Title: **Power Triangle** Worksheet: 29

Course: Electrical Applications Unit: Electrical Theory CLO: 3

Name ANSWER KEY Grade 26pts. Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

1. Student shall determine the missing component from the power triangle given two other quantities.
2. Student shall apply trigonometric functions to produce appropriate power triangle quantities.

**Assessment**

Students shall demonstrate a comprehension of the objectives listed above by scoring a minimum of 75% on this Worksheet. Grading shall be based on an answer key.

**Theory**

The power triangle exists in any AC circuit that has something other than a purely resistive load (i.e. load has inductance, capacitance or both). In a resistive-inductive circuit, there exists a relationship between resistance (R), inductive reactance (XL) which correlates to a circuits overall impedance (Z). Since this relationship exists, power is no longer the simple algebraic equation *P = I x E*. When *inductive reactance* is introduced into a circuit, a certain amount of *reactive power* is produced. Below is a graphic of the impedance and power triangles as they relate to a resistive-inductive (RL) circuit.

|  |  |
| --- | --- |
| Impedance Triangle Opposition to current flow | Power Triangle Presence of Reactive Power |
|  |  |
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| --- | --- | --- | --- |
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**Instructions**

Using the formulas from the previous page, determine the length of the unknown side given two other sides.

|  |  |  |  |
| --- | --- | --- | --- |
|  | R | XL | Z |
|  | 330Ω | 110Ω | 347.85Ω |
|  | 1.164kΩ | 289Ω | 1.2kΩ |
|  | 780Ω | 1.397kΩ | 1.6kΩ |

**Instructions**

Using the formulas from the previous page, determine the length of the unknown side given one side and the angle.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | R | XL | Z | θ |
|  | 969.948Ω | 560Ω | 1.12kΩ | 30˚ |
|  | 918.272Ω | 212Ω | 942.427Ω | 13˚ |
|  | 680Ω | 281.665Ω | 736.027Ω | 22.5˚ |

**Instructions**

Using the formulas from the previous page, determine the unknown quantities given the following information.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | P | Q | S | θ | PF |
|  | 500W | 748.331VAR | 900VA | 56.251˚ | .556 |
|  | 1200W | 400VAR | 1.265kVA | 18.435˚ | .949 |
|  | 4.2kW | 3.854kVAR | 5.7kVA | 42.537˚ | .737 |
|  | 517.924W | 228VAR | 565.888VA | 23.76˚ | .915 |
|  | 553W | 116.233VAR | 565.083VA | 11.87˚ | .979 |
|  | 626.558W | 338.181VAR | 712VA | 28.358˚ | 0.88 |

Evaluations

1. If a circuit has any type of reactance, the power triangle will be present.
   1. True
   2. False
2. Power factor is not dependent upon frequency.
   1. True
   2. False
3. All the active power in a circuit will occur across the circuits resistive components.
   1. True
   2. False