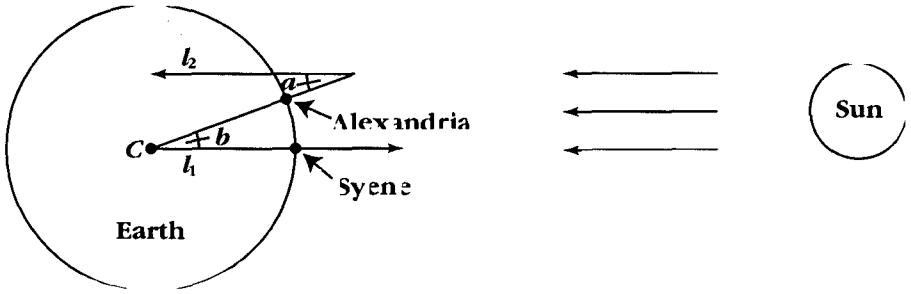


Alexandria, the capital of Egypt, as depicted by nineteenth-century engraver Samuel Walker.

In the third century B.C., Greek mathematician **Eratosthenes** (276-194 B.C.) performed an important function: He was the chief librarian of the library at Alexandria. Established during the fourth century B.C., this famous library was a sort of university where scholars and students could meet to discuss philosophy and literature. By the time it was destroyed in the fourth century A.D., the library had collected and organized over 500,000 Greek works on thousands of topics, making it a center for research and learning in the Egyptian and Greek worlds.

In addition to administering the library, Eratosthenes was an accomplished mathematician who is well known for his attempt to measure the circumference of the earth. Using only simple geometric concepts, his measurement was remarkably accurate. Eratosthenes observed that at the ancient city of Syene (now Aswan) on the Nile, a vertical pole cast no shadow at noon on summer solstice. He knew that during this same time in the city of Alexandria—on the same meridian as Syene—the angle formed by a vertical pole and the segment from its top to the tip of its shadow (point a in the figure) was about 7°12′, or about $\frac{1}{50}$ of a complete circumference. He also knew that the distance from Syene to Alexandria was 5,000 Greek *stadia*. Assuming that the sun's rays are parallel (making $a = b$) and letting C represent the center of the earth, he was able to calculate the number of *stadia* in the circumference of the earth.



A *stadium* (the singular form of *stadia*) is approximately 516.7 feet. If we convert Eratosthenes' calculations into miles, we can show that the error in his measurement of the earth's circumference was well under two percent. ★

ACTIVITIES

1. Using Eratosthenes' figures, calculate the number of stadia in the circumference of the earth, then convert your answer to miles. Compare your result with what we now know to be the equatorial circumference of the earth (24,901.55 miles).

2. Research the Greek word *stadium.* How does it relate to the English use of the word today?

3. Eratosthenes attempted to calculate the distance from the earth to the moon and the sun. What methods did he use? How accurate were his computations?

4. What is the sieve of Eratosthenes? Demonstrate how it can be used to find prime numbers.

RELATED READING

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