# Jamin Early 99133391 - Quiz 1

# Question 1

- Convert from .png to .jpg
- Ran calib_gui
- Select standard
- Select image names, imported all the images
- Extracted grid corners for each image (using 100x100mm dx and dx)
- Custom selected each # of squared depending on how many are in frame

Initial calibration results
Focal Length: fc = [ 882.16154 882.08351 ] +/- [ 8.18340 7.92670 ]
Principal point: cc = [ 506.35118 421.23060 ] +/- [ 6.06926 5.35822 ]
Skew: alpha_c = [ 0.00000 ] +/- [ 0.00000 ] => angle of pixel axes = 90.00000 +/- 0.00000 degrees
Distortion: kc = [ -0.19732 0.17523 0.00014 0.00093 0.00000 ] +/- [ 0.01360 0.02807 0.00136 0.00164 0.00000 ]
Pixel error: err = [ 1.09612 0.45139 ]

- We can further improve it by recomputing the corners. I will only do this once to avoid overfitting the dataset. These are the new values for our calibration:

Calibration results after optimization (with uncertainties):
Focal Length: fc = [ 881.28914 879.87153 ] +/- [ 2.06889 2.00033 ]
Principal point: cc = [ 513.91775 423.03256 ] +/- [ 1.54078 1.36481 ]
Skew: alpha_c = [ 0.00000 ] +/- [ 0.00000 ] => angle of pixel axes = 90.00000 +/- 0.00000 degrees
Distortion: kc = [ -0.19947 0.14113 -0.00019 0.00085 0.00000 ] +/- [ 0.00332 0.00625 0.00032 0.00041 0.00000 ]
Pixel error: err = [ 0.22497 0.19936 ]

- Please not that I am NOT happy with these results. It appears that human error caused my pixel error to be too large. If this was not time senstive, I would recalibrate the values.

# Question 2

```
clc;
clear;

px = 513.91775;
py = 423.03256;

fx = 881.28914;
fy = 879.87153;
K = [fx,0,px;
     0,fy,py;
     0,0,1];

X_cam = [18;-30;60;1];
IM = eye(3,4);
x = K*IM*X_cam;

u = x(1)/x(3)
v = x(2)/x(3)
```

```
u =

  778.3045


v =

  -16.9032
```