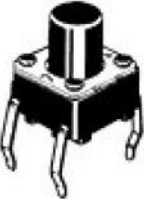
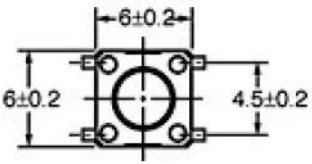


Closed book, closed notes. Calculators allowed. 30 minute time limit.

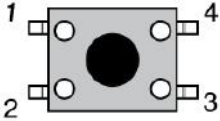
1) Momentary (or push-button) switches typically come in 2 types, abbreviated to NO and NC. What do these abbreviations stand for? **(2 points)**

2) Thinking about the buttons that come in the SparkFun Inventors kit and how the 4 pins are connected, fill in the table below **(8 points)**:

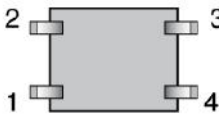




Top View



Bottom View



Connect Pins	Measured Resistance (Ω)	
	When not pressed	When pressed
1 and 2		
1 and 3		
1 and 4		
2 and 3		

3) In the Arduino language, the interrupt handler is initiated using the command:

`attachInterrupt(interrupt, ISR, mode)`

Briefly describe what the 3 input arguments (“interrupt”, “ISR” and “mode”) to this command represent and what values (if any) they can take **(6 points)**.

An engineer measures the velocity of a vehicle at 1 second intervals for 5 seconds and obtains the following data.

Time (s)	Velocity (m/s)
1	9
2	21
3	28
4	41
5	47

4) Using this data, fill in the table below (10 points)

$\sum x_i$	
$\sum y_i$	
$\sum x_i y_i$	
$\sum x_i^2$	
$(\sum x_i)^2$	

$$b = \frac{\sum y_i - m \sum x_i}{n}$$

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

5) Calculate the gradient and y-intercept for a linear least-squares best fit line for the data. **Draw a box around your answer (10 points)**

6) What is the velocity of the vehicle expected to be at $t = 10$ seconds? (2 points)