**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**