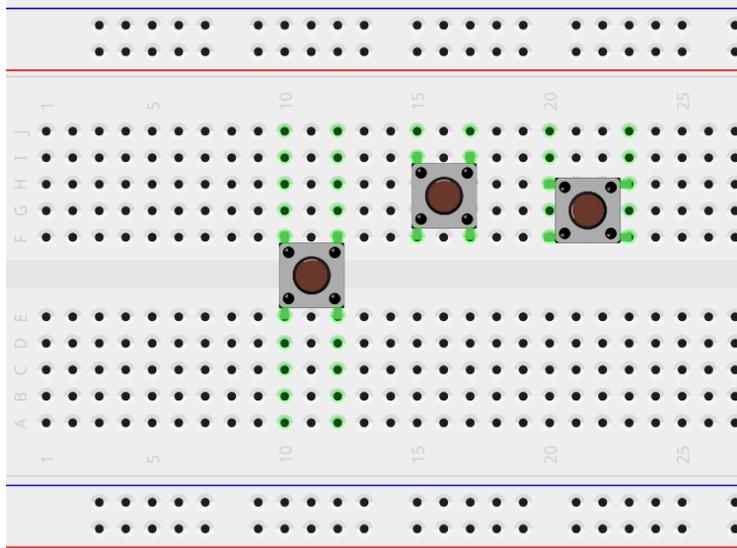**Closed book, closed notes, no calculator. NOTE: there are questions on both sides of this sheet**

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1. (6 points) Circle all correct button placements on the breadboard.

2. (8 points) Given the 3 data pairs $(x_i, y_i) = (1,1)$, $(2,3)$, $(3,4)$, compute the slope (m) of the least square line fit. (*show your work*)

$$m = \frac{n\sum x_i y_i - \sum x_i \sum y_i}{n \sum x_i^2 - (\sum x_i)^2}$$

3. (5 points) Which off the following affects DRO readout?

☐ Crank handle for z-translation of the entire cutting head assembly

☐ Spindle handle for z-translation of the drill chuck?

4. (6 points) The code below is written to show on the serial monitor the raw value from a sensor connected to pin A0. It is using a user-defined function that is missing some code. Complete the boxes where the code is missing.

```
void setup() {
  Serial.begin(9600);
}

void loop() {
  int sensorValue = [____] (A0);
  Serial.println(sensorValue);
}

int Read (int pin){
  int value = analogRead(pin);
  return ([____]);
}
```

7. (5 points) When clamping the pump block into the milling vise in preparation for the through hole, why do you need to make sure parallels are supporting the workpiece?

8. (5 points) *Choose one answer.* When operating the milling machine, in order to change the speed of the motor you need to
   a. Turn the motor off before changing the speed
   b. Keep the motor on when changing the speed
   c. It does not matter: motor can be on or off.

9. (5 points) *Select one or more answers.* In a polynomial curve fitting, when $R^2 \approx 1$, it means that
   a. The fit function follows the trend of the data
   b. The fit function does not follow the trend of the data
   c. The fit function is as good as approximating the data by its average

10. (5 points) On the Arduino Uno board, how many pins can be used for interrupts?