**USER MANUAL—CALCULATIONS (SAMPLE RESPONSES)**

# Calculating Total Impedance

Use the circuit diagrams below to calculate the total impedance for each circuit. Write your final answer in standard form: ***a*** +***bi*** .

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| **Question 1** | **Question 2** |
| *Total Impedance*  = − + − + −3 2 5 2 6*i i i i*  =9 | Diagram  Description automatically generated  *Total Impedance*  = + − + + + −9 4*i i* 2 3 4 7*i i*  = −15 *i* |
| *Total Impedance* = 9*ohms* | *Total Impedance* =(15−*i oh*) *ms* |

# Calculating Voltage

***Voltage*** = (***Current***)(***Impedance***) is the formula that relates voltage, current, and total impedance. Use this formula in each of the following scenarios to calculate the voltage. Write your final answer in standard form: ***a*** +***bi*** .

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| **Question 3** | **Question 4** |
| What is the voltage in a circuit with current 7 5+ *i* and impedance 8 6− *i* ?  *Voltage* = +(7 5 8 6*i*)( − *i*)  = − + −56 42 40 30*i i i*2  = − −56 2 30 1*i* (− )  = − +56 2 30*i*  = −86 2*i* | What is the voltage in a circuit with current 5 8+ *i* and impedance 5 8− *i*?  *Voltage* = +(5 8 5 8*i*)( − *i*)  = − + −25 40 40 64*i i i*2  = −25 64 1(− )  = +25 64  =89 |
| *Voltage* =(86 2− *i volts*) | *Voltage* = 89 *volts* |



**MY IMAGINARY FRIEND**

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**PART 2**

# Calculating Current

Use the formula ***Voltage*** = (***Current***)(***Impedance***) in each of the following scenarios to calculate the current. Write your final answer in standard form: ***a*** +***bi*** .

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| **Question 5** |
| What is the current in a circuit with voltage 2*i* and impedance 1+*i* ?  *Voltage* 2*i* (2*i*) (1−*i*) 2 2*i* − *i*2 2 2 1*i* − (− ) 2 2*i* +  *Current* = = ⇒ ⋅ = 2 = =  *Impedance* 1+*i* (1+*i*) (1−*i*) 1− + −*i i i* 1− −( 1) 1 1+  *i* |
| *Current* =(1+*i am*) *ps* |

**Definition**

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The

**complex conjugate**

of

*a*

*bi*

+

is

*a*

*bi*

−

.

o

For example,

94

*i*

+

is the complex conjugate of

94

*i*

−

.

Use the complex conjugate and the voltage formula (from above) to calculate the current.

Write your final answer in standard form: ***a*** +***bi*** .

|  |
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| **Question 6** |
| What is the current in a circuit with voltage 2 5+ *i* and impedance 5 2+ *i*?  2 5+ *i* (2 5+ *i*) (5 2− *i*) 10 4 25 10− *i* + *i* − *i*2 10 21 10 1+ *i* − (− ) 10 21 10+ *i* +  *Current* = ⇒ ⋅ = 2 = =  5 2+ *i* (5 2+ *i*) (5 2− *i*) 25 10 10 4− *i* + *i* − *i* 25 4 1− (− ) 25 4+  *i* |
| *Current* = |



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**PART 2**