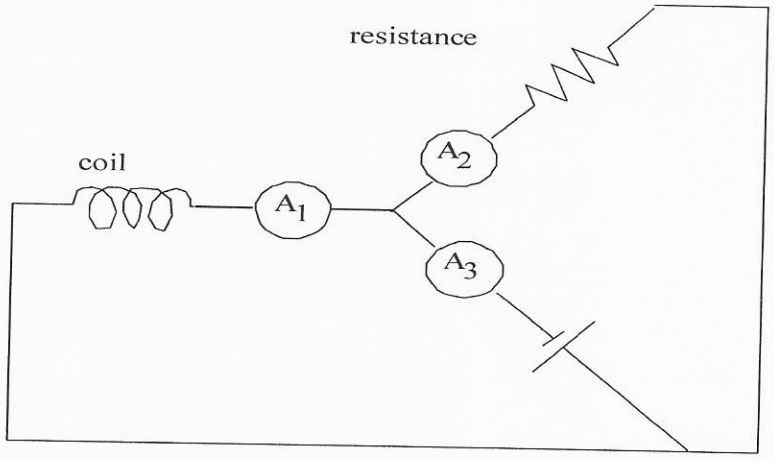
Circuit Worksheet

1. Two electrical appliances and a power source are set up as shown on the diagram below. Three ammeters are installed in the circuit.

Ammeter A_1 shows value I_1.
Ammeter A_2 shows value I_2.
Ammeter A_3 shows value I_3.

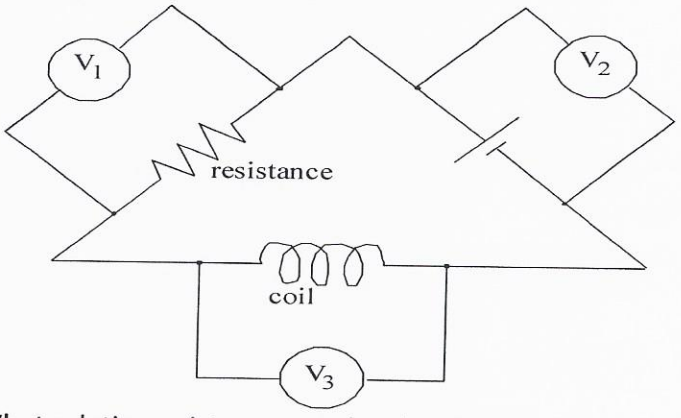


What relation exists among the three values?

A) $I_3 = I_1 + I_2$ B) $I_1 = I_2 + I_3$ C) $I_2 = I_1 + I_3$ D) $I_1 = I_2 + I_3$

2. Two electrical appliances and a power source are set up as shown on the diagram below. Three voltmeters are installed in the circuit.

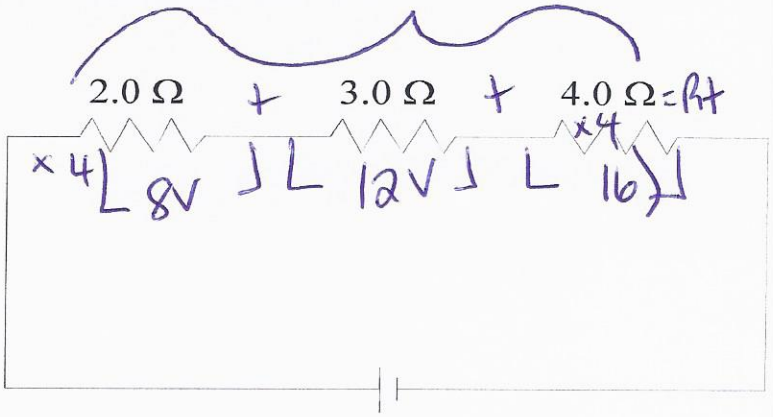
Voltmeter V_1 shows value V_1.
Voltmeter V_2 shows value V_2.
Voltmeter V_3 shows value V_3.



What relation exists among the three values?

A) $V_1 = V_2 + V_3$ B) $V_2 = V_1 + V_3$ C) $V_3 = V_1 + V_2$ D) $V_1 = V_2 + V_3$

3. Three known resistances are connected in series to the terminals of a power source. The potential difference at the terminals of the 3.0 Ω resistance is 12 V. What is the potential difference of the power source?



$I = \frac{V}{R}$ $\frac{12}{3.0} = 4\ A$

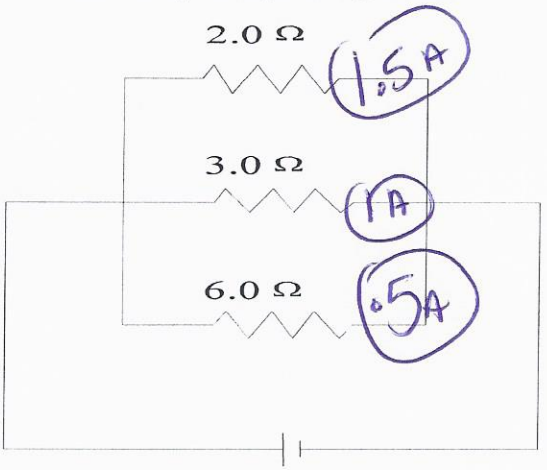
$V_t = R_T \times I_T = 9 \times 4 = 36V$

or

$V_1 + V_2 + V_3$

$8 + 12 + 16 = 36V$

4. Three known resistances are connected in parallel to the terminals of a power source. The current passing through the 3.0 Ω resistance is 1.0 A.



$V = R\,I$ $3.0 \times 1.0 = 3.0\ V$

$R_T = \frac{1}{2} + \frac{1}{3} + \frac{1}{6} = 1\ \Omega$

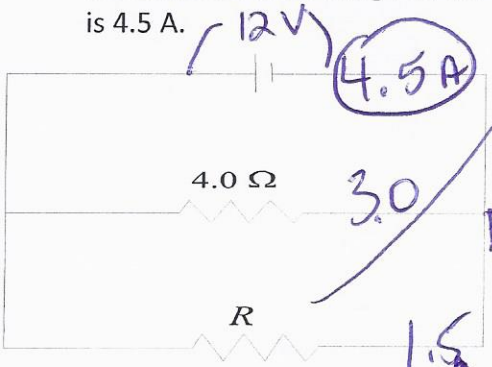
$I_T = \frac{3}{1} = 3\ A$

or

$1.5 + 1 + .5 = 3A$

What is the intensity of the current coming from the power source?

5. In the following electric circuit, one of the two resistances is 4.0 Ω. The other resistance, "*R*", is unknown. The voltage of the power source is 12 V and the electric current from the source is 4.5 A.



$R = \frac{V}{I}$ $\frac{12}{1.5} = 8\ \Omega$

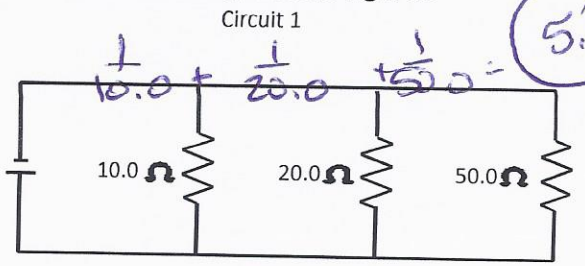
$I = \frac{V}{R}$ $\frac{12}{4} = 3.0A$

$4.5 - 3.0 = 1.5$

What is the value of resistance "*R*"?

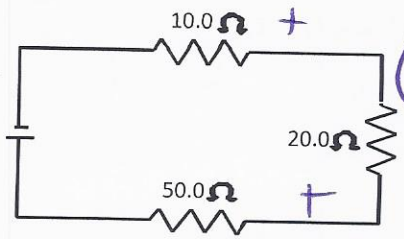
6. Calculate the equivalent resistance that could replace three resistors in each of the circuits. Answer in significant figures

Circuit 1



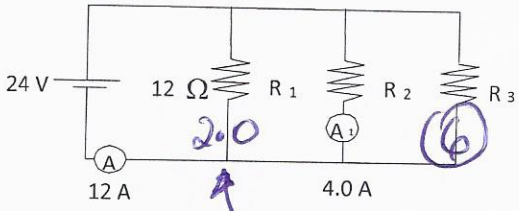
$\frac{1}{10.0} + \frac{1}{20.0} + \frac{1}{50.0} = 5.88\,\Omega$

Circuit 2



$80.0\,\Omega$

7. A circuit consisting of 3 resistors R_1, R_2 and R_3, connected in parallel is illustrated below. The power supply is fixed at 24 V. According to this diagram, what is the value of the resistance of resistor R_3?

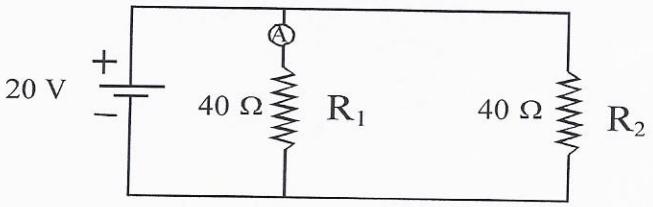


$R = \frac{V}{I} \quad \frac{24}{6} = 4\,\Omega$

$12 - 2 - 4 = 6$

$I = \frac{V}{R} \quad \frac{24}{12} = 2.0\,A$

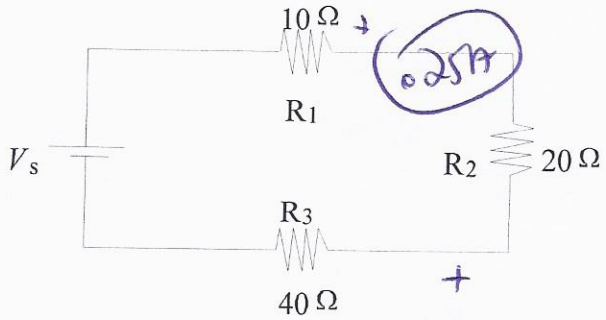
8. The electric circuit shown below consists of an ammeter A, a power supply, and resistors R_1 and R_2 connected in parallel. Answer in significant figures.



$I = \frac{V}{R} = \frac{20}{40} = .5A$

What is the current intensity (*I*) flowing through the ammeter?

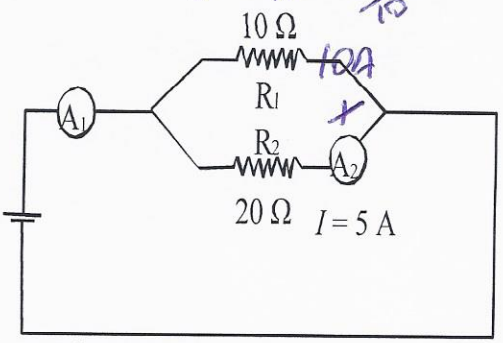
9. In the electric circuit illustrated below, the current intensity (*I*) is 0.25 A. What is the potential difference across the terminals of the power source, V_s? Answer in significant figures.



$V_t = R_T \times I_t$

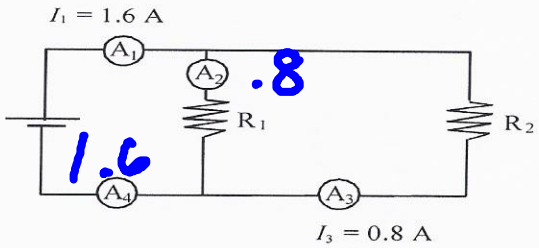
$70 \times .25 = 17.5\,V$

10. The following circuit consists of two resistors R_1 and R_2, two ammeters A_1 and A_2 and a power supply.



Ammeter A_2 reads 5 A. What is the reading given by ammeter A_1?

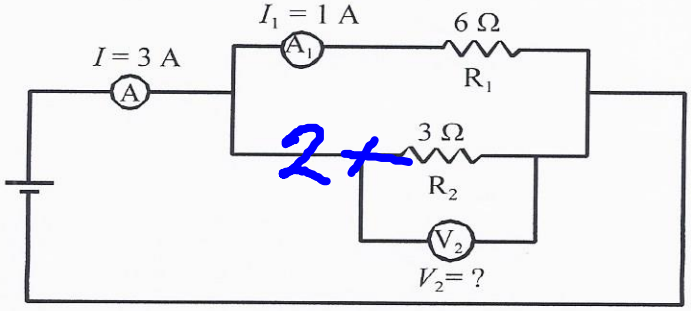
11. The following electric circuit consists of a power source, two identical resistors (R_1 and R_2) and four ammeters A_1, A_2, A_3 and A_4.



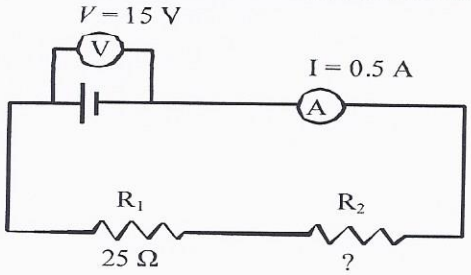
Ammeter A_1 reads 1.6 A and ammeter A_3 reads 0.8 A.
What do ammeter A_2 and ammeter A_4 read?

A) Ammeter A_2 reads 0.8 A and ammeter A_4 reads 0.8 A.
B) Ammeter A_2 reads 0.8 A and ammeter A_4 reads 1.6 A.
C) Ammeter A_2 reads 1.6 A and ammeter A_4 reads 1.6 A
D) Ammeter A_2 reads 1.6 A and ammeter A_4 reads 2.4 A.

12. The following electric circuit consists of a power source, two ammeters (A and A_1), two resistors (R_1 and R_2) and a voltmeter V_2. Ammeter A reads 3 A and ammeter A_1 reads 1 A. What is the potential difference (voltage), V_2, across the terminals of resistor R_2? Answer in significant figures.



13. The following circuit consists of a battery, two resistors (R_1 and R_2), a voltmeter (V) and an ammeter (A). The voltmeter reads 15 V and the ammeter reads 0.5 A.



$V = RI$

$25 \times .5 = 12.5\text{V}$

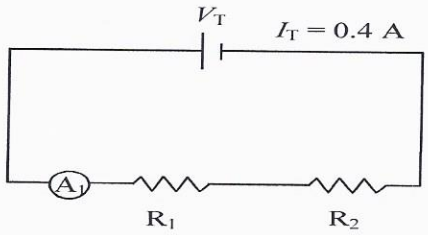
$15 - 12.5 = 2.5\text{V}$

$R = \frac{V}{I} = \frac{2.5}{.5} = 5\Omega$

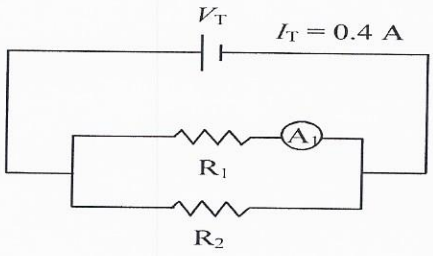
What is the resistance of resistor R_2?

14. The following two electric circuits consists of a power supply, V_T, an ammeter (A_1) and two identical resistors (R_1 and R_2).

Circuit 1



Circuit 2

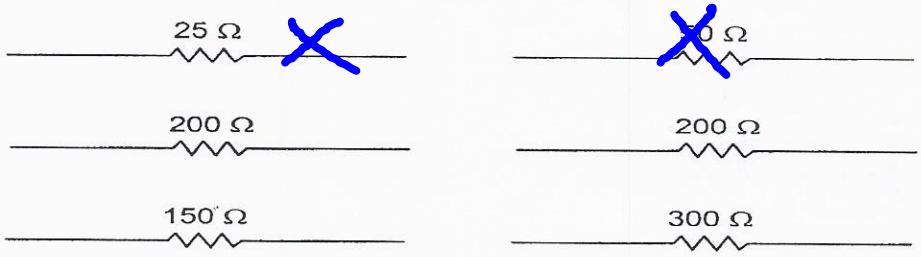


The total current intensity, I_T, in both circuits is 0.4 A.

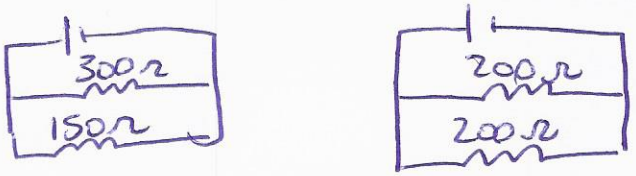
What is the current intensity reading given by ammeter (A_1) in each circuit?

A) The ammeter reads 0.2 A in Circuit 1 and 0.2 A in Circuit 2.
B) The ammeter reads 0.2 A in Circuit 1 and 0.4 A in Circuit 2.
C) The ammeter reads 0.4 A in Circuit 1 and 0.2 A in Circuit 2.
D) The ammeter reads 0.4 A in Circuit 1 and 0.4 A in Circuit 2.

15. In the laboratory, you are given a power supply (⊣⊢), conducting wires and the six resistors shown below.

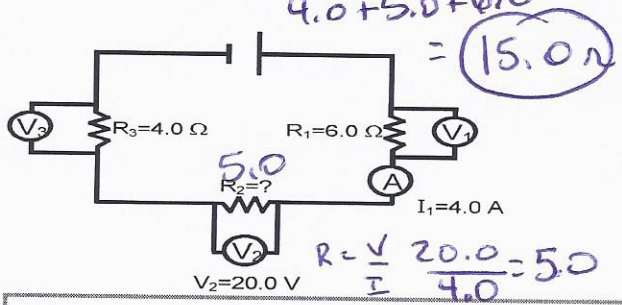


Using the power supply and two of these resistors, you must build **two** circuits that each have an equivalent resistance of 100 Ω.



16. A student is asked to create two circuits using the same three resistors. He sets up Circuit A so that all the resistors are in series. He then takes it apart and places these same resistors in parallel in Circuit B. (See diagrams below.) Answer in significant figures.

Circuit A

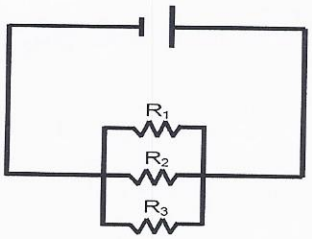


4.0+5.0+6.0 = 15.0 Ω

5.0

$R = \frac{V}{I}$ $\frac{20.0}{4.0} = 5.0$

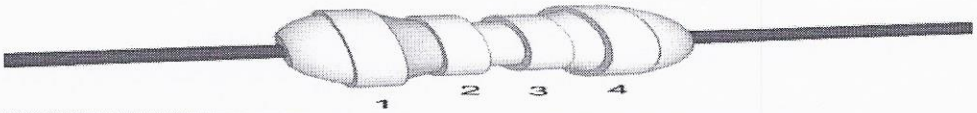
Circuit B



$\frac{1}{4.0} + \frac{1}{6.0} + \frac{1}{5.0}$ = 1.6 Ω

Calculate the equivalent resistance (R_{eq}) of Circuit A and Circuit B.

17. As the values of manufactured resistors are never perfectly precise, they are manufactured with a certain tolerance.



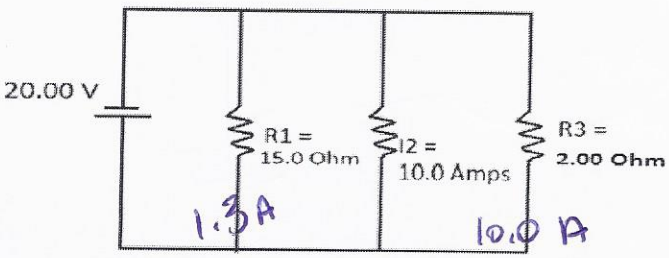
Determine, in order from left to right, the band colors of a resistor if it had a true resistance value of 340 Ω ± 5%. orange, yellow, brown, gold

18. The circuit below represents a toy fire truck. This truck can either activate its lights or sound its siren, but cannot do both at the same time.

Which of the following identifies the type of switch that must be used?

A) Bipolar unidirectional
B) Bipolar bidirectional
C) Unipolar unidirectional
(D) Unipolar bidirectional

19. Calculate the equivalent resistance of the circuit below.



1.3 A

10.0 A

$R_T = \frac{V_T}{I_T}$ $\frac{20.00}{21.3}$ = 0.939 Ω

1.3 + 10.0 + 10.0 ↑

$\frac{20.00}{15.0}$ $\frac{20.0}{2.00}$