Learning Objective 3.6: I can use the Smith Chart to solve transmission line problems.

Show your work. Solve each part on a printed Smith chart, then check it with the formulas from the lesson. Write a **Documentation** line at the end (**None** if you did not collaborate). All lines are lossless with $Z_0 = 50\,\Omega$.

1. **Element moves.** State which way each element moves the point, and along which grid circle.

   (a) A series capacitor added to $z = 1 + j1$.

   (b) A shunt inductor added to $y = 0.5 + j0.5$.

   (c) A load has $|\Gamma| = 0.5$. Find the reactance x where its VSWR circle crosses the $r = 1$ circle.

   x = ____

2. **Series-element match.** A load $Z_L = 100 + j50\,\Omega$ must be matched at 500 MHz with a length of line and one series element.

   (a) Find Γ_L and the reactance x on the $r = 1$ circle.

   x = ____

   (b) Find the shortest line length d and z at that point.

   d = ____

   z = ____

   (c) Name the series element and find its value.

   element = ____

3. **Shunt-element match.** Match the same load at 500 MHz with a length of line and one shunt element.

   (a) Find y_L and the angle of its point on the chart.

   y_L =

   (b) Find the shortest d that puts y on the $g = 1$ circle, and y there.

   d =

   y =

   (c) Name the shunt element and find its value.

   element =

   (d) Which of the two designs, series or shunt, would you build? Justify your answer in one or two sentences.

Documentation: _____