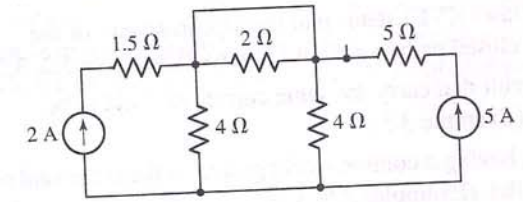
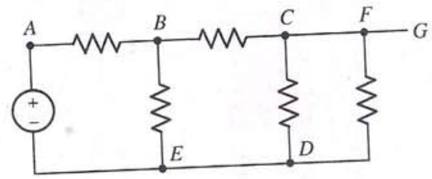
wire size resistance

2. Referring to the circuit depicted in Fig. 3.45, count the number of (*a*) nodes; (*b*) elements; (*c*) branches.



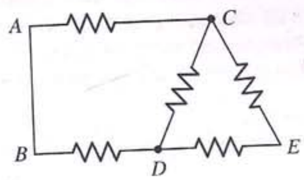
■ **FIGURE 3.45**



■ **FIGURE 3.46**

3. For the circuit of Fig. 3.46:
   (*a*) Count the number of nodes.
   (*b*) In moving from *A* to *B*, have we formed a path? Have we formed a loop?
   (*c*) In moving from *C* to *F* to *G*, have we formed a path? Have we formed a loop?

4. For the circuit of Fig. 3.46:
   (*a*) Count the number of circuit elements.
   (*b*) If we move from *B* to *C* to *D*, have we formed a path? Have we formed a loop?
   (*c*) If we move from *E* to *D* to *C* to *B*, have we formed a path? Have we formed a loop?

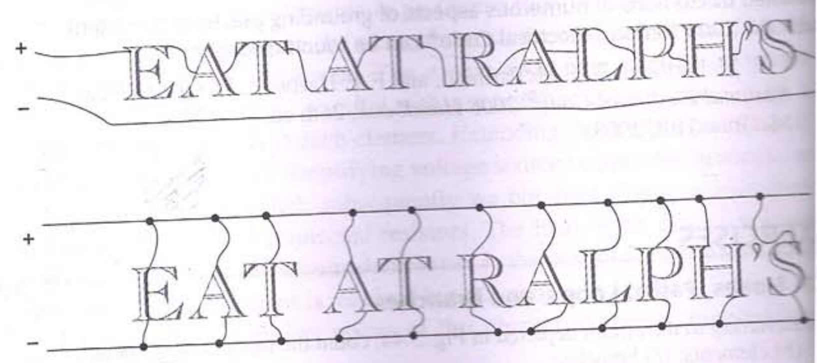


■ **FIGURE 3.47**

5. Refer to the circuit of Fig. 3.47, and answer the following:
   (*a*) How many distinct nodes are contained in the circuit?
   (*b*) How many elements are contained in the circuit?
   (*c*) How many branches does the circuit have?
   (*d*) Determine if each of the following represents a path, a loop, both, or neither:
      (*i*) *A* to *B*
      (*ii*) *B* to *D* to *C* to *E*
      (*iii*) *C* to *E* to *D* to *B* to *A* to *C*
      (*iv*) *C* to *D* to *B* to *A* to *C* to *E*

3.2 Kirchhoff's Current Law

6. A local restaurant has a neon sign constructed from 12 separate bulbs; when a bulb fails, it appears as an infinite resistance and cannot conduct current. In wiring the sign, the manufacturer offers two options (Fig. 3.48). From what you've learned about KCL, which one should the restaurant owner select? Explain.

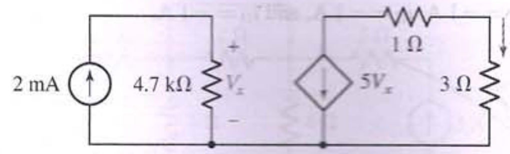


■ **FIGURE 3.48**

wire size resistance

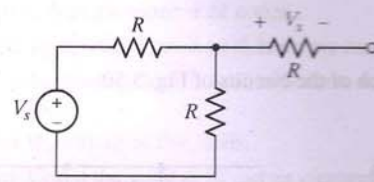
SI

13. Determine the current labeled I_3 in the circuit of Fig. 3.55.



■ **FIGURE 3.55**

14. Study the circuit depicted in Fig. 3.56, and explain (in terms of KCL) why the voltage labeled V_x must be zero.

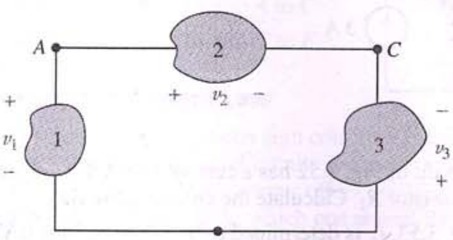


■ **FIGURE 3.56**

15. In many households, multiple electrical outlets within a given room are often all part of the same circuit. Draw the circuit for a four-walled room which has a single electrical outlet per wall, with a lamp (represented by a 1 Ω resistor) connected to each outlet.

3.3 Kirchoff's Voltage Law

16. For the circuit of Fig. 3.57:
    (*a*) Determine the voltage v_1 if $v_2 = 0$ and $v_3 = -17$ V.
    (*b*) Determine the voltage v_1 if $v_2 = -2$ V and $v_3 = +2$ V.
    (*c*) Determine the voltage v_2 if $v_1 = 7$ V and $v_3 = 9$ V.
    (*d*) Determine the voltage v_3 if $v_1 = -2.33$ V and $v_2 = -1.70$ V.



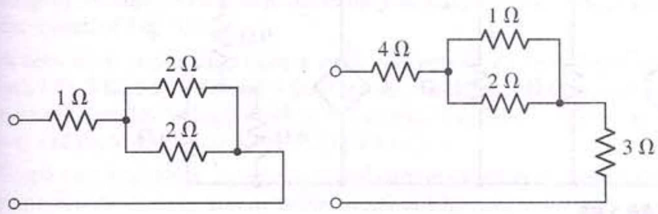
■ **FIGURE 3.57**

17. For each of the circuits in Fig. 3.58, determine the voltage v_x and the current i_x.

■ **FIGURE 3.58**

3.7 Resistors in Series and Parallel

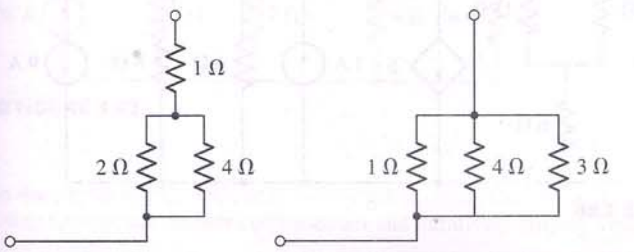
42. Determine the equivalent resistance of each of the networks shown in Fig. 3.80.



(*a*) (*b*)

■ **FIGURE 3.80**

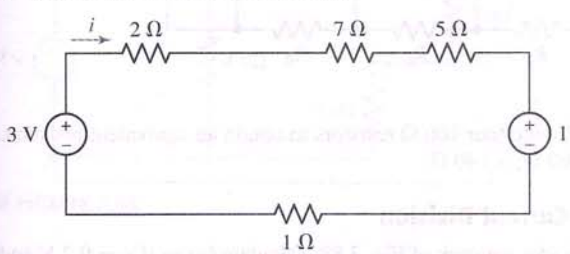
43. For each network depicted in Fig. 3.81, determine a single equivalent resistance.



(*a*) (*b*)

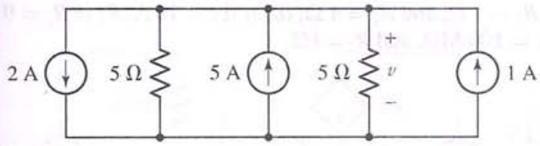
■ **FIGURE 3.81**

44. (*a*) Simplify the circuit of Fig. 3.82 as much as possible by using source and resistor combinations. (*b*) Calculate *i*, using your simplified circuit. (*c*) To what voltage should the 1 V source be changed to reduce *i* to zero? (*d*) Calculate the power absorbed by the 5 Ω resistor.



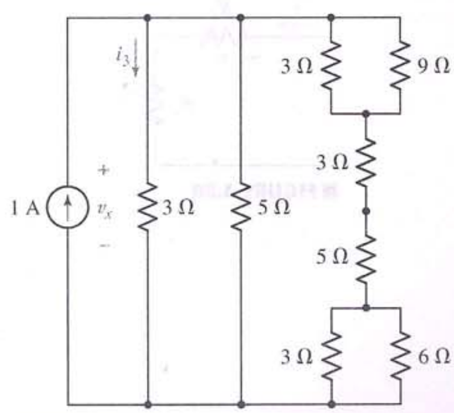
■ **FIGURE 3.82**

45. (*a*) Simplify the circuit of Fig. 3.83, using appropriate source and resistor combinations. (*b*) Determine the voltage labeled *v*, using your simplified circuit. (*c*) Calculate the power provided by the 2 A source to the rest of the circuit.



■ **FIGURE 3.83**

46. Making appropriate use of resistor combination techniques, calculate i_3 in the circuit of Fig. 3.84 and the power provided to the circuit by the single current source.



■ **FIGURE 3.84**