Eratosthenes was a Greek astronomer who lived in Alexandria, Egypt about 2,000 years ago. He was interested in figuring out the size of the earth. Specifically, he was concerned about the circumference of the earth – in other words, how big it is around. Eratosthenes heard of a place in southern Egypt (Syene) where the sun shone straight down into the bottom of a vertical well on a very special day of the year - the summer solstice. The summer solstice is the day of the year that all observers in the northern hemisphere experience the longest duration of insolation (incoming solar radiation).

By measuring the angular distance of the noon sun at two different locations that were directly North and South of each other (Alexandria and Syene) on the exact same day of the year (the summer solstice), and by knowing that the 2 cities were 5,000 stadia apart, Eratosthenes was able to determine the circumference of our planet to within about 15% error! This was WAY before satellites, computers, or even cell phones! The diagram below summarizes Eratosthenes’ work – use this diagram to help you with the questions below.

1. Your job: Figure out the circumference of some imaginary planets just like Eratosthenes. Remember that the drawings are not to scale.

SHOW YOUR WORK AND YOUR UNITS!
(I set up this up one for you)
2a. BRAIN BUSTER – Part 1: Now that you have determined the circumference of imaginary “Planet D”, you can now use basic algebra to figure out the Diameter of this planet!

**NOTE:** You should round to the nearest whole number before doing the math for this question!
Remember how to correctly round numbers!!!

Formula: Circumference = \( \pi \) (use 3.14 not the button) \times\) Diameter (d)  
SHOW YOUR WORK!!!!!!!!

Calculated Diameter of Planet D = _______________
2b. BRAIN BUSTER – Part 2: The dimensions of Planet D match very closely (it’s o.k. if they differ slightly) to a planet you are familiar with in our solar system. Use your Handy Dandy ESRT’s Page 15 to determine which planet “Planet D” really is! NOTE: The ESRT’s lists the diameter of the planets in our solar system as “equatorial diameter”.

Planet D = ________________

3. You should note that your diameter calculation of “Planet D” on the previous page is approximately 34 kilometers different when compared to its diameter listed in the ESRTs (Hint: you may have calculated the polar diameter and not the equatorial diameter). Write a 1-2 sentence inference summarizing your thoughts on what you think may be causing this slight discrepancy (this difference)?

____________________________________________________________________________

____________________________________________________________________________

4. Your calculations of Earth’s shape on the previous page assume that the earth is a perfect sphere. However, what if the earth is not a perfect sphere? Instead, what if the earth is slightly bulged?

Using your ESRTs, and your earth calculations from page 2, is earth’s diameter slightly larger at the poles or at the equator? Why? (Hint #1: How do you feel around the holidays after a big meal? Hint #2: you came very close to calculating the polar diameter of earth on page 2.)

____________________________________________________________________________

____________________________________________________________________________

5. You are now ready to calculate the percent deviation for your calculated value versus the ESRT value! You are like Eratosthenes – but just 2,000 years later!

(HINT: You can use the ESRT diameter on pg. 15 of the ESRTs as the accepted value, and your calculated value from Planet D on page 2 as yours to calculate the % deviation.)

SHOW ALL OF YOUR WORK!!! (formula, plug-ins with units, circle answer with units!!!!!)
6a. Due to the Earth being *slightly bulged at the equator* - the right answer to question 4, the name we give to Earth’s shape is an **OBLATE SPHEROID**. Draw a picture of the earth with a bulge at the equator. Be sure to label the equator. You can exaggerate – have fun with it.

Your Drawing:

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6b. *However, it is VERY IMPORTANT to remember that the earth’s bulge is very slight.* How slight a bulge? Well, you calculated that the percent deviation between the polar and equatorial circumferences was only

\[
\text{______________} \%
\]

6c. So, at any reasonable scale, a perfect ________________ is the best representation of the earth’s shape.

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![Equatorial Diameter = 12,756 km
Polar Diameter = 12,718 km](image)

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**Fig 1: Map of Egypt**

FYI - Aswan used to be called Syene.