RQ12: Why does the orbital period of a binary star depend on its mass?

Greater mass $\Rightarrow$ more gravitational attraction $\Rightarrow$ faster orbits
$\Rightarrow$ smaller orbital period

Phet: My Solar System
For main-sequence stars, there’s a nice pattern that lower mass stars have lower luminosity and higher mass stars have higher luminosity.

RQ15: How do the masses of stars along the main sequence illustrate the mass-luminosity relation?
SQ10 (a) I look up in the sky and see a single star. I train a telescope on the same “star” and see two distinct dots. What kind of binary is it?

visual binary

SQ10 (b) What if I watch these stars for many years and they never move relative to the other … what kind of system is this?

optical double

SQ10 (c) What kind of system would it be if I looked at it through an excellent telescope and never see it as two separate dots, but the brightness periodically bounces up and down?

eclipsing binary
SQ11 (a) I watch a binary pair and they appear to have an elliptical orbit. Could they really have a circular orbit? Explain.

   Yes, it could be a circular orbit and we have a tilted view.

SQ11 (b) I watch a binary pair and they appear to have a circular orbit. Could they really have an elliptical orbit? Explain.

   Yes, it could be an elliptical orbit and we have a view tilted just right to make it look circular.
Based on your reading of Section 9-5, are binaries fairly rare or fairly common? Give a short quote and the page number to back up your answer.

Page 185, column 1, last paragraph: “Visual binary systems are common; more than half of all stars are members of binary star systems, and many of those are visual binaries.”

For some reason, this basic information isn’t in the section titled “Binary Stars in General.” It’s in the “Visual Binary Systems” section.
SQ13 How would you guess the techniques of “planet hunting” compare to the methods used to analyze binaries?

They are exactly the same:

• Visual Binaries: Only rarely, and recently, has the planet been actually imaged.

• Spectroscopic Binaries: This is the most common method. The star’s spectral lines move but the planet’s lines aren’t visible.

• Eclipsing Binaries: This is also fairly common. The star has periodic dips in brightness. Usually the light from the planet doesn’t noticeably add to the light curve. The Kepler Mission used this method.

• Astrometric Binaries: These methods don’t work for planets.
When I heard the learn’d astronomer,
When the proofs, the figures, were ranged in columns
    before
me,
When I was shown the charts and diagrams, to add, divide,
    and measure them,
When I sitting heard the astronomer where he lectured
    with much applause in the lecture-room,
How soon unaccountable I became tired and sick,
Till rising and gliding out I wander’d off by myself,
In the mystical moist night air, and from time to time,
Look’d up in perfect silence at the stars.

—Walt Whitman, 1819-1892