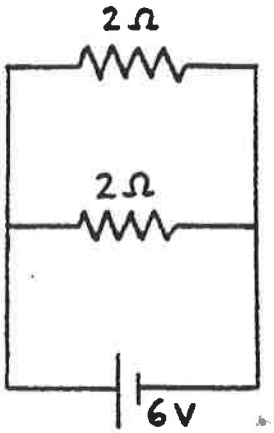
Name KEY

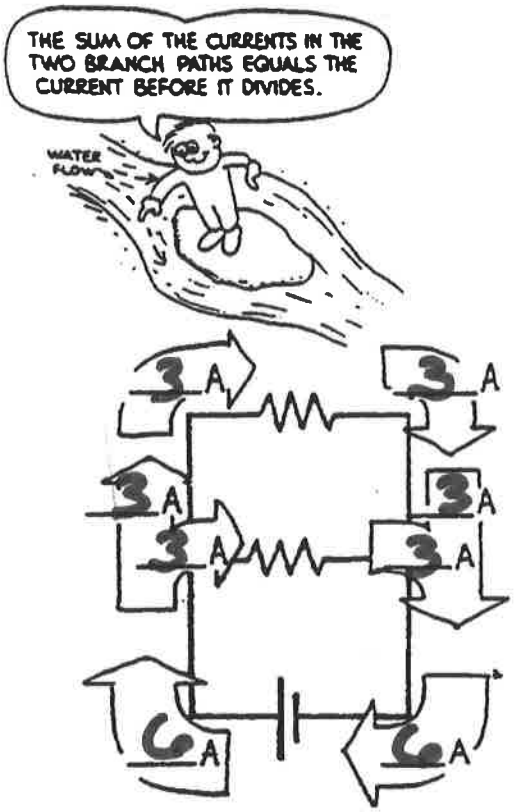
INTRO TO PARALLEL CIRCUITS

1. In the circuit below, there is a voltage drop of 6 V across each 2 Ω resistor.



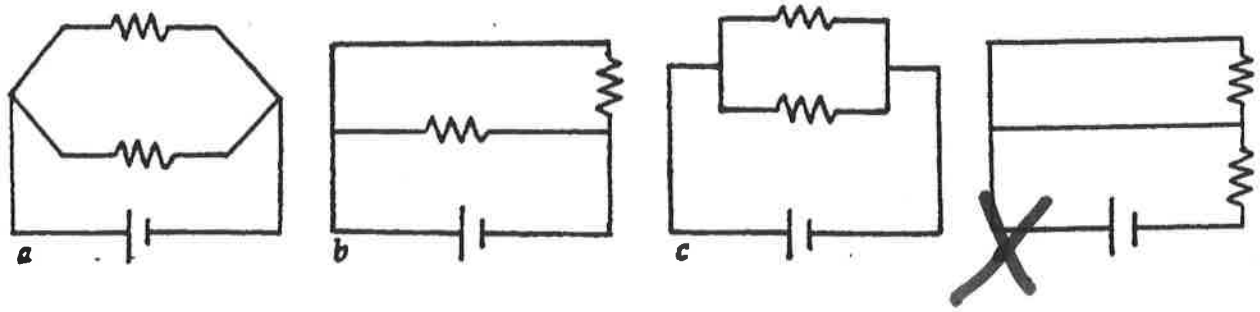
a. By Ohms Law, the current in each resistor is 3 A.

b. The current through the battery is the sum of the current in the resistors, 6 A.

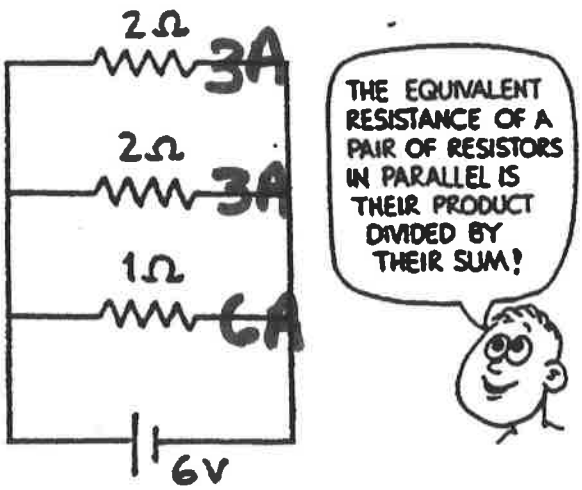


c. Fill in the current in the eight blank spaces in the view of the same circuit shown again to the right.

2. Cross out the circuit below that is not equivalent to the circuit above.



3. Consider the parallel circuit to the right.



a. The voltage drop across each resistor is 6 V.

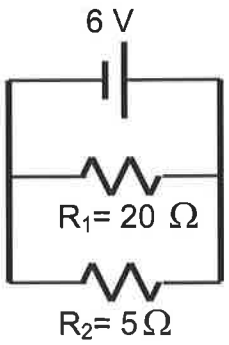
b. Write the current in each branch next to each resistor.

c. The current through the battery equals the sum of the currents, which equals 12 A.

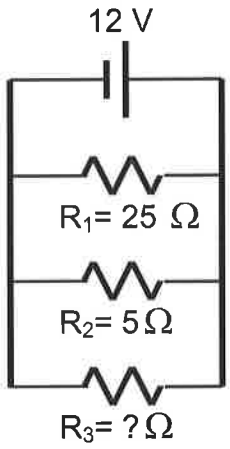
d. The equivalent resistance of the circuit equals .5 Ω.

Parallel Circuits

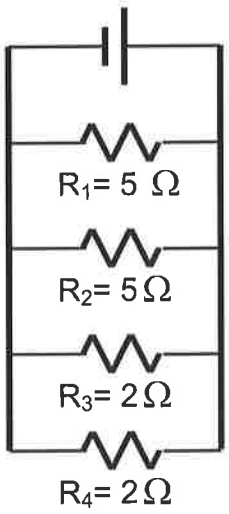
Fill in the chart for each of the following circuits.



	R	I	V	P
R_1	20	0.3	6V	1.8
R_2	5	1.2	6V	7.2
TOTAL	4	1.5	6V	9



	R	I	V	P
R_1	25	0.48	12	5.76
R_2	5	2.4	12	28.8
R_3	100	0.12	12	1.44
TOTAL	4	3.0 A	12	36



	R	I	V	P
R_1	5	0.6 A	3.0	1.8
R_2	5	0.6 A	3.0	1.8
R_3	2	1.5	3.0	4.5
R_4	2	1.5	3.0	4.5
TOTAL	0.714	4.2	3.0	12.6

Electric Circuits
Physics Honors 2015/16

Name _____

Parallel Circuit Problems: **Show your work – Draw the circuit – Make a chart**

1. A 16.0 Ω loud speaker and an 8.0 Ω loud speaker are connected in parallel across the terminals of an amplifier. Assuming the speakers behave as resistors, determine the equivalent resistance of the two speakers. *(5.3 Ω)*

$\frac{1}{R} = \frac{1}{16} + \frac{1}{8} = 0.1875 \qquad R = \frac{1}{0.1875} = 5.33\,\Omega$

2. Three resistors, 25 Ω, 45 Ω and 75 Ω are connected in parallel and a 0.50 A current passes through the 25Ω resistor. Determine:

	R	I	V
R_1	25	.5	12.5
R_2	45		↓
R_3	75		
R			12.5

a) The voltage supplied by the battery.

$V = IR = (25)(.5) = 12.5$

b) The total current that the battery must supply

$\frac{1}{R} = \frac{1}{25} + \frac{1}{45} + \frac{1}{75} \qquad R = 13.24\,\Omega$

$I = V/R = \frac{12.5}{13.24} = 0.944$

c) The equivalent resistance of the system

SEE "b"

3. A 75 W lamp and a 15 W radio are connected in parallel to the same 120 V electric outlet.
a) What is the total power dissipated by these two devices? *(90.0 W)*

$P = 75 + 15 = 90\ W$

b) What is the total current drawn from the outlet? *(0.75 A)*

$P = IV \qquad I = P/V = 90/120 = 0.75$

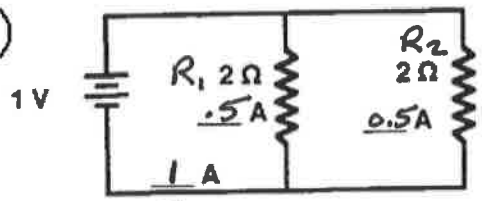
c) What is the equivalent resistance of these devices. *(160. Ω)*

$V = IR \qquad R = V/I = 120/.75 = 160\,\Omega$

Find the missing values for the parallel circuits below:

$R = \frac{R_1 R_2}{R_1 + R_2}$

(1)

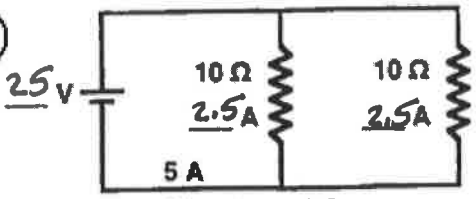


$R = \frac{2 \cdot 2}{2+2} = 1$

$I = \frac{V}{R} = \frac{1}{1}$

$I_1 = \frac{V}{R_1} = \frac{1}{2}$, $I_2 = \frac{V}{R_2} = \frac{1}{2}$

(2)



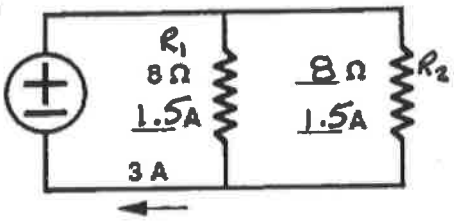
$R = \frac{10 \cdot 10}{10+10} = 5$

$V = IR = 5 \cdot 5$

$V = 25$

$I_1 = \frac{V}{10} = \frac{25}{10} = 2.5$

(3)



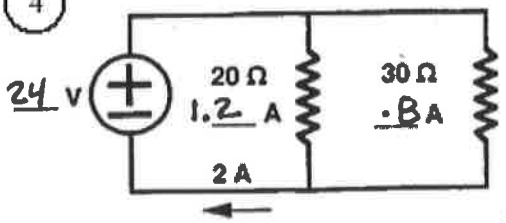
$I_1 = \frac{V}{R_1} = \frac{12}{8}$

$I_1 = 1.5$

$\Rightarrow I_2 = 1.5$

$R_2 = \frac{V}{I} = \frac{12}{1.5} = 8$

(4)



$R = \frac{20(30)}{20+30}$

$\frac{60}{5} = 12$

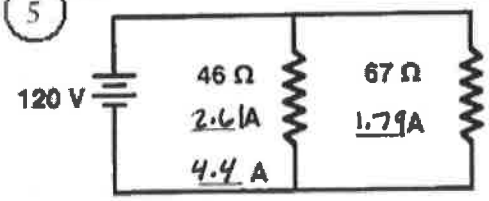
$V = IR = 12 \cdot 2$

$V = 24$

$I_1 = \frac{24}{20}$

$I_2 = 2 - 1.2 = 0.8$

(5)



$I_1 = \frac{V}{R_1} = \frac{120}{46}$

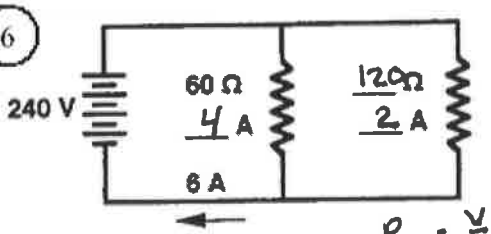
$I_1 = 2.61$

$I_2 = \frac{V}{R_2} = \frac{120}{67}$

$I_2 = 1.79$

$I = 2.61 + 1.79 = 4.4$

(6)



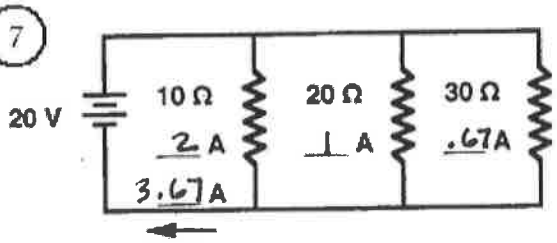
$I = \frac{V}{R} = \frac{240}{60}$

$I = 4$

$I_2 = 6 - 4 = 2$

$R_2 = \frac{V}{I} = \frac{240}{2} = 120$

(7)

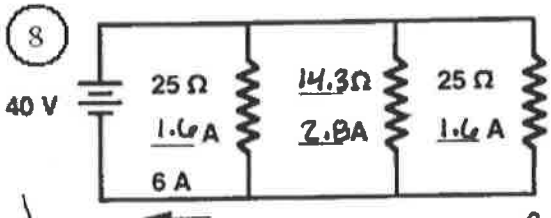


$I_1 = \frac{20}{10} = 2.0$

$I_2 = \frac{20}{20} = 1.0$

$I_3 = \frac{20}{30} = 0.67$

(8)



$I_1 = \frac{40}{25} = 1.6$

$I_3 = I_1$

$I_2 = 6 - 1.6 - 1.6 = 2.8$

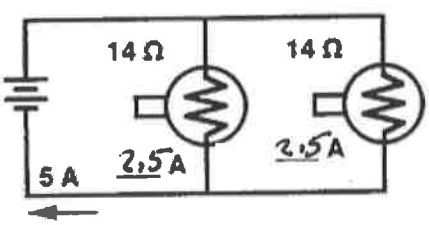
$R_2 = \frac{40}{2.8} = 14.3$

$I_1 = \frac{120}{240} = .5$ $I_2 = \frac{120}{192} = .63$ $I_3 = \frac{120}{144} = .83$

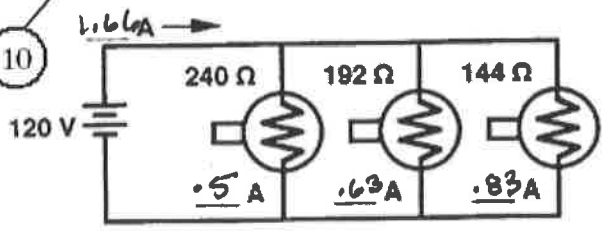
$V = IR$

(9)

$V = 2.5(14) = 35$ V



(10)



P = 60W P = 75W P = 100W

$P = IV$