Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block \_\_\_\_\_\_ Binder Page # \_\_\_\_\_\_\_

**Kepler’s 3 Laws – A Math Review**

**FIRST LAW – the shape of the orbit of a planet is an ellipse**

 Find the eccentricity of the orbits of the following objects…

 Eccentricity = Distance between the focal points / The distance along the major axis

1. **The distance between the focal points is 0.20 AU. The distance along the major axis is 1.32 AU. What is the eccentricity of the orbit of the object?**

*E = 0.20 / 1.32 E = 0.152*

1. **The distance between focal points is 16 AU. The distance along the major axis is 152 AU. What is the eccentricity of the orbit of the object?**

**E = \_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_\_ E = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **The distance between focal points is 19 AU. The distance along the major axis is 321 AU. What is the eccentricity of the orbit of the object?**

**E = \_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_\_ E = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **The distance between focal points is 2.52 AU. The distance along the major axis is 12.76 AU. What is the eccentricity of the orbit of the object?**

**E = \_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_\_ E = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **The distance between focal points is 17 AU. The distance along the major axis is 65 AU. What is the eccentricity of the orbit of the object?**

**E = \_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_\_ E = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Put the objects orbits in order, from least eccentric to most eccentric**

**Least \_\_\_\_\_\_\_\_\_\_/ \_\_\_\_\_\_\_\_\_\_\_/ \_\_\_\_\_\_\_\_\_\_\_/ \_\_\_\_\_\_\_\_\_\_\_\_/ \_\_\_\_\_\_\_\_\_\_\_\_\_ Most**

**Kepler’s Third Law – Period of the Object in orbit is directly related to the distance from the star (P2 = A3)**

**Find the Period of an orbit in YEARS, if you are given the Distance in astronomical units.**

1. **What is the Period of the orbit in years, if the average distance of the orbit is 3 AU.**
2. Multiply: Distance x Distance x Distance (3 x 3 x 3 = 27)
3. Press square root button: √
4. Enter the answer to step 1: 27 (should show: √27)
5. Press: =
6. Record Answer: 5.20 years
7. **What is the Period of the orbit in years, if the average distance of the orbit is 9 AU.**

**P2 = A3 P2 = 93 P = \_\_\_\_\_\_\_\_\_ AU**

1. **What is the Period of the orbit in years, if the average distance of the orbit is 22 AU.**

**P2 = A3 P2 = 223 P = \_\_\_\_\_\_\_\_\_ AU**

1. **What is the Period of the orbit in years, if the average distance of the orbit is 75 AU.**

**P2 = A3 P2 = 753 P = \_\_\_\_\_\_\_\_\_ AU**

1. **What is the Period of the orbit in years, if the average distance of the orbit is 225 AU.**

**P2 = A3 P2 = 2253 P = \_\_\_\_\_\_\_\_\_ AU**

 **Find the Distance (AU) of the Orbit, if you are given the Period (years) of the orbit.**

1. **What is the average Distance of the orbit in AU, if the Period of the orbit is 3 years?**
2. Multiply: Period x Period (3 x 3 = 9)
3. Press “3”
4. Press “Shift” button, then the “^” button (screen should read “3x√”
5. Enter the answer to #1: 9 (Screen should read: “ 3x√9 ”)
6. Press “=”
7. Record the answer: **2.08 years**
8. **What is the average Distance of the orbit in AU, if the Period of the orbit is 8 years?**

**A3 = P2 A3 = 82 AU = \_\_\_\_\_\_\_\_\_ years**

1. **What is the average Distance of the orbit in AU, if the Period of the orbit is 20 years?**

**A3 = P2 A3 = 202 AU = \_\_\_\_\_\_\_\_\_ years**

1. **What is the average Distance of the orbit in AU, if the Period of the orbit is 75 years?**

**A3 = P2 A3 = 752 AU = \_\_\_\_\_\_\_\_\_ years**

1. **What is the average Distance of the orbit in AU, if the Period of the orbit is 127 years?**

**A3 = P2 A3 = 1272 AU = \_\_\_\_\_\_\_\_\_ years**