Assignment

March 12, 2016

In this assignment you will review some of the concepts from the class. No error handling is necessary in this assignment.

0.1 List, Mapping, Filtering, and Reducing Comprehensions

Write a function that doubles an integer or floating type values, reverses the content if it is a string, and does nothing if it is another kind of value.

Use that function in a list comprehension and apply it to the below list of data.

```
In [1]: fix_me = ['arsenic', 5, 'ball', 2, 47, 123,
                  'comprehensions', 'list', 5.5,
                  8343.23, 'shishkabob']
```

```
In [ ]:
```

Now do the same with a map.

```
In [ ]:
```

Now do the same, except filter out the final values that are less than 5. See if you can do it using only lambda expressions.

```
In [ ]:
```

1 Generating Random Data and Filtering That Data

In this next section, we will work with NumPy. Set your random seed below in the way that I have.

```
In [85]: import numpy as np
         np.random.seed(25)
         ar = np.random.randn(1000)
```

Now we will start playing around with this data. You will follow a series of steps and output your answers. For each step, you will use the `ar` value that I created above, and after each step, you should set `ar` to be the new `ar` value. The first step is:

Multiply all values by 100

so your answer will be the following.

```
In [86]: ar = ar * 100
         ar
```

```
Out[86]: array([  2.28273090e+01,   1.02689030e+02,  -8.39584849e+01,
                 -5.91181518e+01,  -9.56888297e+01,  -2.22325694e+01,
                 -6.19915108e+01,   1.83790458e+02,  -2.05323076e+02,
                  8.68583052e+01,  -9.20734440e+01,  -2.32311864e+01,
```

```
 2.15295690e+02,  -1.33466147e+02,   7.63796505e+00,
-1.24608928e+02,   1.20227231e+02,  -1.04994158e+02,
 1.05661011e+02,  -4.19677671e+01,   2.29484234e+02,
-2.59448738e+02,   2.82275640e+02,   6.80888923e+01,
-1.57769345e+02,  -1.97625359e+02,   5.33339823e+01,
-2.90869712e+01,  -5.13519669e+01,   1.98262608e+02,
 2.26001050e+01,  -1.83990496e+02,   1.60767083e+02,
 3.88291936e+01,   3.99732064e+01,   4.05476600e+01,
 2.17001772e+01,  -6.33439103e+01,   2.46621529e+01,
-1.93954552e+02,   1.14059633e+01,  -1.88534140e+02,
 2.43080482e+01,  -7.05480672e+01,   3.64627615e+01,
-5.02952163e+01,  -2.25751546e+01,  -5.65537733e+01,
 1.03395013e+01,   2.01840842e+02,   1.09424827e+02,
 1.66243440e+02,  -6.27453481e+01,   1.62119964e+02,
 1.17813267e+02,  -3.74878746e+01,  -5.44328983e+01,
 2.87761181e+01,  -2.05819993e+01,   1.18998786e+02,
 7.28926883e+01,  -2.22040117e+01,  -1.62270578e+02,
 3.12540549e+01,  -1.16042141e+02,   3.13559680e+01,
 4.71997864e+01,   5.77861705e+01,   5.05406754e+01,
-6.26487774e+01,  -3.46369326e+01,  -2.06594183e+02,
 7.68936287e+01,   1.12886631e+02,   1.66923538e+01,
-9.67255392e+01,   4.91996254e+01,  -5.50857174e+01,
-8.46940715e+00,   1.96756834e+02,  -6.26751086e+00,
-8.51135782e+01,   4.26520629e+01,  -2.77560741e+01,
-1.37794456e+02,  -9.51964130e+00,   8.33638726e+01,
-7.84754447e+01,   1.04614478e+02,  -6.45783995e+01,
-1.89157934e+02,  -9.73328512e+00,  -1.35889534e+02,
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-2.45010985e+01,   2.08728338e+01,  -3.00851524e+01,
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-9.77803407e+01,  -1.97286621e+02,  -1.26613854e+02,
-1.00096544e+02,  -3.04989010e+02,   3.94720433e+01,
-1.94733934e+02,   5.33330216e+01,   3.79162684e+01,
```

```
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-1.28280414e+02,  -1.93224342e+02,  -2.06349615e+02,
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```
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 2.31146445e+02,  -8.50695957e+00,  -6.48115247e+01,
 5.76300418e+01,  -7.90087351e+01,  -1.18379827e+02,
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 4.29352169e+00,  -1.60909744e+01,   9.18553051e+01,
-2.92696575e+01,  -1.30383444e+02,  -1.99604475e+01,
 8.71022989e+01,  -1.37068101e+02,  -2.05701448e+01,
-4.92973120e+01,   1.12308269e+02,  -8.18424761e+00,
-1.18526952e+01,   2.45837893e+01,  -3.15741805e+01,
-5.11806364e+01,   1.14695770e+00,  -3.61040369e+00,
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-1.23478276e+02,  -1.12149985e+02,   1.19647765e+02,
-5.69521672e+01,   4.22022286e+01,  -2.20483643e+01,
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-1.68721768e+01,  -1.47799639e+02,  -1.96991678e+02,
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-7.62051909e+01,   1.99378679e+01,  -9.64346424e+01,
-2.56691900e+01,   1.26527473e+02,   8.48762115e+01,
-7.84160788e+01,   1.86377632e+02,  -3.55569333e+01,
 8.54551964e+01,   7.68061333e+01,  -2.07571764e+02,
-2.50106925e+02,   1.10986832e+02,   9.57544610e+01,
-6.83275787e+01,   3.07764491e+01,   7.33073436e+01,
 1.70624957e+02,  -1.11809146e+02,   3.74961453e+01,
-1.41450337e+02,  -5.24182592e+01,  -1.66269630e+02,
 6.87920537e+01,   5.21731582e+01,   1.45139577e+02,
-8.33490923e+01,  -3.62796076e+01,  -1.17444370e+02,
-8.13892816e+01,  -8.93220082e+01,   7.70742602e+01,
 1.15664671e+02,  -6.47443621e+01,   1.25928624e+01,
 5.13599516e+01,  -5.37873603e+01,   1.99205226e+02,
-1.94658408e+02,  -1.04758986e+01,   4.84778787e+01,
-2.90935538e+01,  -4.41074676e+01,   5.42993458e+01,
-1.05003807e+02,   1.63048249e+02,   2.39770578e+01,
-1.17730963e+02,   4.64803670e+01,  -9.66994575e+01,
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-2.26782693e+02,  -1.22961637e+02,   1.31380464e+02,
 1.07329150e+02,   2.32493978e+02,  -5.42720331e+01,
-1.50429249e+02,   7.77642627e+01,  -6.18552890e+01,
 1.13423732e+00,   1.38506236e+02,   1.36355215e+02,
-5.49833922e+01,   6.88896186e+01,   1.36128823e+02,
-3.81137438e+01,   7.97811721e+01,  -1.12819836e+02,
 3.69207730e+01,   5.40132175e+01,   4.13853321e+01,
-2.00308442e+01,  -9.69126233e+01,   9.81292847e+01,
-9.78274712e-01,  -3.20019617e+01,  -5.74816417e+01,
 1.41997661e+02,   4.34813417e+01,  -1.10121686e+02,
-1.58627506e+02,   1.97957257e+02,   3.78298162e+01,
 7.82325786e+01,   2.17898703e+02,   6.57563754e+01,
 6.83774128e+01,  -9.10001062e+00,  -5.95520701e+00,
-7.38908328e+01,  -9.07652815e+01,  -7.01935890e+01,
 5.80038811e+01,  -6.18757050e+01,   4.53684432e+01,
 1.66538179e+02,  -1.52320746e+01,   8.80076503e+01,
```

```
 5.71072987e+01,  -6.04735955e+01,   5.32359199e+01,
 5.15031225e+01,  -9.59843862e+01,  -8.87184379e+01,
 4.35781005e+01,   8.62093294e+01,  -9.56320609e+01,
-6.25909446e+01,   1.94472030e+01,   4.42490233e+01,
 5.26503270e+01,  -2.15273950e+01,   9.07107012e+00,
 9.32591583e+01,   8.11999431e+01,  -2.49702559e+02,
 6.31545459e+01,   3.21418395e+01,  -4.25549380e+01,
-1.07883180e+02,   7.53443532e+01,   1.99789701e+01,
-3.60526445e+01,  -1.34481077e+00,  -8.19476385e+01,
 8.14869052e+01,   4.42117694e+01,  -9.72047958e+01,
-6.06027164e+00,  -2.34982466e+02,   1.26544504e+02,
-5.73257404e+01,   4.29123962e+01,   1.04978344e+02,
 1.95477270e+02,   7.18828682e+00,  -9.42092937e+00,
 2.65616442e+01,   9.48318105e+01,   3.31645063e+01,
 1.34340104e+02,  -1.67933768e+01,  -1.10525178e+02,
-1.67077421e+01,  -9.65764461e+00,  -8.38161311e+01,
-2.08563867e+01,   3.94534137e+01,   7.62532546e+01,
 1.23535683e+02,  -2.07281999e+01,  -2.02945561e+01,
-4.68024798e+01,   2.56943715e+01,   2.58758387e+02,
 1.18669703e+02,  -1.03190291e+02,   1.42831591e+02,
 6.58898613e+01,  -4.65824446e+00,  -7.54221740e+00,
 1.32935858e+02,  -6.84266902e+01,  -1.52418233e+02,
 2.01406062e+02,   3.77093301e+02,   6.47353487e+01,
-1.02137667e+02,  -3.45492907e+01,   5.82811374e+01,
 7.97812447e+01,   1.32601978e+02,   1.42285720e+02,
-3.07700742e+02,   1.84082739e+01,   1.47893471e+02,
-6.00141738e+01,   1.92956108e+02,  -2.34677110e+02,
-6.69700083e+01,  -1.16525817e+02,   8.14787889e+01,
 4.44449083e+01,  -5.76758188e+01,   3.53090905e+01,
 4.08893248e+01,   9.13908976e+00,  -2.29438930e+02,
 4.85505695e+01,  -8.13039016e+00,  -7.16272061e+01,
-1.64800997e+02,   1.00536138e+02,  -1.48960347e+02,
 3.63098228e+01,   7.58601936e+01,  -1.37384716e+02,
-9.72056718e+01,   1.98853662e+02,   3.19829029e+01,
 1.16906017e+02,   1.46585409e+01,   1.03038775e+02,
 1.16598404e+02,   1.36956258e+02,   7.30983593e+01,
-1.38369650e+02,  -5.15189212e+01,  -8.08927443e+01,
-1.17465146e+02,  -1.63150212e+02,  -1.12341362e+02,
-4.78154697e+01,  -1.58306686e+02,   1.41907433e+02,
 1.66877652e+02,   1.56751679e+02,   2.22103033e+01,
-3.36040143e+01,  -1.35206412e+02,   2.51031771e+01,
-4.01695061e+01,   2.68412520e+01,  -1.22986532e+00,
-9.18953111e+01,   2.92120813e+02,  -5.81587535e+01,
 6.72848297e+01,   1.25113596e+02,   1.38226304e+02,
 1.42989675e+02,   1.29099034e+02,  -1.27267303e+02,
-3.08611463e+01,  -4.22988268e+01,  -6.75641635e+01,
 8.74441121e+01,   1.30573621e+02,  -2.62585374e+01,
-1.09939477e+02,  -6.67101455e+01,  -6.46736807e+01,
-5.56337879e+01,  -1.96590982e+01,   1.19306323e+01,
-2.66454560e+01,  -5.24266929e+01,   2.65095114e+02,
 9.73184341e+00,  -9.74696716e+01,   1.89963798e+01,
 1.14115540e+02,  -6.44342574e+00,   1.10497075e+02,
-1.50890764e+02,  -3.18327029e+00,   8.03919116e+01,
-6.59221113e+01,   9.39145439e+01,   2.14041391e+01,
```

```
                -5.31804789e+01,   9.56060213e+01,   2.49328459e+01,
                 6.37903038e+01,  -5.10157668e+01,   1.85028673e+02,
                -3.48406612e+01,   2.00137621e+02,  -3.89643279e+01,
                -2.47859984e+00,  -4.70972858e+01,   8.69338641e+01,
                 1.70667391e+01,   5.98061597e+01,   1.21726220e+02,
                 1.27401251e+02])
```

the first 3 values should be

```
2.28273090e+01,   1.02689030e+02,  -8.39584849e+01,
```

Now convert that matrix into a matrix of 8-bit integers.

In [ ]:

the first 3 values should be

```
 22,  102,  -83,
```

And the length should be 1000.

At this point you have performed a transformation without my telling you exactly what to do. However, you got an answer. Assuming that you have gotten the first conversion right, to ensure that you understand the material, it is time to stop giving you the answers.

Reshape the array into a set of five columns with 200 rows.

In [ ]:

Now that `ar` is a matrix, let's get the maximum and minimum values from the matrix both row wise and column wise. (Keep the value of `ar` to be the same). Be sure to remember how many total values you should be outputting.

In [ ]:

In [ ]:

Now that we have gotten the minimum and maximum values for the columns, get the mean of the entire matrix. (This should be a specific value.)

In [ ]:

What is the total number of values that are less than the mean?

In [ ]:

What is the total number of values in each row that are greater than this mean value? (Remember, if we are doing a row-oriented comparison, how many numbers should be in our output array?)

In [ ]:

How many zeros are in the matrix that we have?

In [ ]:

Lastly, sum all the values that are either greater than 100 or are less than 5 and greater than or equal to -20.

In [ ]: