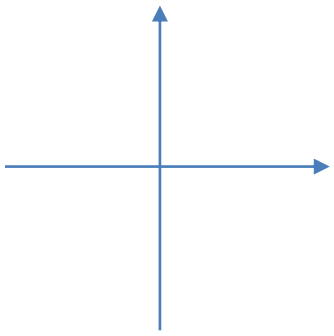
CONCEPT: IMPEDANCE IN AC CIRCUITS

- We know how to find the current in any AC circuit with ONE element
  - → It's just the maximum voltage divided by the _____
- There are two types of circuits: series circuits and parallel circuits.
  - Whenever an AC circuit has multiple elements in series, the _____ phasors line up
  - Whenever an AC circuit has multiple elements in parallel, the _____ phasors line up
- Consider an AC source connected in series to a resistor and a capacitor.
  - In this case, the maximum voltage across the resistor and capacitor, V_{RC}, will NOT be equal to $V_R + V_C$
  - These maximum voltages, V_R and V_C, occur at different times
  - Instead, the maximum voltage V_{RC} will be the _____ of the voltage phasors



→ This leads us to $V_{RC} = I_{MAX}\sqrt{R^2 + X_C^2} = I_{MAX}Z$

- The IMPEDENCE in an AC circuit, $\boldsymbol{Z}$, acts as the effective reactance in a circuit with multiple elements
  → The MAXIMUM CURRENT output by the source is ALWAYS

$I_{MAX} =$ _____

EXAMPLE: What's the impedance of an AC circuit with a resistor and inductor in series?

EXAMPLE: IMPEDANCE OF A PARALLEL LR AC CIRCUIT

What's the impedance of a parallel LR AC circuit?

PRACTICE: IMPEDANCE OF A PARALLEL RC AC CIRCUIT

What's the impedance of a parallel RC AC circuit?

PRACTICE: CURRENT IN A PARALLEL RC CIRCUIT

An AC source operates at a maximum voltage of 120 V and an angular frequency of 377 s^{-1}. If this source is connected in parallel to a 15 Ω resistor and in parallel to a 0.20 mF capacitor, answer the following questions:

a) What is the maximum current produced by the source?
b) What is the maximum current through the resistor?
c) What is the maximum current through the capacitor?