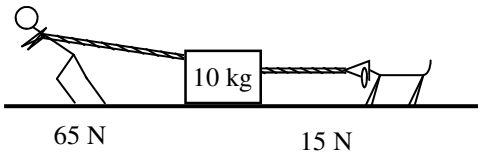
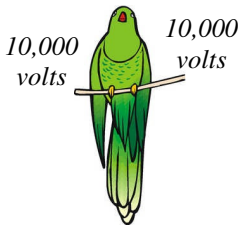
Due Tues., Jan 3

2011-12 PreAP Circuits 4



1. Slim Jim is trying to move a 10 kg box. Unfortunately his dog, Bim, is trying to be "helpful".
   A. How much force is actually pulling the box?
   B. What is the acceleration of the box?

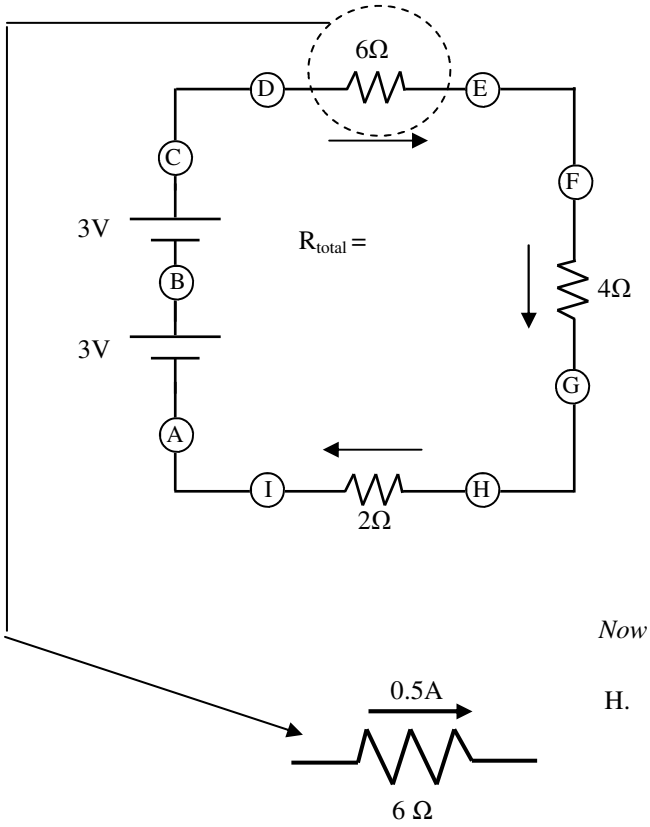
   C. So, it is not the force that matters, but the n_____ force.
   This is just like voltage.



2. A bird perches on a high voltage wire.
   A. What is the difference of voltage between the bird's legs?
   B. How big of a shock does the bird feel?

   C. * What would happen if the wire sagged down until one of the bird's foot touched the ground?

Let me talk you thru your first series circuit. Two tips that will make this easier: 1) Use units or the circuit will get REALLY confusing; 2) work the circuit first, labeling everything as you go; 3) when writing current, show an arrow.



3. Use the circuit at the left to answer the following questions:
   A. * What is the voltage at point A? (*label it)*
   B. * What is the voltage at C? (*label it)*
   C. * What is the total resistance of the circuit? (*label this R_{total} and put it in the middle of the loop.) Now we are going to use V = IR, but with subscripts.*
   D. * Using $V_{total} = I_{total} R_{total}$, calculate the total current flowing thru the loop. (*label this I_{total} and put it in the middle of the loop.)*

   E. * Since there is only one path for the electrons to flow, what I_{R1} (the current flowing thru R_1)? (*label it on the arrow below R_1)*

   F. * What is I_{R2}? (*label on the arrow near R_2)*
   G. What is I_{R3}?

Now let me show you how to find the voltage used by each resistor:

   H. * Now we are concentrating on just resistor 1. You have the current flowing thru the resistor and its resistance. Calculate V_{R1} (the voltage used by R_1). You will now change V = IR to $V_{R1} = I_{R1}(R_1)$. (*label it on the big circuit, above R_1).*

   Since resistors use up voltage, we can consider V_{R1} negative.
   I. Calculate the voltage remaining at point E (*and label it*).

   J. Following the same logic as point H, calculate the resistance used by R_2 and R_3, labeling the diagram as you go.

   K. Calculate the voltage left at point G.

This is how you will work ALL circuits from now on.

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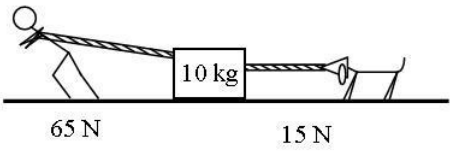
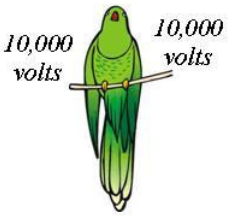


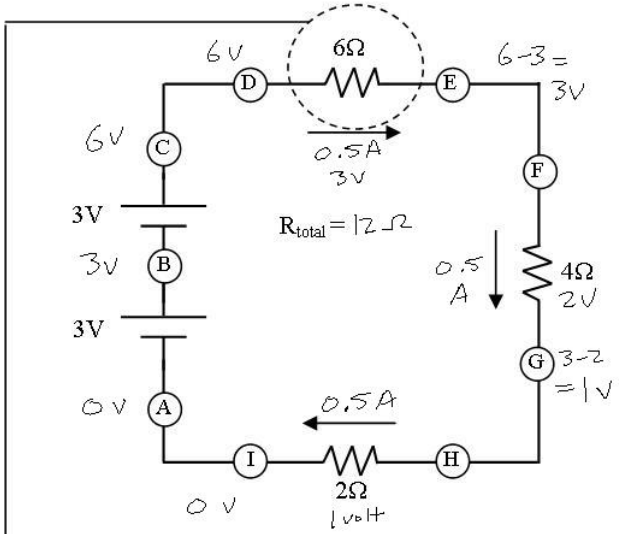
65 − 15 = 50 N ←

1. Slim Jim is trying to move a 10 kg box. Unfortunately his dog, Bim, is trying to be "helpful".
   A. How much force is actually pulling the box? 50 N ←
   B. What is the acceleration of the box?
   $F = ma \quad a = \frac{F}{m} = \frac{50}{10} = 5\ m/s^2$ —2w —6 blank
   C. So, it is not the force that matters, but the n<u>et</u> force.
   This is just like voltage.



2. A bird perches on a high voltage wire.
   A. What is the difference of voltage between the bird's legs? 0 volts
   B. How big of a shock does the bird feel?
   none, no net voltage
   C. What would happen if the wire sagged down until one of the bird's foot touched the ground? shocked (ground = 0 volts)

Let me talk you thru your first series circuit. Two tips that will make this easier: 1) Use units or the circuit will get REALLY confusing; 2) work the circuit first, labeling everything as you go; 3) when writing current, show an arrow.

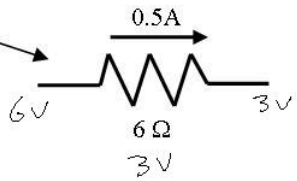


3. Use the circuit at the left to answer the following questions:
   A. * What is the voltage at point A? (*label it*) 0 V
   B. * What is the voltage at C? (*label it*) 6 V
   6+4+2 = 12Ω C. * What is the total resistance of the circuit? (*label this R_{total} and put it in the middle of the loop.*) *Now we are going to use V = IR, but with subscripts.*
   D. * Using $V_{total} = I_{total} R_{total}$, calculate the total current flowing thru the loop. (*label this I_{total} and put it in the middle of the loop.*)

$$I = \frac{V}{R} = \frac{6}{12} = 0.5\ A$$

   E. * Since there is only one path for the electrons to flow, what I_{R1} (the current flowing thru R_1)? (*label it on the arrow below R_1*) 0.5A
   F. * What is I_{R2}? (*label on the arrow near R_2*) 0.5 A
   G. What is I_{R3}? 0.5 A

Now let me show you how to find the voltage used by each resistor:



   H. * Now we are concentrating on just resistor 1. You have the current flowing thru the resistor and its resistance. Calculate VR1 (the voltage used by R_1). You will now change V = IR to $V_{R1} = I_{R1}(R_1)$. (*label it on the big circuit, above R_1*). $V_{R_1} = (0.5)6 = 3V$

   Since resistors use up voltage, we can consider V_{R1} negative.
   I. Calculate the voltage remaining at point E (*and label it*).
   6 − 3 = 3V
   J. Following the same logic as point H, calculate the resistance used by R_2 and R_3, labeling the diagram as you go.
   $V_2 = 0.5(4) = 2V$, $V_3 = .5(2) = 1V$
   K. Calculate the voltage left at point G.
   1 volt (which is taken by the last R)

This is how you will work ALL circuits from now on.

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