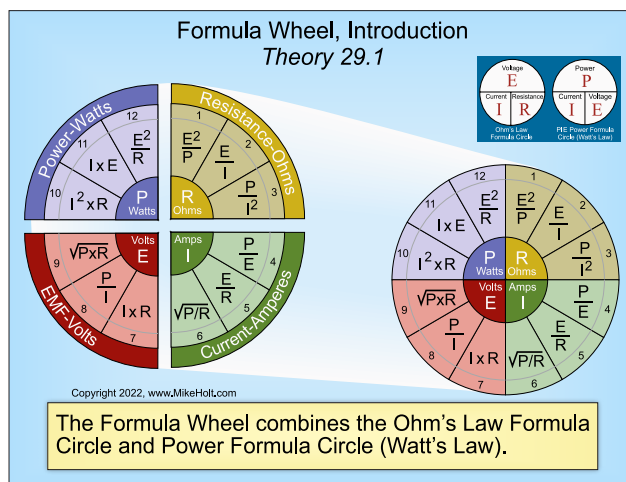


UNIT 29

THE FORMULA WHEEL

29.1 Introduction

The formula wheel combines the Ohm's Law Formula Circle and Power Formula Circle (Watt's Law). In this unit you will learn how to perform calculations using the formula wheel. ▶Figure 29-1



▶Figure 29-1

29.3 Using the Formula Wheel

When working with the formula wheel, the key to finding the correct answer is to follow these steps:

Step 1: What is the question? Amperes, voltage, resistance, or power?

Step 2: What do you know? Amperes, voltage, resistance, or power?

Step 3: Select the formula from the wheel.

Step 4: Work out the formula calculation.

▶ Resistance Example

Question: What is the resistance of two wires where each wire has a voltage drop of 1.50V and the current flowing in the circuit is 100A?

▶Figure 29-3

(a) 0.03Ω (b) 2Ω (c) 30Ω (d) 300Ω

Solution:

Step 1: What is the question? What is "R"?

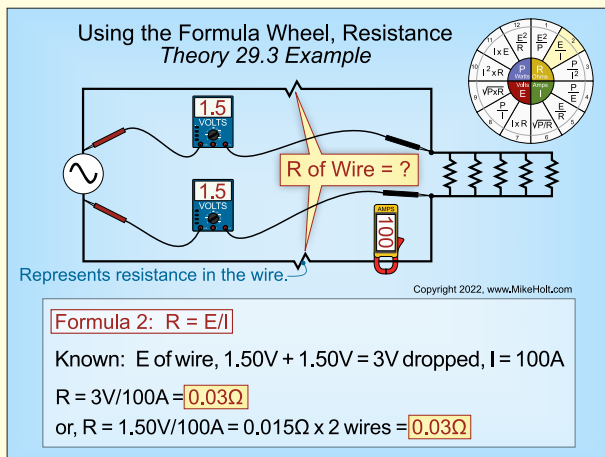
Step 2: What do you know?

Voltage Drop = 3V

Circuit Current = 100A

Step 3: The formula to use is $R = E/I$.

...



► Figure 29-3

Step 4: Calculate the answer:

$$R = 3V/100A$$

$$R = 0.03\Omega$$

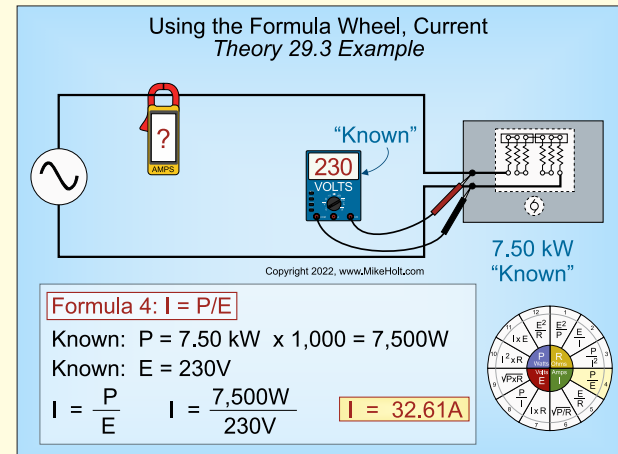
Answer: (a) 0.03Ω

► Current Example

Question: What is the current flow in amperes through a 7.50 kW heat strip rated 230V when connected to a 230V power source?

► Figure 29-4

- (a) 25A (b) 33A (c) 39A (d) 230A



► Figure 29-4

Solution:

Step 1: What is the question? What is "I"?

Step 2: What do you know?

$$\text{Heat Strip Power Rating, } P = 7.50 \text{ kW} \times 1,000$$

$$\text{Heat Strip Power Rating, } P = 7,500W$$

$$\text{Heat Strip Voltage Rating, } E = 230V$$

Step 3: The formula to use is $I = P/E$.

Step 4: Calculate the answer:

$$I = 7,500W/230V$$

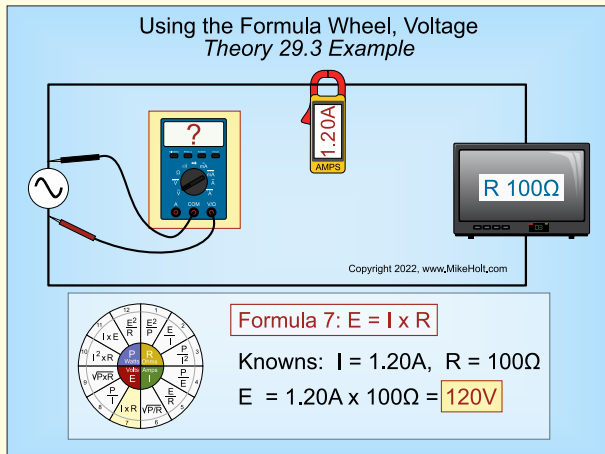
$$I = 32.61A$$

Answer: (b) 33A

► Voltage Example

Question: What is the voltage of a circuit carrying 1.20A supplying a 100Ω resistor? ►Figure 29-5

- (a) 110V (b) 120V (c) 160V (d) 320V



►Figure 29-5

Solution:

Step 1: What is the question? What is "E"?

Step 2: What do you know?

Current (I) = 1.20A

Resistance (R) = 100Ω

Step 3: The formula to use is $E = I \times R$.

Step 4: Calculate the answer:

$$E = 1.20A \times 100\Omega$$

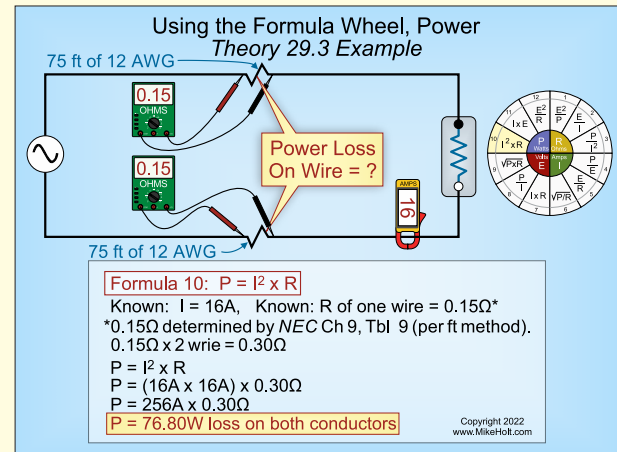
$$E = 120V$$

Answer: (b) 120V

► Power Example

Question: What is the power loss of a 2-wire circuit carrying 16A having a length of 75 ft with two 12 AWG wires each having a resistance of 0.15Ω? ►Figure 29-6

- (a) 67.20W (b) 76.80W (c) 83.50W (d) 96.30W



►Figure 29-6

Solution:

Step 1: What is the question? What is the power loss of the wires in watts ("P")?

Step 2: What do you know about the circuit?

$$I = 16A$$

$$R = 0.15\Omega \text{ per wire} \times 2 \text{ wires}$$

$$R = 0.30\Omega$$

Step 3: What is the formula? $P = I^2 \times R$.

Step 4: Calculate the answer:

$$P = 16A^2 \times 0.30\Omega$$

$$P = (16A \times 16A) \times 0.30\Omega$$

$$P = 256A \times 0.30\Omega$$

$$P = 76.80W$$

Answer: (b) 76.80W