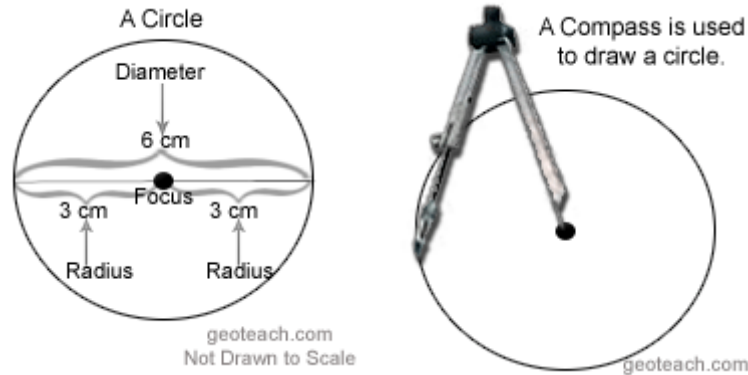


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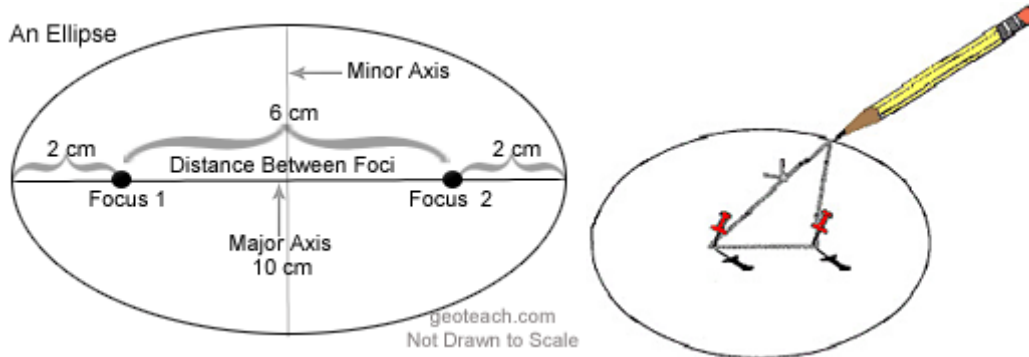
Ellipses and Eccentricity: What You Should Know

Basic Facts: An ellipse is an oval.

When drawing a perfect circle, one uses an instrument called a compass. One point is used to draw a circle on paper. At all locations the focus (center) of the circle is equidistant from the edge of the circle.



However, to draw an ellipse on paper, one must use 2 points. An ellipse, therefore, is a geometric shape having 2 fixed focus points (foci) equidistant from the ends of the ellipse. Additional terminology, important when working with ellipses includes the following: major axis, minor axis and "distance between foci". To draw an ellipse, often 2 push pins, a pencil and a length of knotted string are used.



Orbits in space are ellipses, too. Our planets orbit the sun in elliptical orbits with the sun being one of the focus points and the other focus being an imaginary point in space.

Eccentricity: How Oval is the Oval? An ellipse can vary in degrees of "ovalness". An ellipse may be only slightly eccentric (meaning it is slightly oval) and to the eye an occasional ellipse may even look like a circle. Or, an ellipse may be very eccentric and appear obviously flattened north to south

and widened east to west.

Exactly how oval an ellipse is refers to its eccentricity.

The further apart the foci are, the more eccentric (oval) the ellipse will be.

Eccentricity is expressed with a numbered scale from 0 to 1.

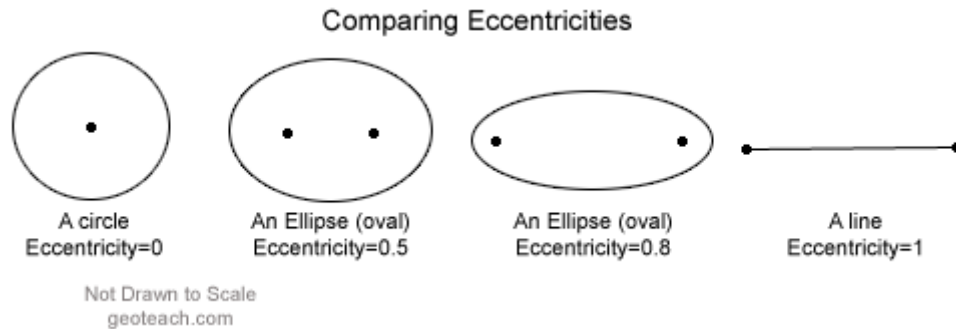
A **perfect circle** is assigned the number "**zero**", since it is not oval at all.

A **line** is assigned the number "**1**", since it is an ellipse so eccentric that it flattened down upon itself to form a line.

Any **ellipse** between a circle and a line will have a "**decimal number**" to describe its eccentricity.

The **higher** the decimal number, the **more eccentric** (oval) the ellipse is.

See the following illustration:



Computing Eccentricity: Eccentricity can be computed mathematically using the following equation:

$$\text{Eccentricity of an ellipse} \quad \text{eccentricity} = \frac{\text{distance between foci}}{\text{length of major axis}}$$

Using data for the Ellipse in the illustration above and the mathematical formula for computing eccentricity, here is the eccentricity for that ellipse:

$$\text{eccentricity} = \frac{\text{distance between foci}}{\text{length of major axis}}$$

$$\text{eccentricity} = \frac{6 \text{ cm}}{10 \text{ cm}}$$

$$\text{eccentricity} = 0.6$$

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Remember: The eccentricity of an ellipse will always have a **decimal** assigned to it and, because it is a ratio, there are **No Units!**

You will only achieve a decimal by dividing the larger number into the smaller number. When using a calculator, be sure to put the top (smaller) number into the calculator first, then the division sign, then the bottom (larger) number, then "=".

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