**Question 1a – What is the** inclination **of GJ 8999 b?**

**Since we observe a transit of GJ 8999 b, this means that the planet passes directly in front of its host star from our line of sight. For a transit to be visible, the inclination of the planet's orbit must be very close to 90°.  
Therefore, the inclination of GJ 8999 b is approximately:**

**yazı tipi, metin, grafik, simge, sembol içeren bir resim

Yapay zeka tarafından oluşturulmuş içerik yanlış olabilir.**

**Question 1b – What is the period of this exoplanet?**

**By looking at the full 28-day TESS observation in Figure 1, we can see five regularly spaced transit events.  
The time between each transit is about 6 days, which means the orbital period of GJ 8999 b is:**

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**Question 1c – What is the radius of this planet**

**In the transit graph, the normal brightness of the star is approximately 1.0000. During the transit, the brightness drops to about 0.9975, which means:**

**Transit depth=1.0000−0.9975=0.0025\text{Transit depth} = 1.0000 - 0.9975 = 0.0025Transit depth=1.0000−0.9975=0.0025**

**The radius of the host star is R∗=0.2R⊙R\_\* = 0.2 R\_\odotR∗​=0.2R⊙​.  
The transit depth is related to the planet and star radii by:**

**(RpR∗)2=Transit depth⇒Rp=R∗⋅0.0025=0.2⋅0.05=0.01R⊙\left( \frac{R\_p}{R\_\*} \right)^2 = \text{Transit depth} \Rightarrow R\_p = R\_\* \cdot \sqrt{0.0025} = 0.2 \cdot 0.05 = 0.01 R\_\odot(R∗​Rp​​)2=Transit depth⇒Rp​=R∗​⋅0.0025​=0.2⋅0.05=0.01R⊙​**

**Now, converting solar radii to Earth radii using:**

**1R⊙≈109R⊕⇒Rp=0.01⋅109=1.1R⊕1 R\_\odot \approx 109 R\_\oplus \Rightarrow R\_p = 0.01 \cdot 109 = \boxed{1.1 R\_\oplus}1R⊙​≈109R⊕​⇒Rp​=0.01⋅109=1.1R⊕​​**

**So the planet's radius is approximately 1.1 times the radius of Earth.**

**Question 1d – What is the semi-amplitude KKK of this planetary signal?**

**From Figure 3, we observe that the maximum radial velocity is about +2.2 m/s and the minimum is about –2.2 m/s.  
The total variation is about 4.4 m/s, so the semi-amplitude KKK is:**

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**Question 1e – What is the mass of this planet?**

**Using the radial velocity formula and assuming sin⁡i≈1\sin i \approx 1sini≈1:**

**Mp≈2.1M⊕M\_p \approx 2.1 M\_\oplusMp​≈2.1M⊕​**

**So the mass of GJ 8999 b is approximately 2.1 times the mass of Earth.**

**Question 1f – What is the composition of GJ 8999 b?**

**From the mass-radius diagram, we see that GJ 8999 b (with M≈2.1M⊕M \approx 2.1 M\_\oplusM≈2.1M⊕​, R≈1.1R⊕R \approx 1.1 R\_\oplusR≈1.1R⊕​) lies close to the 67% rock / 33% iron composition curve.  
Therefore, its likely composition is similar to Earth:**

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