WPI | Department of Physics

Worksheet for Significant Figures and Uncertainty

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Use this sheet to enter and submit your answers to the questions asked in the gray boxes on the Lab Instructions document. When you have completed this worksheet, save this file as a .pdf and upload the pdf to the canvas assignment associated with this lab. If you have any trouble converting to a pdf, please ask you Lab Instructor or Lab Assistant.

Remember to use complete sentences and that these text boxes will increase in size as you add more content.

1)

12.60 cm ± .05 cm

2)

12.60 cm ± .05 cm

3)

(15.00 cm ± .05cm) + (15.00 cm ± .05cm) + (13.90 cm ± .05cm)

4)

43.90 cm ±.15 cm

5)

Change the length of the ruler, specifically use a larger rule to decrease the amount of measurements and uncertainty.

6)

It was highly unlikely that we placed the ruler in the exact spot where it left off when we were measuring consecutive lengths.

7)

Length = 42.56 cm ± 1.96 cm, width = 12.24 ± 0.79 cm

8)

The mean values are on the same order of magnitude as the individual measurements.

9)

The class' total uncertainties are on a different order of magnitude as the estimated uncertainties because as you take more measurements and data, there is a greater chance for error to occur.

10)

Area of the keyboard = 520.79 cm ± 57.48 cm

11)

In [5]:

```
import statistics as stat

x= [40.10,39.85,44.00,44.10,39.90,44.00,44.00,44.10,39.93,44.00,42.80,43.90]
y= [10.40,12.45,12.45,12.50,11.40,12.50,12.50,13.50,11.50,12.55,12.50,12.60]

meanx = stat.mean(x)
meany = stat.mean(y)

area =  meanx * meany  #the avgArea = avgLength * avgWidth

stdevx = stat.stdev(x)
stdevy = stat.stdev(y)

uncertaintyX = stdevx / abs(meanx) #uncertainty for the length
uncertaintyY = stdevy / abs(meany) #uncertainty for the width

totalUncertainty = uncertaintyX + uncertaintyY # uncertainty of the
                                               # area divided by area

AreaUncertainty = totalUncertainty * area   # uncertainty of the area

print ("mean of x = ", meanx)
print ("mean of y = ", meany)
print ("Area = ", area)
print ("uncertainty of area = ", AreaUncertainty)

print ("uncertainty in x = ", stdevx)
print ("uncertainty in y = ", stdevy)
```

```
mean of x =  42.556666666666665
mean of y =  12.2375
Area =  520.7872083333333
uncertainty of area =  57.47764826378369
uncertainty in x =  1.9604931352425934
uncertainty in y =  0.7868594075644817
```

12)

The calibration of a measurement device would help ensure accuracy about our measurements because it would determine a baseline measurement for every data point.

13)

Make sure all the rulers used the same unit of measurement and calibration. We could also have everyone use the same ruler.