

### **WORKSHEET 3: Apparent Size of the Sun and Moon in the Sky – Types of Solar Eclipses**

When viewed from Earth, the disk of the Sun is approximately the same size as the disk of the Moon. Therefore, there may be a total solar eclipse, during which the Moon will completely cover the Sun. There may also be an annular eclipse of the Sun, in which the apparent size of the Moon is smaller than the Sun, and therefore a ring of the radiant Sun can be seen around the Moon's shadow. If the apparent size of both bodies is exactly the same and the lunar disk covers the solar disk exactly, a hybrid solar eclipse will occur. If the Moon disk shades only a part of the Sun, a partial solar eclipse occurs.

The Moon also does not orbit the Earth in the same plane as the Earth around the Sun (= in the ecliptic plane). Therefore, a solar eclipse will occur only if all three bodies exceptionally reach the same plane. If they orbited in the same plane constantly, the Sun would be eclipsed with each new moon.

Let's try to consider which types of solar eclipses could or could not occur if the size or distances of the bodies were significantly different. (We consider parameter changes so big that fluctuations in distance during the circulation of bodies have no effect.)

#### **Answer**

**Answer the following questions, you can justify the answer with an explanatory drawing:**

a) Both the Sun and the Moon are as big as they really are, but the Moon orbits closer to the Earth. What types of eclipses could occur (total, annular, hybrid, partial)? Would solar eclipses be more frequent or rarer than they actually are?

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b) Both the Sun and the Moon are as big as they really are, but the Moon orbits further from the Earth. What types of eclipses could occur (total, annular, hybrid, partial)? Would solar eclipses be more frequent or rarer than they actually are?

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c) Both the Sun and the Moon are as big as they really are, but the Earth orbits closer to the Sun. What types of eclipses could occur (total, annular, hybrid, partial)? Would solar eclipses be more frequent or rarer than they actually are?

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d) Both the Sun and the Moon are as big as they really are, but the Earth orbits further from the Sun. What types of eclipses could occur (total, annular, hybrid, partial)? Would solar eclipses be more frequent or rarer than they actually are?

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e) In fact, the Moon is slowly moving away from the Earth. Which of the situations a) to d) describes this? What will be the gradual development of the occurrence of individual types of eclipses?

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