Calculating the Relative Brightness of the Supermoon

The Moon doesn't orbit in a perfect circle. Instead, it travels in an ellipse which brings the Moon closer to and farther from Earth in its orbit. The farthest point in this ellipse is called the *apogee*. Its closest point is the *perigee*. During every 27-day orbit around Earth, the Moon reaches both its apogee and perigee.

Full moons can occur at any point along the Moon's elliptical path, but when a full moon occurs at or near the perigee, it looks slightly larger and brighter than a typical full moon. That's what the term "supermoon" refers to.

The light from a full moon is bright enough to cast shadows, but it is still very dim. In fact, it's so dim that a mobile device's light sensor combined with a basic lux measurement app won't register a reading. Direct sunlight is about 1 million times brighter!

Instead of using a light meter to measure the brightness of the Moon, you can mathematically compare the light intensity (I_1) of a full Moon at apogee (D_1) to the light intensity (I_2) of a full supermoon at perigee (D_2).

Given that the brightness, or light intensity, of the Moon is inversely proportional to the square of the distance from the Moon to Earth (D), how much brighter is a full supermoon (at perigee) than a full moon at apogee? (To solve this problem, you will need to visit https://www.fourmilab.ch/earthview/pacalc.html and find the Moon's farthest apogee and closest perigee for any year you wish.) Show your work.

$$\frac{I_1}{I_2} = \frac{{D_2}^2}{{D_1}^2}$$