

NAME: _____ **Principles of Tech Final Exam Review Sheet**
Arduino Programming, Circuit Wiring, Woodworking, Shop Safety and CAD/CAM

This exam will be in two parts: an online multiple choice exam AND you will write an Arduino program.

Sample programming questions:

Which line of code correctly identifies the variable green as an output?

- A. Pinmode (green, OUTPUT);
- B. pinMode (green, OUTPUT)
- C. pinMode (green, OUTPUT);
- D. pinmode (green, output);

Arduino programming - be able to:

- 1. Assign a variable to a pin.
- 2. Understand the difference between input and an output.
- 3. Program an input.
- 4. Program an output.
- 5. Program an LED so that it blinks on and off.
- 6. Choose which of four similar programs or lines of code is correct and error free (samples provided).
- 7. Program a standard and continuous servo.
- 8. Describe the importance of commenting your code.

Be able to describe what is happening in these sample programs:

```
int red = 13; //assigns red as a variable for pin 13
int button = 2; //assigns button as the variable for pin 2

void setup(){
  Serial.begin(9600); //starts the Serial monitor
  pinMode(red, OUTPUT); //indicates that the variable "red" is an output
  pinMode(button, INPUT); //waiting for an input signal
}

void loop(){
  if(digitalRead(button)==HIGH){ //if the button is pressed (HIGH) then turn the red light ON
    digitalWrite(red, HIGH); //turns the red LED on.
    Serial.println("Button pressed"); //displays this message in the Serial monitor.
  }
  else{ //when the button is NOT pressed the red LED is off.
    digitalWrite(red, LOW); //turns the red LED off.
    Serial.println("Button not pressed."); //displays this message in the Serial monitor.
  }
}
```

Assign variables to each Arduino pin.

void setup(){} is required and is only used once. It begins and ends with a curly brace {}.

void loop(){} is only used once. It begins and ends with a curly brace {}.

Comments start with two slashes like this:
//this is a comment.
The program ignores everything on that line after the //.

Review the program below and be able to describe what is happening by commenting the code.

```
1 //created by Rod Milstead
2 int red = 13; //assigns red as a variable for pin 13
3 int yellow = 7;
4 int green =11;
5 int button = 2;
6 void setup() { //begins setup function
7   pinMode (red, OUTPUT); //indicates that red on pin 13 is an output
8   pinMode (yellow, OUTPUT);
9   pinMode (green, OUTPUT);
10  pinMode (button, INPUT);
11  Serial.begin(9600);
12 } //ends setup function
13
14 void loop() { //begins the loop
15   if (digitalRead (button) == HIGH) {
16     digitalWrite (red, HIGH);
17     digitalWrite (yellow, HIGH);
18     digitalWrite (green, HIGH);
19     delay(1000);
20     Serial.println("countdown begins");
21     digitalWrite (red, HIGH);
22     delay(2000);
23     digitalWrite (red, LOW);
24     digitalWrite (yellow, LOW);
25     delay (2000);
26     digitalWrite (green, LOW);
27     delay (2000);
28     digitalWrite (red, HIGH);
29     digitalWrite (yellow, HIGH);
30     digitalWrite (green, HIGH);
31     digitalWrite (red, LOW); //red LED off for one second
32     Serial.println("liftoff!!");
33   }
34   else{
35     Serial.println ("READY");
36     digitalWrite (red, LOW);
37     digitalWrite (yellow, LOW);
38     digitalWrite (green, HIGH);
39   }
40
41 }
42 //ends the loop
```

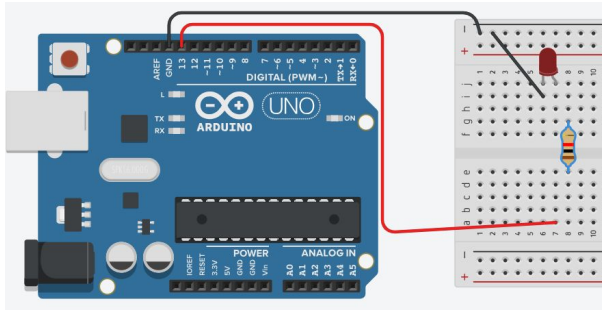
Be ready to answer questions LIKE these samples:

1. Which of the follow lines of code would light an LED connected to pin 13?
2. What's wrong with line 36 in this screenshot?
3. What does line 25 do in the program?
4. Is line 30 written correctly?
5. How many void setup and void loop sections should you have in your Arduino program?

```
25 int red = 13;
26 void setup() {
27     pinMode(red, OUTPUT);
28 }
29 void loop() {
30     digitalWrite (red, HIGH) |
31
32     digitalWrite (red, HIGH);
33
34     digitalWrite (red, LOW);
35
36     digitalWrite (red, high);
37
38 }
```

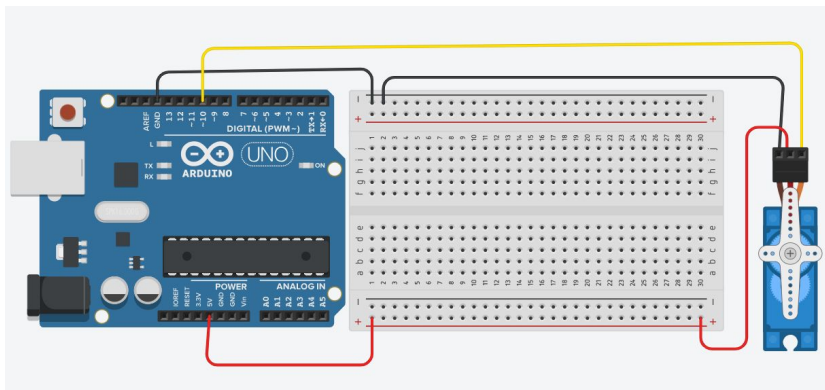
Circuit wiring:

1. Understand the wiring of a circuit related to positive and ground.
2. Wire an LED properly using a resistor.
3. Wire a servo.
4. Wire a button.
5. Types of servos.

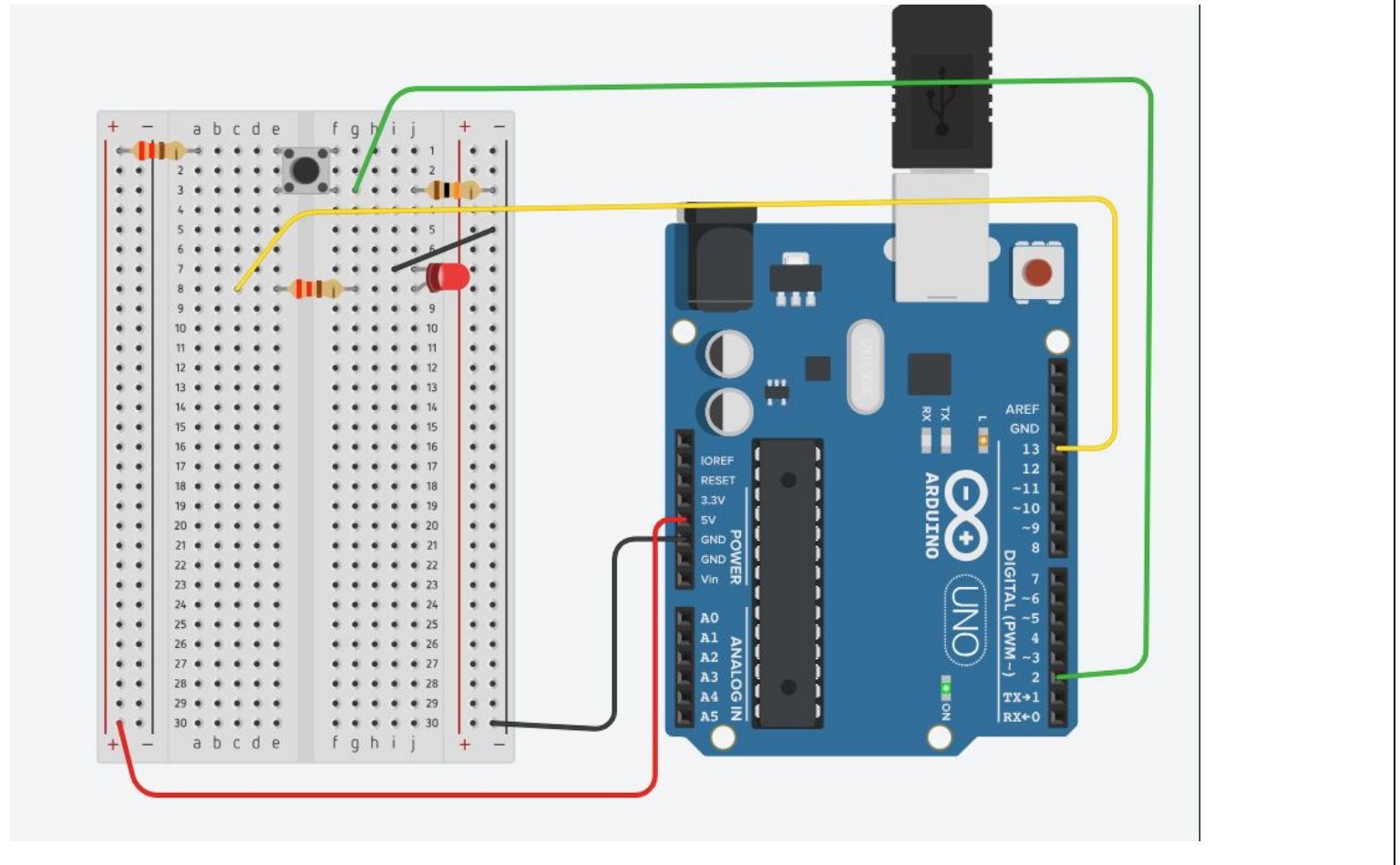


Circuit wiring examples:

1. Look at the circuit on the left - would the LED light if programmed properly?
2. What Arduino pin would you program as an output based on this circuit?
3. What is the difference between a continuous and a standard servo and how they rotate? Be able to give specific examples of use for each type of servo.
 4. Look at the servo circuit on the left. Be able to describe what each wire (yellow, red, black) is connected to on the breadboard and/or Arduino.
 5. What pin would you program for the servo on the left? Would the servo be an input or an output?



6. Review the button wiring diagram below. Be able to understand how an input (button) is wired. Be able to complete this diagram if one or more of the wires are missing or placed in the wrong pins.



Programming: Be prepared to write an Arduino program that involves the following:

1. Variables
2. Inputs (buttons)
3. Outputs
4. Servos
5. LEDs
6. Serial monitor
7. if/else statements
8. Comments

You will be given a prompt similar to this:

Write a program that does the following using an Arduino:

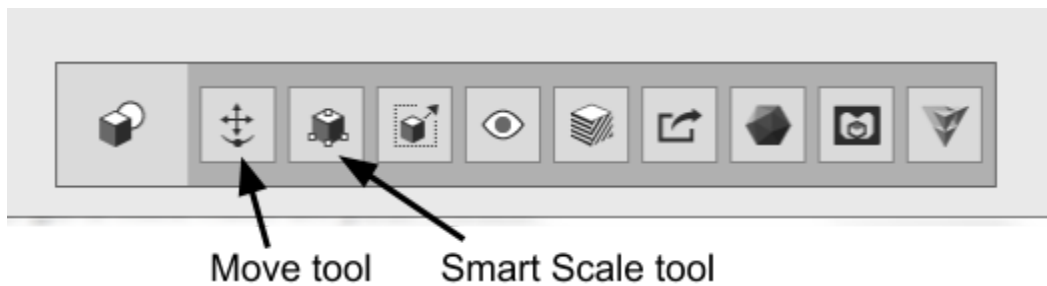
1. When the button is pressed the red LED stays on for one second, then goes off for one second, then a blue LED goes on for one second and then off for one second.
2. After the blue LED goes off the continuous servo spins clockwise for five seconds and then stops.
3. When the button is NOT BEING pressed the red and blue LEDs are on and the servo is stopped.
4. Comment your code or each section of code to clearly indicate that you understand what is happening in your program.
5. Place your name, today's date and the exam version as a comment at the top of your program.
6. Print out your program and submit it as part of your exam.

Soldering electrical connections:

When trying to solder electrical connections (wires, LEDs, switches, etc), and the solder won't "wet" the connection, the tip of soldering iron is probably dirty. To clean it by rubbing it on a brass wool soldering iron scrubber.

CAD/CAM Review:

1. Know the different files types and how they are used in 3d printing and laser cutting: 123dx, SVG, STL, PDF. Complete the sentence:
 - a. A pdf file is used for: **submitting a file to be laser cut.**
 - b. A 123dx file is used for: **saving files from 123d Design.**
 - c. An SVG is used for: **graphics that will be 3d printed.**
 - d. An STL is used for: **sending a file to be 3d printed.**
2. Know the key design tools in 123d Design: group, subtract, export, align.
3. How do you export an STL from 123d Design? Write your answer below:
 - a. **Click on the menu in the top-left corner.**
 - b. **Select Export as 3d from the drop down menu.**
 - c. **Choose STL**
 - d. **Make sure to check the "Combine Objects" box if it is available.**
4. What is the proper line thickness for laser cutting on the Drake laser cutter? **.001 inches**
5. Label the **move** and **scale** tools on this diagram below:



6. What does the align tool do? **Aligns, or centers, one or more objects in 123d Design.**
7. When using the subtract tool, what do you select first - the part to keep or the part to subtract? **Select the part you wish TO KEEP first, then the part to subtract second.**

Shop Tool Use and Shop Safety - sample questions

Review the image on the right - name three things that are unsafe in regards to using this tool and general shop safety.



Be able to identify these tools by name and their best use:

Proper tool use (toolbank)



Bandsaw



Drill Press



Spindle Sander



Hole Saw bits



Chop Saw

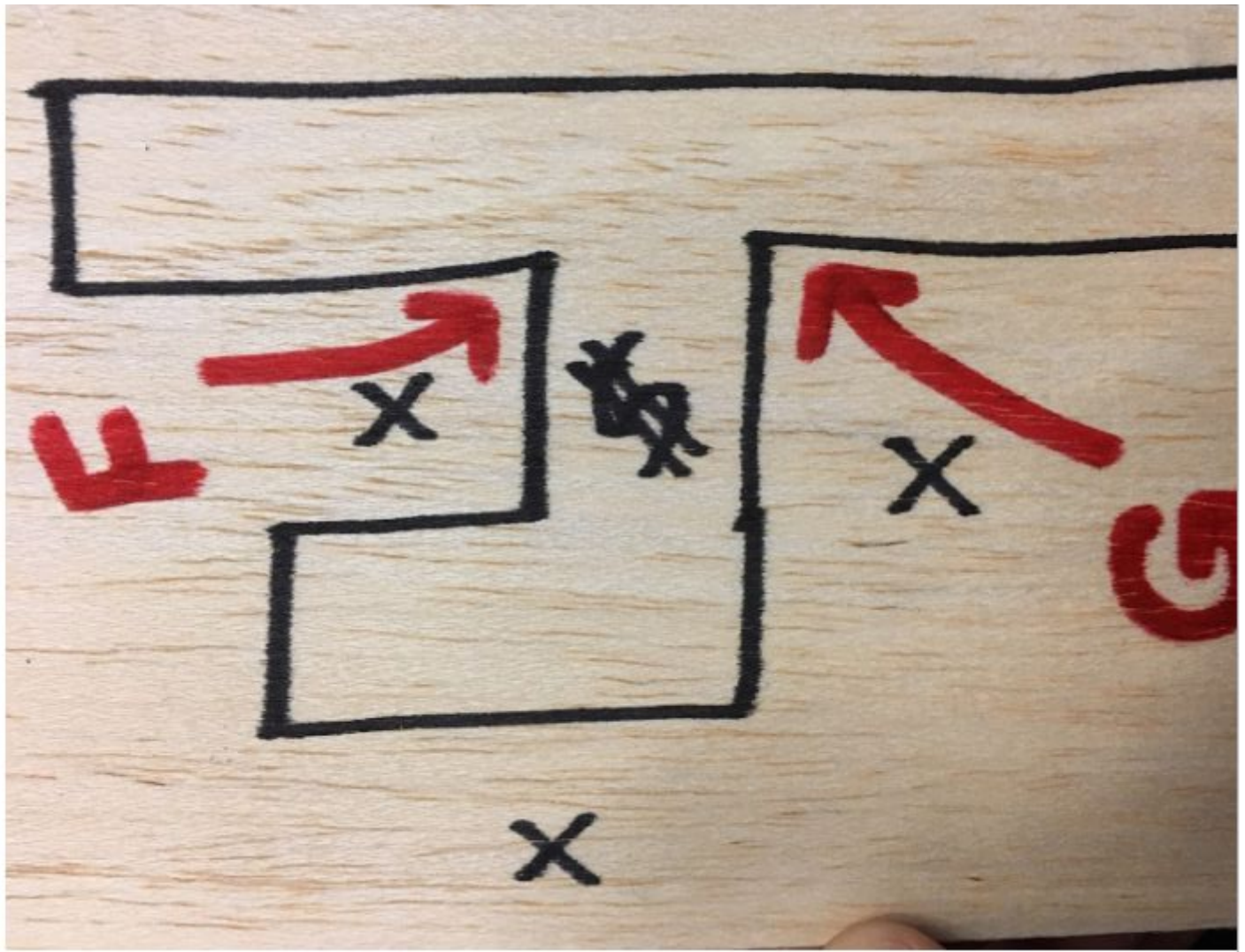


Belt Sander

Your student shows you the wood piece below and asks, "How do I cut out the money side?". Write out the steps they should follow. (number your steps)



Which of the following would be best to cut out the money side of the wood at section "F" at section "F"



Know what these drill components are and what they are best used for.



Which item(s) are "Drill bits" (Check all that apply) *



