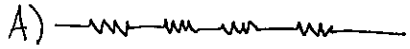
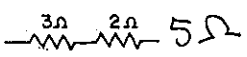
Skill 44-Parallel Circuits

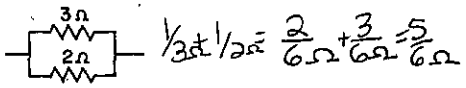
175. A student needs a 4-ohm resistor to complete a circuit. Only a large quantity of 1-ohm resistors are available. Which of the following should be done to complete the circuit?

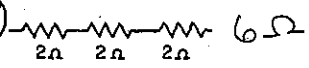
(A) Connect four 1-ohm resistors in series.
B) Connect four 1-ohm resistors in parallel.
C) Connect two of the 1-ohm resistors in series and two in parallel.
D) Connect only two 1-ohm resistors in parallel.

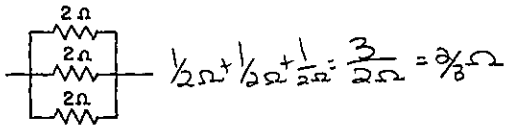
A) 

176. Which circuit segment has an equivalent resistance of 6 ohms?

A) 

B) 

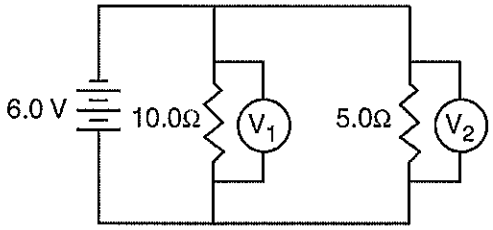
(C) 

D) 

177. A 3-ohm resistor and a 6-ohm resistor are connected in parallel across a 9-volt battery. Which statement best compares the potential difference across each resistor?

(A) The potential difference across the 6-ohm resistor is the same as the potential difference across the 3-ohm resistor.
B) The potential difference across the 6-ohm resistor is twice as great as the potential difference across the 3-ohm resistor.
C) The potential difference across the 6-ohm resistor is half as great as the potential difference across the 3-ohm resistor.
D) The potential difference across the 6-ohm resistor is four times as great as the potential difference across the 3-ohm resistor.

178. In the circuit diagram below, what are the correct readings of voltmeters V_1 and V_2?

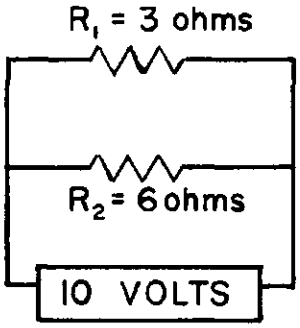


A) V_1 reads 2.0 V and V_2 reads 4.0 V
B) V_1 reads 4.0 V and V_2 reads 2.0 V
C) V_1 reads 3.0 V and V_2 reads 3.0 V
(D) V_1 reads 6.0 V and V_2 reads 6.0 V

$V_T = V_1 = V_2$

Skill 44-Parallel Circuits

179. Base your answer to the following question on the diagram below.



	V	I	R
R_1	10V	3.33A	3Ω
R_2	10V	1.67A	6Ω
	10V	5A	2Ω

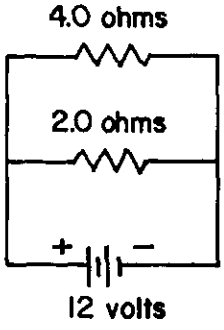
The voltage drop across R_1 is

A) 6 V B) 9 V
C) 3 V D) 10 V

$V_T = V_1 = V_2$

Same in every branch

180. In the circuit shown at the right, the potential difference across the 4.0-ohm resistor is

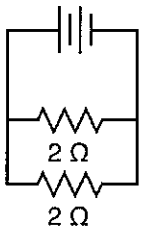


A) 6.0 volts B) 2.0 volts
C) 3.0 volts D) 12 volts

Same in every branch

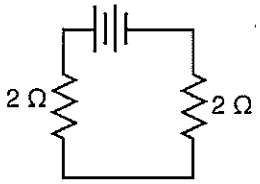
181. Which circuit has the *smallest* equivalent resistance?

A)



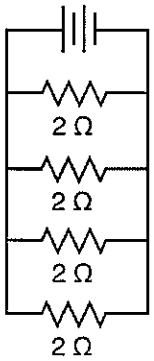
$R_{eq} = 1\Omega$

B)



$R_{eq} = 4\Omega$

C)

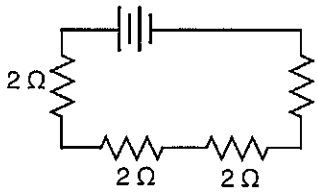


$\frac{1}{R_{eq}} = \frac{1}{2\Omega} + \frac{1}{2\Omega} + \frac{1}{2\Omega} + \frac{1}{2\Omega}$

$\frac{1}{R_{eq}} = \frac{4}{2\Omega}$

$R_{eq} = \frac{2\Omega}{4} = .5\Omega$

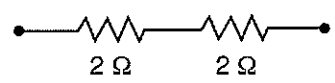
D)



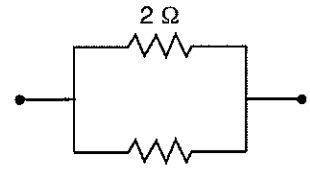
$R_{eq} = 8\Omega$

Skill 44-Parallel Circuits

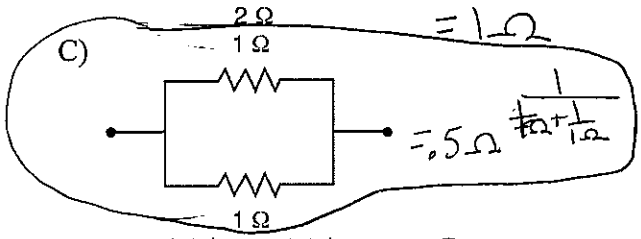
182. Which combination of resistors has the *smallest* equivalent resistance?

A) 

4Ω

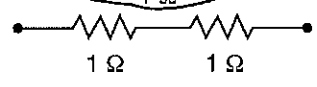
B) 

$R_{eq} = \frac{1}{\frac{1}{2\Omega}+\frac{1}{2\Omega}}$

C) 

$= 1\Omega$

$= .5\Omega$ $\frac{1}{\frac{1}{1\Omega}+\frac{1}{1\Omega}}$

D) 

$R_{eq} = 2\Omega$

183. Three identical lamps are connected in parallel with each other. If the resistance of each lamp is X ohms, what is the equivalent resistance of this parallel combination?

A) $X\,\Omega$
B) $\frac{X}{3}\,\Omega$
C) $3X\,\Omega$
D) $\frac{3}{X}\,\Omega$

$\frac{1}{R_{eq}} = \frac{1}{X\Omega} + \frac{1}{X\Omega} + \frac{1}{X\Omega} = \frac{3}{X\Omega}$ $R_{eq} = \frac{X}{3}\Omega$

184. Three resistors, 4 ohms, 6 ohms, and 8 ohms, are connected in parallel in an electric circuit. The equivalent resistance of the circuit is

A) less than 4 Ω
B) between 4 Ω and 8 Ω
C) between 10 Ω and 18 Ω
D) 18 Ω

less than the smallest R

185. A circuit consists of a 10.0-ohm resistor, a 15.0-ohm resistor, and a 20.0-ohm resistor connected in parallel across a 9.00-volt battery. What is the equivalent resistance of this circuit?

A) 0.200 Ω
B) 1.95 Ω
C) 4.62 Ω
D) 45.0 Ω

$\frac{1}{R_{eq}} = \frac{1}{10\Omega} + \frac{1}{15\Omega} + \frac{1}{20\Omega}$

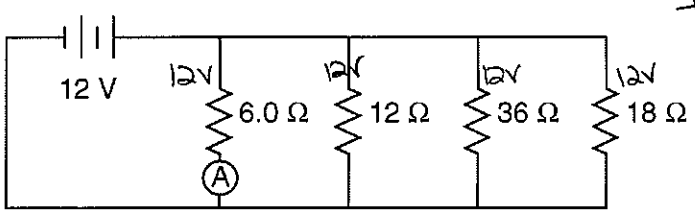
$\frac{1}{R_{eq}} = \frac{6}{60\Omega} + \frac{4}{60\Omega} + \frac{3}{60\Omega} = \frac{13}{60\Omega}$

$R_{eq} = 4.62\Omega$

R must be lower than the lowest R but not tiny

Skill 44-Parallel Circuits

186. Base your answer to the following question on the diagram below, which represents an electric circuit consisting of four resistors and a 12-volt battery.



$I_T = I_1 + I_2 + I_3 + I_4$
$= 2A + 1A + .33A + .67A$

V	I	R
12V	2A	6Ω
12V	1A	12Ω
12V	.33A	36Ω
12V	.67A	18Ω
12V	4A	3Ω

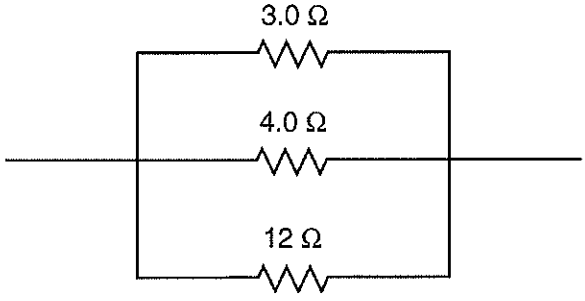
What is the equivalent resistance of this circuit?

A) 72 Ω B) 18 Ω C) 3.0 Ω D) 0.33 Ω

187. Two identical resistors connected in series have an equivalent resistance of 4 ohms. The same two resistors, when connected in parallel, have an equivalent resistance of

A) 1 Ω B) 2 Ω C) 8 Ω D) 4 Ω

188. The diagram below represents part of an electric circuit containing three resistors.



What is the equivalent resistance of this part of the circuit?

A) 0.67 Ω B) 1.5 Ω
C) 6.3 Ω D) 19 Ω

$\frac{1}{R_{eq}} = \frac{1}{3\Omega} + \frac{1}{4\Omega} + \frac{1}{12\Omega}$

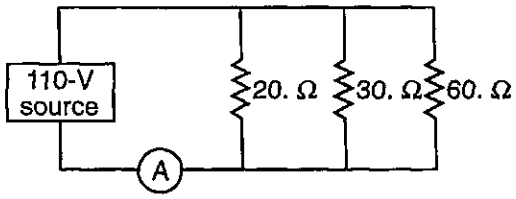
$= \frac{4}{12\Omega} + \frac{3}{12\Omega} + \frac{1}{12\Omega} = \frac{8}{12\Omega}$

189. What is the total current in a circuit consisting of six operating 100-watt lamps connected in parallel to a 120-volt source?

A) 5 A B) 20 A
C) 600 A D) 12 000 A

$P = VI$
$I = .83A \times 6 = 5A$

190. In the diagram below of a parallel circuit, ammeter *A* measures the current supplied by the 110-volt source.



The current measured by ammeter *A* is

A) 1.0 A B) 0.10 A
C) 5.5 A D) 11 A

V	I	R
110V	5.5A	20Ω
110V	3.7A	30Ω
110V	1.83A	60Ω
110V	11A	10Ω

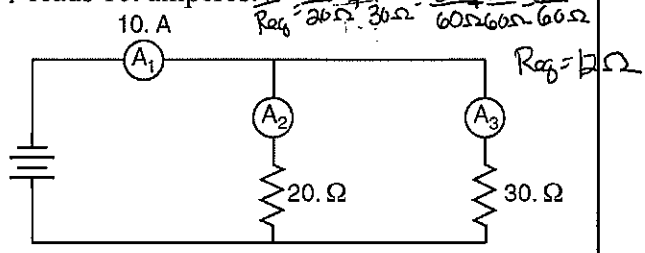
$\frac{1}{R_{eq}} = \frac{1}{20\Omega} + \frac{1}{30\Omega} + \frac{1}{60\Omega}$

$\frac{1}{R_{eq}} = \frac{3}{60\Omega} + \frac{2}{60\Omega} + \frac{1}{60\Omega} = \frac{6}{60\Omega} =$

$R_{eq} = \frac{60\Omega}{6} = 10\Omega \quad I = V/R = \frac{110V}{10\Omega} = 11A$

Skill 44-Parallel Circuits

191. In the circuit diagram shown below, ammeter A_1 reads 10. amperes.



What is the reading of ammeter A_2?

A) 6.0 A
B) 10. A
C) 20. A
D) 4.0 A

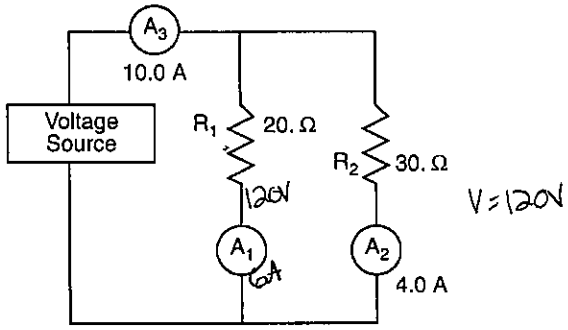
192. An electric circuit contains an operating heating element and a lit lamp. Which statement best explains why the lamp remains lit when the heating element is removed from the circuit?

A) The lamp has less resistance than the heating element.
B) The lamp has more resistance than the heating element.
C) The lamp and the heating element were connected in series.
D) The lamp and the heating element were connected in parallel.

193. As the number of resistors in a parallel circuit is increased, what happens to the equivalent resistance of the circuit and total current in the circuit?

A) Both equivalent resistance and total current decrease.
B) Both equivalent resistance and total current increase.
C) Equivalent resistance decreases and total current increases.
D) Equivalent resistance increases and total current decreases.

Base your answers to questions **194** and **195** on the diagram below, which shows two resistors and three ammeters connected to a voltage source.



194. What is the current reading of ammeter A_1 ?

A) 10.0 A
B) 6.0 A
C) 3.0 A
D) 4.0 A

195. What is the potential difference across the source?

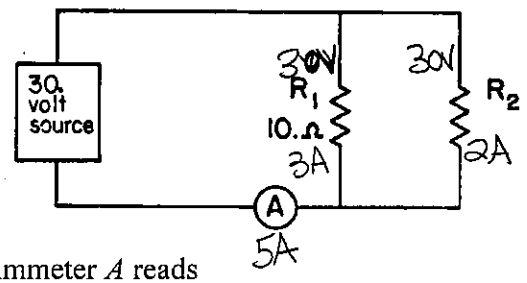
A) 440 V
B) 220 V
C) 120 V
D) 60. V

V	I	R
40V	4A	10Ω
40V	2A	20Ω
40V	6A	

Skill 44-Parallel Circuits

40V / 6

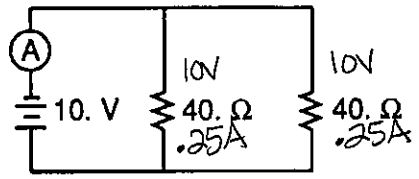
196. Base your answer to the following question on the diagram below which represents two resistances (R_1 and R_2) and an ammeter connected to a constant 30. volt source. The combined resistance of the circuit is 6.0 ohms.



Ammeter A reads

A) 7.5 A
(B) 5.0 A
C) 3.0 A
D) 1.2 A

197. In the circuit diagram below, ammeter A measures the current supplied by the 10.-volt battery.



The current measured by ammeter A is

A) 0.13 A
B) 2.0 A
(C) 0.50 A
D) 4.0 A

$\frac{1}{R_{eq}} = \frac{1}{40\Omega} + \frac{1}{40\Omega} = \frac{2}{40\Omega}$

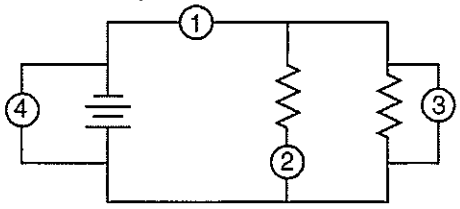
$R_{eq} = 20\ \Omega$

198. A 10-ohm and a 20-ohm resistor are connected in parallel to a constant voltage source. If the current through the 10-ohm resistor is 4 amperes, then the current through the 20-ohm resistor is

A) 1 A (B) 2 A C) 8 A D) 4 A

$\frac{1}{R_{eq}} = \frac{1}{10\Omega} + \frac{1}{20\Omega} = \frac{2}{20\Omega} + \frac{1}{20\Omega} = \frac{3}{20\Omega}$ $R_{eq} = \frac{20\Omega}{3}$

199. In the electric circuit diagram below, possible locations of an ammeter and a voltmeter are indicated by circles 1, 2, 3, and 4



Where should an ammeter be located to correctly measure the total current and where should a voltmeter be located to correctly measure the total voltage?

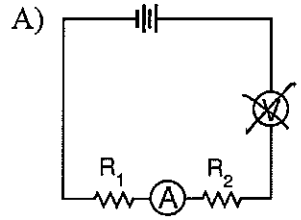
A) ammeter at 1 and voltmeter at 4
B) ammeter at 2 and voltmeter at 3
(C) ammeter at 3 and voltmeter at 4
D) ammeter at 1 and voltmeter at 2

Voltage is the same everywhere across all branches of a parallel circuit

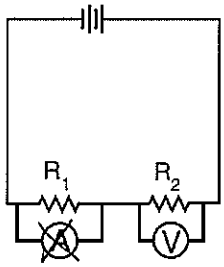
Skill 44-Parallel Circuits

200. In which circuit represented below are meters properly connected to measure the current through resistor R_1 and the potential difference across R_2?

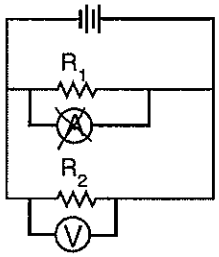
A)



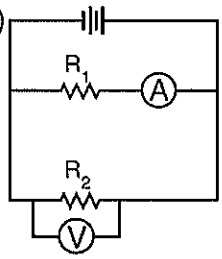
B)



C)



D)

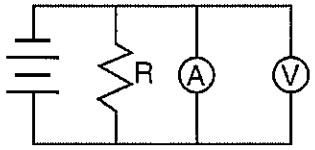


Voltmeters in parallel

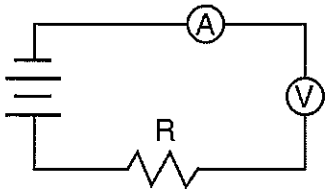
Ammeters in series

201. Which circuit diagram below correctly shows the connection of ammeter A and voltmeter V to measure the current through and potential difference across resistor R?

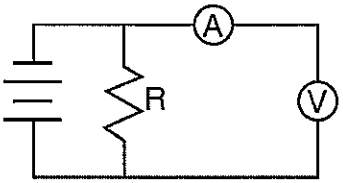
A)



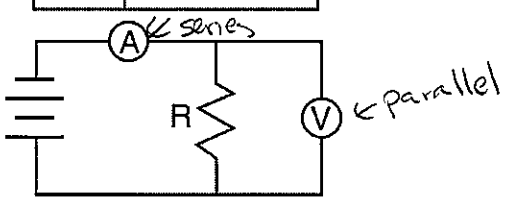
B)



C)



D)



202. In simple electrical circuits, connecting wires are assumed to have a resistance of

A) one ohm
B) greater than one ohm
C) less than zero ohms
D) zero ohms