17. Consider that there were no beads other than Bead 1. Is that possible?

When $\theta = 0$, $E_{xs} = -5.0 \times 10^4 \ N/C$.

When $\theta = 90$, $E_{ys} = -9.0 \times 10^4 \ N/C$.

If there were no other bead, then these two values should have been the same. Thus, there must be another bead, and it must be somewhere along the y-axis. The question tells us that Bead 2 is fixed in place on the ring.

As E_{xs} is negative when $\theta = 0$, it means that the electric field is pointing away from Bead 1, and thus, Bead 1 must be positively charged.

When $\theta = 90$, the magnitude of the electric field is greater, but still pointing away from Bead 1. Thus, Bead 2 can either be on the +y-axis and be positively charged, or it can be on the –y-axis and be negatively charged.

If Bead 2 were on the +y-axis, then as θ goes from 0 to 90, Bead 1 and Bead 2 would collide, and it would not be possible for Bead 2 to continue on its path. Thus, Bead 2 must be on the –y-axis and it must be negatively charged.

The charge on Bead 1, q_1:

$$E_{xs} = \frac{kq_1}{r^2}$$

$$q_1 = \frac{E_{xs} r^2}{k} = \frac{\left|-5.0 \times 10^4\right| (0.600)^2}{8.99 \times 10^9} = 2.0 \times 10^{-6} C = 2.0 \mu C$$

As we know that Bead 1 is positively charged, its charge is +2.0 μC.

The charge on Bead 1, q_2:

$$E_{ys} - E_{xs} = \frac{kq_2}{r^2}$$

$$q_2 = \frac{\left(E_{ys} - E_{xs}\right) r^2}{k} = \frac{\left|-9.0 \times 10^4 - (-5.0 \times 10^4)\right| (0.600)^2}{8.99 \times 10^9} = 1.6 \times 10^{-6} C = 1.6 \mu C$$

As we know that Bead 2 is negatively charged, its charge is –1.6 μC.