Math 113: Classroom Activity 2   Name : _____
10 pts

Materials Needed:
    Paper, washers, colored markers, ruler

Instructions:
    Divide into pairs. Place the sheet of paper on the desk and tape it down on the
    edge closest to you. Place a washer behind the line and flick the washer with your
    finger, trying to get it as close to center of the target as possible. Mark the center
    of the washer with a dot and then repeat until there are at least five marks on the
    paper.

    Now, let the other partner flick the washer. Mark the centers with a different color
    (or perhaps an x instead of a dot).

1.   Record the location of each mark using an x-y coordinate system. The lines are
      1 cm apart and you should estimate all values to the nearest mm (1 decimal place).

      a.   First person's name: _____

x						
y						

      b.   Second person's name: _____

x						
y						

2.   Use **your** points to complete these tables. Your partner will use his/her points.

                                                                          total

x							
$x - \bar{x}$							
$\left(x - \bar{x}\right)^2$							

							total
y							
y^2							

3. Find the descriptive statistics for x and y and record them in question 5. Use the formula $Variation = \sum(x-\bar{x})^2$ to find the variation in the x-values and the formula $Variation = \sum y^2 - \left(\sum y\right)^2 / n$ to find the variation in the y-values.

4. Enter your x and y values into Minitab and then use the Calculator under the Calc menu to find two new variables as described below. The Minitab function for square root is SQRT() and the exponential function is ** instead of ^.
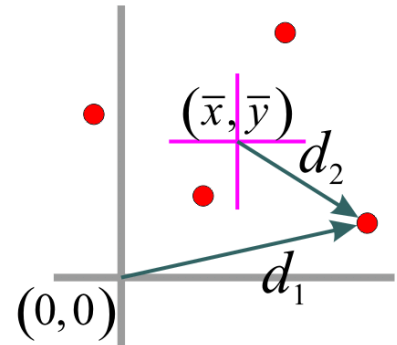
a. The distance each point is from the center of the target can be found using the formula

$$d_1 = \sqrt{x^2 + y^2}\,.$$

In Minitab, you would store the results in d1 and the expression would be SQRT(x**2+y**2).

b. The distance each point is from the center of your points, which is called the centroid and is the point $(\bar{x}, \bar{y})$, is found using the formula

$$d_2 = \sqrt{(x-\bar{x})^2 + (y-\bar{y})^2}\,.$$

For example, if $\bar{x} = 2.5$ and $\bar{y} = -3.7$ then the distance formula is

$d_2 = \sqrt{(x-2.5)^2 + (y-(-3.7))^2}$. Subtracting a -3.7 is the same as

adding 3.7, so you could write $d_2 = \sqrt{(x-2.5)^2 + (y+3.7)^2}$

In Minitab, you would store the results in d2 and the expression would be SQRT((x-2.5)**2+(y+3.7)**2).

Be sure to use your numbers in the formula and not 2.5 and -3.7.

5. Summarize the data for each person. Use Minitab to describe d_1 and d_2. You may either copy your partner's answers or use Minitab to find their values as well.

Name								
Variable	x	y	d_1	d_2	x	y	d_1	d_2
n								
Mean								
Median								
Variation								
Variance								
St Dev								

6. Use d_1 and d_2 to answer these questions.

    a. What is the average distance from the center for each partner? Who was closer?

    b. What is the standard deviation for the distance from the centroid of each partner? Who was more consistent?