#	Question	Answer(s)
1	so is the lab this week optional?	This week's lab Imaging 3 is required. Next week's is optional
2	can we go to lab withoug signing up next week?	I think there is a signup. There's a piazza post on the buffer lab, please check there.
3	when will the hw solutions be posted for this week's hw?	It will be posted later today
4	Why does a voltage source have to have its current returned to it? Why does it have to have an entry point?	Circuits always have to have loops to work. The current leaving the source forms a loop when it returns to the source.
5	what happens if we remove the resistance. does the voltage source burn?	Yes, it's a short circuit. Don't do that to a real voltage source :)
6	Why is resistance's positive side on the top instead of bottom? Shouldn't it be opposite of how the voltage source signs are?	The direction we label voltages actually is arbtirary, as long as we keep the convention of current direction and voltage direction. As for KVL, as long as we respect the direction and sign conventions as we add in the loop, it will work out.
7	Would it be ok to define - on top and + on bottom of R, just so that all of our current is flowing in one direction and is less confusing? Would this change the math?	Yes you can define - on top and + on bottom. That way you should also flip the direction of the I_R definition to follow the passive sign convention.
8	Why did we mark R as Vr? Are every resisters also voltages?	it's the voltage across the resistor
9	How do we decide + and - for the resistor?	We can decide somewhat arbitrarily, as long as we follow labelling the current voltage directions correctly. In this case, we just like putting + on top and - on bottom
10	How do you know where to place the ground node?	you can place it where you want to.
11	Why did she draw the loop opposite from the direction of current?	We can somewhat arbitrarily pick the direction of the loop. Often, we like to start out loop at ground and go through the voltage source, but that's not a requirement.
12	is Vs = V1	Yes
13	Why do we analyze starting from the ground node and note the voltage source?	The ground node gives us an "absolute zero", so we start there often by convention. Also by convention, we often look at going through voltage sources first, but that's not a requirement.
14	so current will be the same but the pressure on the current will be different on either end right?	Yes!
15	what is V1 in the drawing? Is it supposed to be Vs	Yes V1 = Vs in this drawing. V1 is our element voltage labeling, and from the property of the voltage source, we know V1 = Vs.
16	Vs = Vr but why the voltage is different whlie current is the same?	The voltages (with respect to the ground node) at the two terminals of the resistor (and the current source) are different. The voltages across the resistor and the voltage source are the same.
17	why is there a node on the orange wire	Both the top and bottom wires are nodes. Nodes are any continuous connection between elements.
18	is it ever the case where the KCL will be different for two sides the elements? Becuase here they were the same?	In general, KCL will be different, because in general, we will have different connections on either side of an element
19	why is I1 going into the voltage source?	We're using passive sign convention for all elements, so current points from + to - for a given element.
20	So for KCL would we just randomly make a point in the middle of the node to see which is going away and towards the node?	A node is considered one single point (even though it's a section of wire) in our analyses. For KCL you pick up each node, and see what is going away/towards the node
21	How do we interpret I_R = - I_V? Cause they actually flow to the same direction right	Note that when we draw the current directions on the circuit, they are pointing in opposite directions. A negative current can be though of as the current flow the other direction.
22	Why do the arrows go in opposite directions for I1 and IR?	It's labeled by the passive sign convention. After solving the equations you will get I1 = -IR, so you know actually they are in the same direction.
23	why does the current go to infinity in a short circuit?	A short circuit is like a wire, so it can allow any current, even up to infinity. Depending on the circuit, we can create thsoe conditions.
24	What is the component with three lines attached to every circuit? What role does it play?	Do you mean the ground?
25	Does current flow into the + side of the voltage source or out of it?	In our passive sign convention, we always assume that current flows into the positive terminal of all our circuit components.
26	in a short circuit, if V = some constant, R = 0 how does I go to infinity in V = IR?	I = V/R, so if V is nonzero and R is 0, the I is infinite
27	i dnt get how this is reflective of touchscreens?	We haven't explained that yet. We'll see later how this translate from a physical model of touchscreens
28	how do you decide which side of the resistor is +	We can pick the + and - directions of resistors arbitrarily. By convention, we like + on top and - on bottom, but that's not a requirement
29	So, no voltage for R2?	voltage for R2 is Vout
30	Why does the Is face the same way as I1 when current moves from positive to negative?	Is moves from + side of Vs to - side of Vs. I1 moves from +side of V1 to - side of V1.
31	What are the components with the small circles at the end?	Those denote where we are probing the circuit, i.e. physically measuring with lab equipment. It just helps us show where the voltage we want to measure is.
32	why is there no voltage across resistor 2?	The voltage is Vout.
33	Is it true that voltage must be constant throughout an entire node?	yes
34	Should I2 be going into the positive side of R2 or does it not matter?	I2 is going into the positive side of R2. It is equivalent to I2 going out of the negative side of R2.
35	Why does the point toward the voltage source does current enter the voltage source?	*I[s]

36	can you go over ohm's law again? i can't find it in my notes from last class	Ohm's law says the voltage / current relationship for a resisitors is V = I*R
37	why is I3 0?	I3 is on a wire with one end connecting to nothing. So there cannot be a current in that wire.
38	What are Is and I1 and why are they pointing in different directions?	Is the the current going through the voltage source. I1 is the current going through R1. By the passive sign convention we assume the current in each element goes into the positive voltage terminal.
39	I thought the voltage goes toward the positive terminal so why is I3 leaving the positive terminal	current goes towards positive terminal*
40	Why is I-3 = 0?	We don't have a closed circuit, so we have no current
41	Wait so are we solving for nodes or branches when we do analysis?	For KCL we solve for nodes. For KVL we solve for loops.
42	why does the current of the purple part equal 0?	because that is the ground and we assume that the voltage of the ground is 0.
43	why is Vs negative?	The KVL convention is when you travel in the loop, you first meet the negative terminal of Vs, so you have Vs be negative in the equation.
44	did we go through the open circuit wires for KCL?	We showed one of them, I_3. But for the open circuit, the current is 0, so we ignore it.
45	Just clarifying, I1 = I1 is for the orange node?	I2**
46	what was the reason for why the prof chose the + - sides for R1? I understand it's arbitrary but she said something about how she knows ___ so doing it as she did would help her.	By convention, for elements that are vertical, we like + on top and - on bottom. Not sure what exactly you're referring to, but I imagine its related to the KCL equation I1=I2
47	why is the vs negative for kvl?	For the loop, when we add elements, if we add from the negative side, we subtract. If we add from the + side, we add.
48	Can we have multiple ground nodes? If so how does it affect the behaivior of our circuit?	You can have multiple ground nodes. Its equivalent to drawing a wire that connects all those nodes. This can get confusing though, especially if you're new to circuits, so I recommend just manually drawing all connections for now.
49	When solving for Vout, why are we using I2 and not I3?	I3 is 0 on that open wire. Vout is the voltage across R2 so we are using I2*R2 = Vout.
50	why is vout = i2R2 and not I3R1 or something else?	Vout is equal to the voltage across R2, which is given by Ohm's law
51	i'm able to write out all the equatiosn for KCL/KVL/Ohm's but i'm struggling to understand this conceptually. like i picture a current going from a voltage source along the wire to the next element and so on but the first node is made up of two different currents going in opposite directions?	The opposite directions are given by our labeling. It's assuming the current is in that direction, not saying the actual current is in that direction. After you solve the KCL you will find the two current is Is = -I1, so it agrees with your intuition.
52	are r1 and r2 givens?	In this case, yes
53	if voltage is 0 at a point in the circuit, how does the current continue to move?	The current is a result of voltage difference (like pressure difference). 0 voltage at a point can still have some difference with other voltages.
54	can you repeat that?	live answered
55	can we generalize the vout equation?	Yes, this is a general equation we can use for those class of circuit.
56	Why is voltage across R2 the same as Vout?	Vout is just a read out the voltage across R2.
57	is vs the voltage divider or is it v(out)?	The circuit is a voltage divider
58	so V does not depend on the values of R but the ratio right?	correct!
59	How do you know which way to read the resistor? Couldn't it be upside down?	The last band can only be gold or silver.
60	Why is Red not 2?	the 3rd band represents a multiplier, not a number
61	where did the 10 come from	The brown(1) and black(0) bands give the 10.
62	How did it measure the resistance if there was no current/voltage flowing through the resistor?	The multimeter can apply some voltage across the resistors and measure the current (or vice versa), and back calculate the resistor value.
63	what was gold again?	The last band is the tolerance (the allowed difference between the labeled value vs the true value).
64	What would physically happen to a resistor in overload?	It depends on the material of the resistor. For the resistors like we're showing right now (like in lab), flowing too much current will cause them to burn and burst. so be careful!
65	Not necessarily related to lecture, but will we need a battery for any of the labs? Just want to be prepared if we need one	No, your microcontroller has some "voltage source" pins that we will use. As long as your microcontroller is powered up, you're good.
66	does the placement of the clips on the multimeter change the voltage reading?	Yes, if you swap them you will get a negative number with the same absolute value.
67	How do we know what will be v out	We have Vout from the voltage divider circuit we derived a few minutes ago.
68	how did she placed the wires to measure Vout. where was the red and black? between the two Rs or between Ri and R2?	The voltage divider circuit is for Vout, which is measured across R2.
69	is there a definitive positive or negative in circuit analysis or do we only care about the magnitude as long as we stick to our own sign convention	There is no definite positive or negative, only convention. We *generally* like to do + on top, - on bottom, or + on left, - on right, but those are not requirements or guarantees. Also, we do still care about the sign, i.e. you may set the + and - some direction, solve the circuit, and find a negative value. This doesn't mean you drew it wrong, but if you did flip the + and -, you'd get positive.
70	what happenned when we switched R1 and R2? And what happens if we switch red and black	Switching R1 and R2 will change the Vout according to the voltage divider equation. Switching red and black of the multimeter probes will give you a result with the opposite sign.
71	how do we know the direction of the resistors? Like if we flipped them rather than swapping their positions would we also go from 0.5V to 1V	The resistors are direction-less, so flipping them would make no difference for the circuit.

72	does the orientation of the + and - across the voltage source and resistors need to be oriented the same way consistently or does it truly not matter	There are some general conventions, based on visual preference, but the + and - orientations don't matter. What matters for us is the direction of the current relative to the + and -.
73	does changing the height, width, and/or length of the resistor change its resistance?	Yes, we are seeing the equation now.
74	the resistpr is acorss the whole 1d screen?	Yes the entire 2D screen. We will come to the structure of the touchscreen soon.
75	do we have to consider temperature when we calculate resistance?	technically yes, but the materials' temperature dependence is also a material property. we'll tell you if / when it matters.
76	Does rubber have a high resistivity?	Yes typically rubber has a high resistivity, so it's usually considered an insulator.
77	Shouldn't fingers have a high resistivity if she can't get a reading?	If the resistance reading is 0 it means low resistivity, if the resistance reading is 'overload' is means high resistivity. I'm not very sure what's the situation she got :)
78	How did the long resistor get broken down into two?	live answered
79	if it's l-x and x, isn't it just l/2?	If we are measuring at the middle point, then it's l/2.
80	what us the first plate?	and the second. like both are resistors?
81	Would cutting the resistor change the overall voltage drops or current?	We cut the resistor to measure the voltage. In terms of the voltage source, still the entire resistor is connected to the source, so no change of the overall current or source voltage.
82	where is the voltage measures in this circuit?	We measure the voltage across R2, just as we did before in the voltage divider.
83	what's x again?	x is some length less than . It's the length represeting R2
84	what does the second plate do though? like what is its role	live answered
85	Would you mind going over how to find the KCL values in the example we did in the beginning	If we don't get time in lecture, please check out notes 11 and 21.
86	by "cutting" the resistor do we mean touching the resistor to the other plate kinda like cutting it short?	Yes!
87	wheres the link of office hours?	