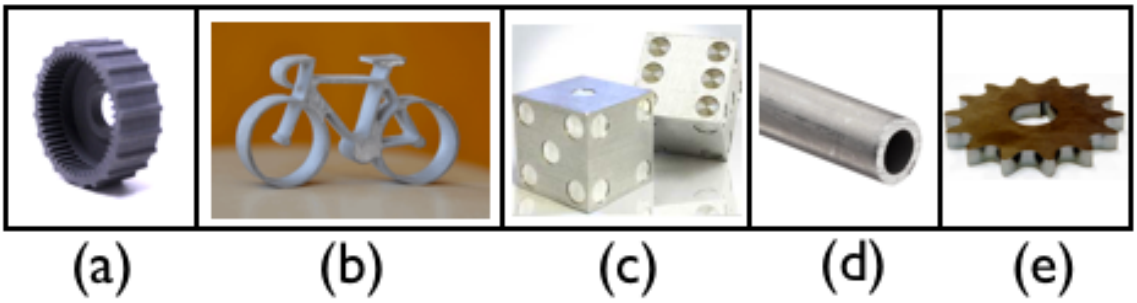
Robotics Quiz 1

Instructions: Work through sections I, II, III, and IV in any order. Complete required questions first, and if you have time remaining, you may work on optional questions.

Section I. MANUFACTURING [7 points]
Instructions: In the table below, write a description of each part (a) through (e), the material you think each is made of, and name of the machine that was **most likely** used to produce each part.

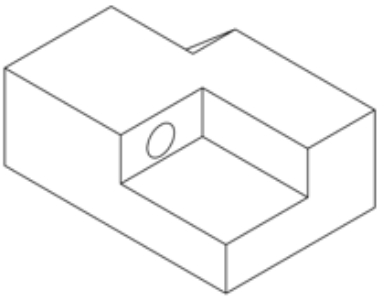
List of Machines (in no particular order): laser cutter, water jet, mill, 3D printer, extruder



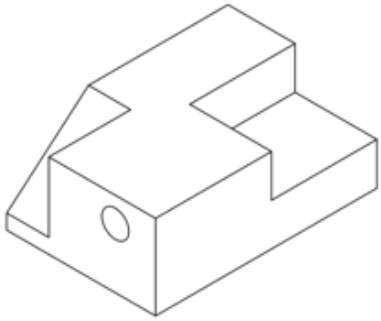
	(i) Description	(ii) Material	(iii) Machine
(ex)	*DriveBot chassis*	*acrylic*	*laser cutter*
(a)			
(b)		stone	
(c)			
(d)			
(e)		wood	

Section II. SKETCHING [9 points]

Instructions: Draw three sketches: one for each view listed. You will draw a top view, front view, and right view. *Note: draw all hidden lines as dotted lines (- - -) and all visible lines as solid lines (___).*



Isometric View 1



Isometric View 2

Top View

Front View

Right View

Section III. SYSTEM DIAGRAMS [10 points]

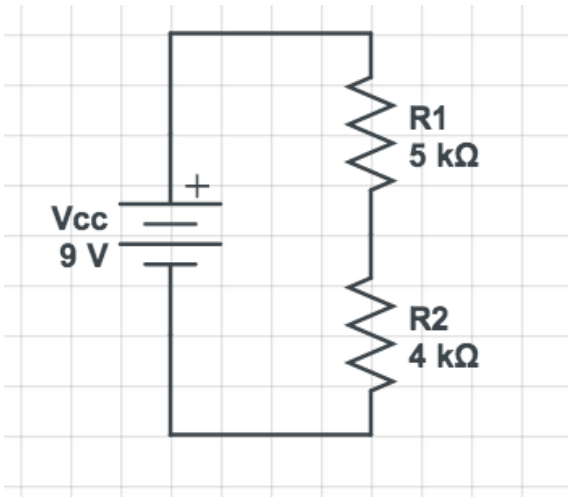
Instructions: Draw a system diagram for a laser cutter, using the following word bank. Each item in the word bank can be: an input, an output, or a module.

Word Bank		
cut part	position system	data
bed (of laser cutter)	acrylic	scrap
electricity	laser	laser cutter
computer		

Section IV. ELECTRONICS

Instructions: Label all units and show your work! Partial credit will be given.

1.



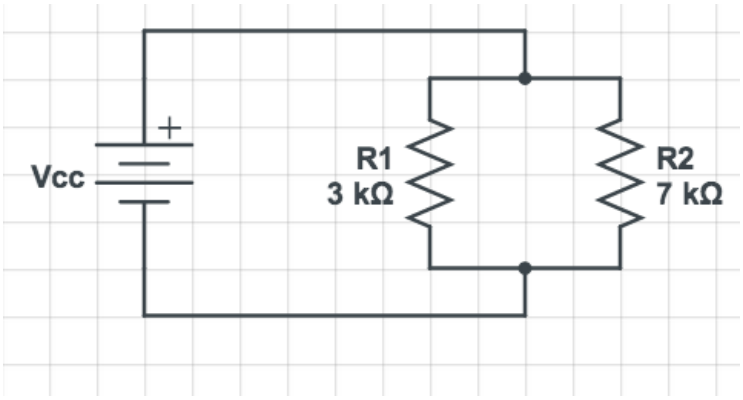
(a) [2 points] (i) Draw the equivalent 1 resistor circuit.

(ii) Find the value of R_{eq}.

(b) [3 points] What is the current that passes through R_{eq}?

(c) [3 points] What is the voltage across R_1?

2.

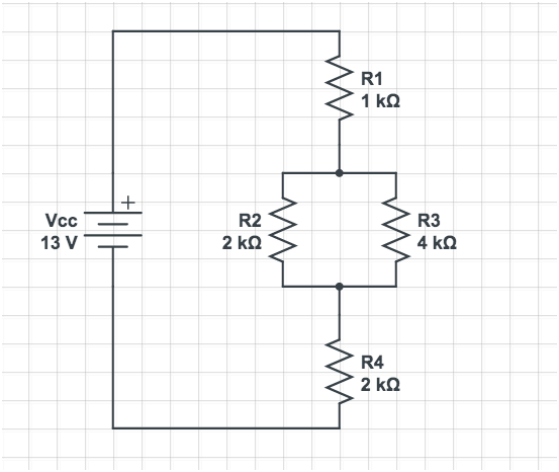


(a) [2 points] (i) Draw the equivalent 1 resistor circuit.

(ii) Find the value of R_{eq}.

(b) [4 points] What is the value of V_{CC} if the current that passes through R_2 is 14mA ($i_2 = 14$ mA)?

3.

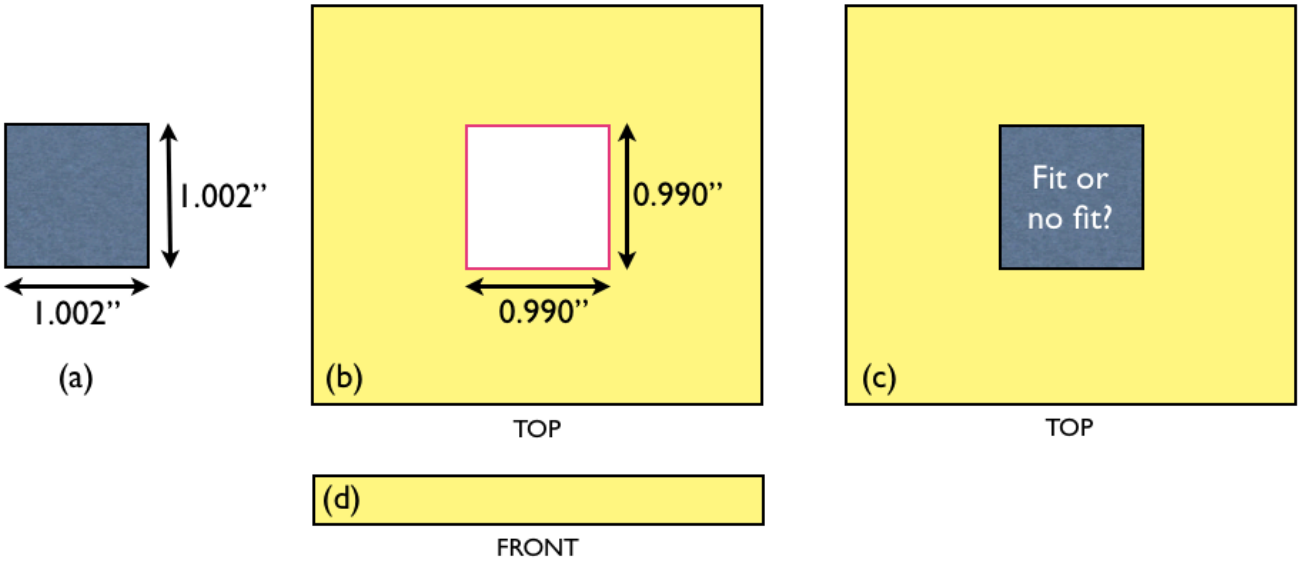


(a) [4 points] How much current flows through R_2?

Section IV. OPTIONAL

1. Square Peg Challenge Question [2 points]

Your goal is to fit a rigid square peg (Figure a) into a laser cut board (Figure b). The kerf of the laser is 0.012" at the **top** surface of the board. The center of the laser traverses the pink line in Figure b. Will the peg fit or not fit (Figure c) into the board, and why? Assume that a 1.000" x 1.000" peg would fit into an exact 1.000" x 1.000" hole. Include a diagram.



2. [2 points] Mathematically show why we should not hook up the leads (+ and -) of a battery using a wire.

3. [3 points] A capacitor is a two-terminal device that resists changes in voltage. Come up with a water device that is analogous to a capacitor. List the analogous characteristics **and** draw a sketch of your water device.

4. There are 20 people in a room.

a. [4 points] What is the likelihood that 2 people in that room share the same birthday?

b. [2 points] How many handshakes take place in the room if every person shakes hands with every other person?