

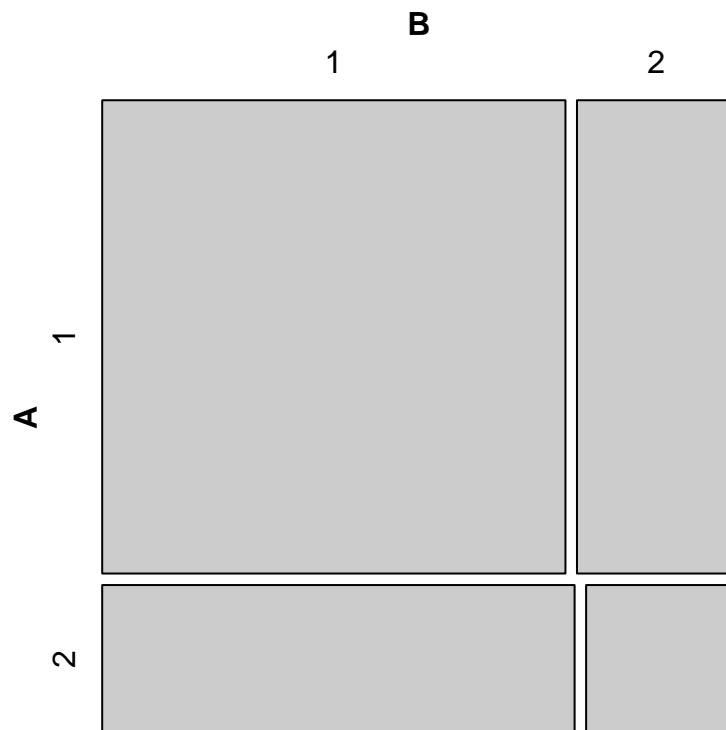
## Lab Assignment 2

Nora Quick

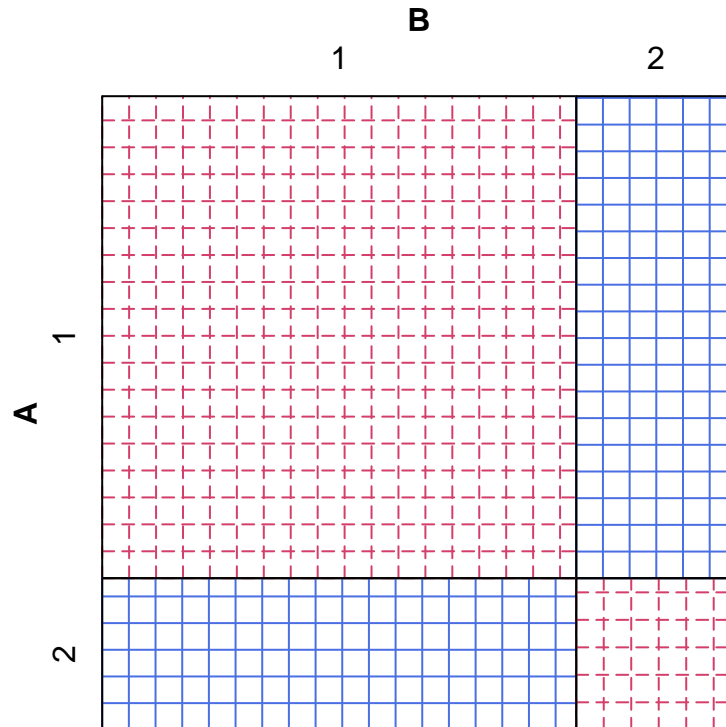
### Questions:

**Q1.**How consistent are these data with Mendel's hypothesis of independence? Notice that in this particular case, we're not interested in a *departure* from independence, but rather a *confirmation* of independence. Is a Chi-squared test appropriate here? Why or why not?

```
tab1 <- matrix(c(315, 108, 101, 32),2,2,byrow=TRUE)
mosaic(tab1)
```



```
sieve(tab1, shade = TRUE)
```



Based on the two graphs above I believe that the data is approximately independent.

Because the Chi-Squared test is used to test and no necessarily confirm independence (what we want to do here) I would say that it is not needed here.

**Q2.**

```
norm <- rnorm(1000)
chi <- rchisq(1000, df = 1)
```

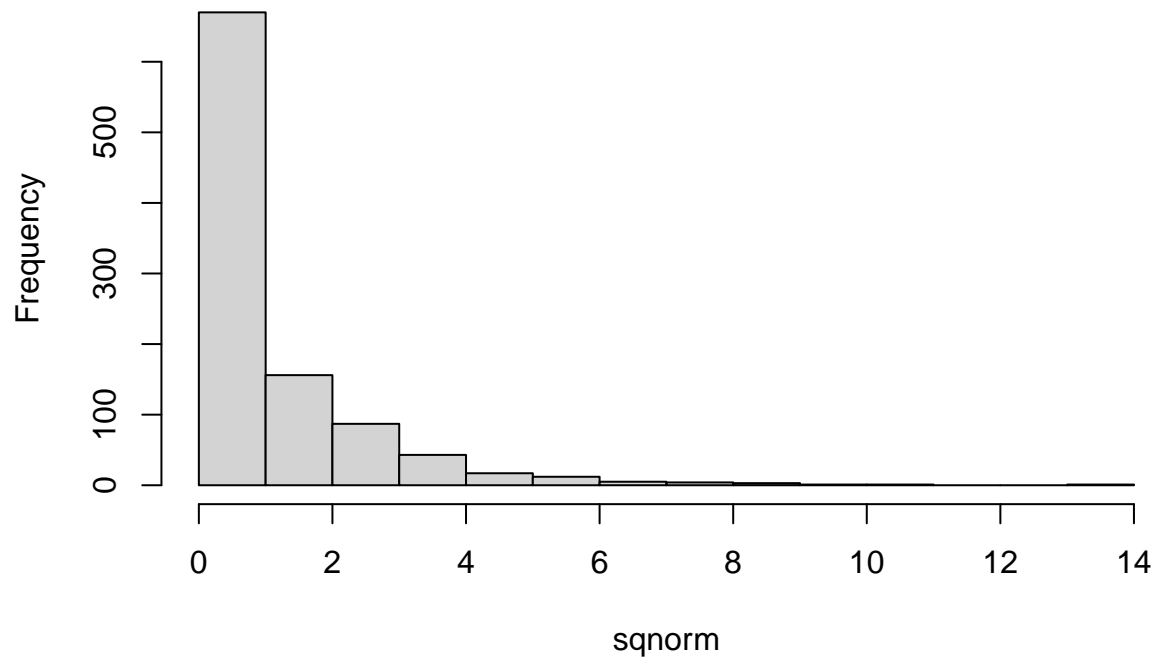
```
sqnorm <- norm * norm
```

```
dnorm <- density(sqnorm)
dchi <- density(chi)
```

(a) Construct separate histograms/density plots of the raw chi-squared values and the *squares* of the standard normal values. What do you observe?

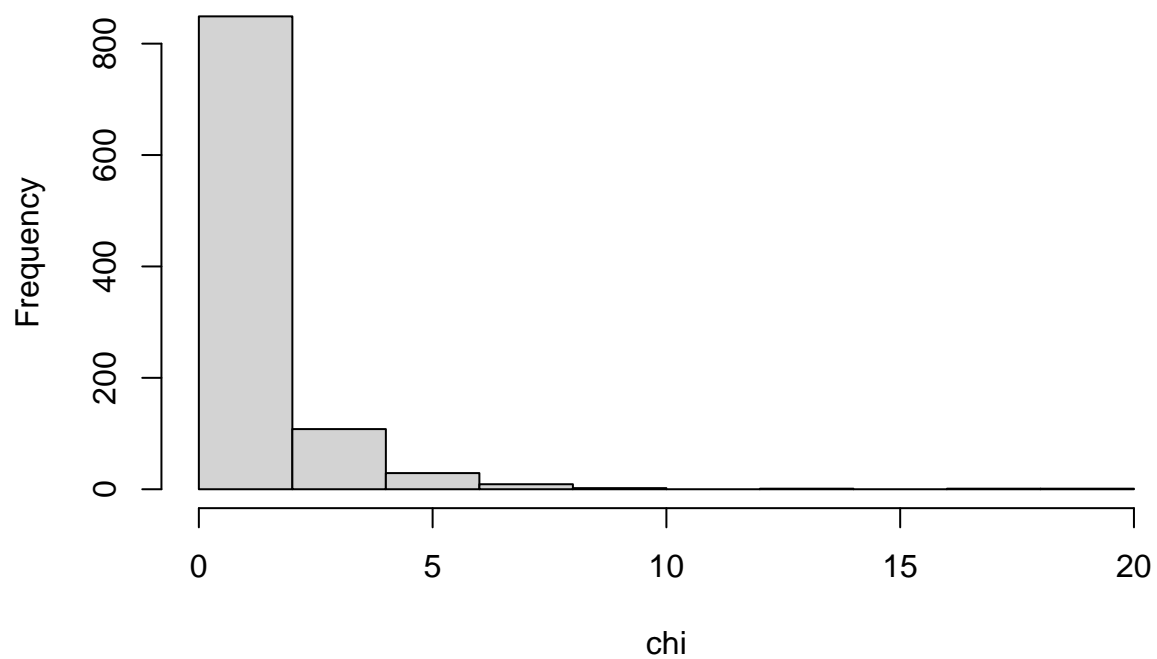
```
hist(sqnorm)
```

**Histogram of sqnorm**



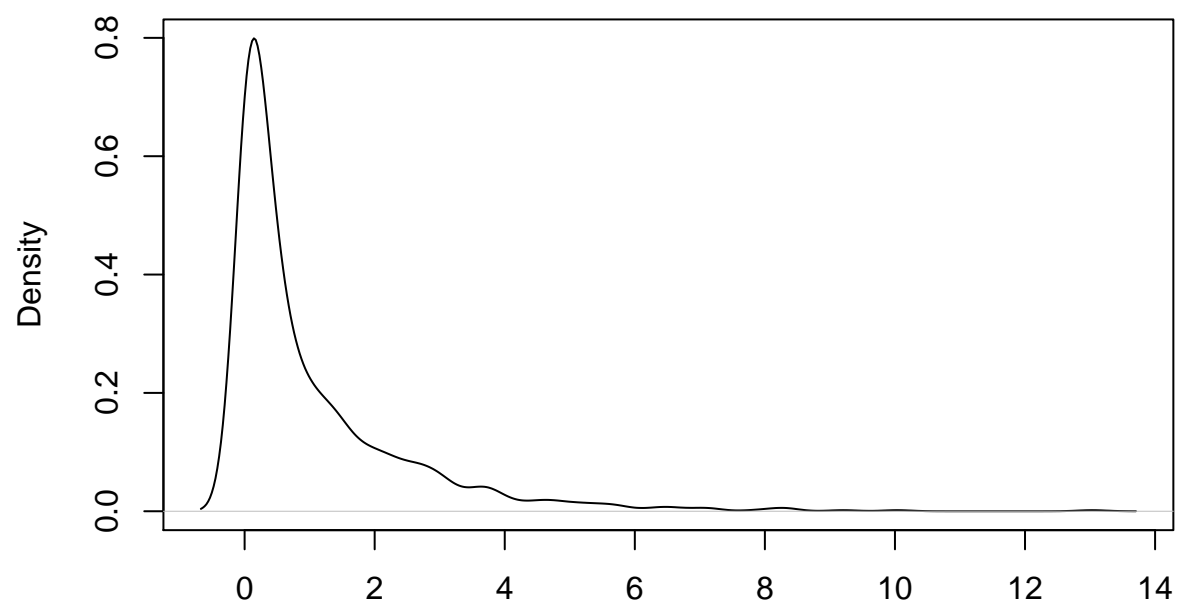
```
hist(chi)
```

**Histogram of chi**



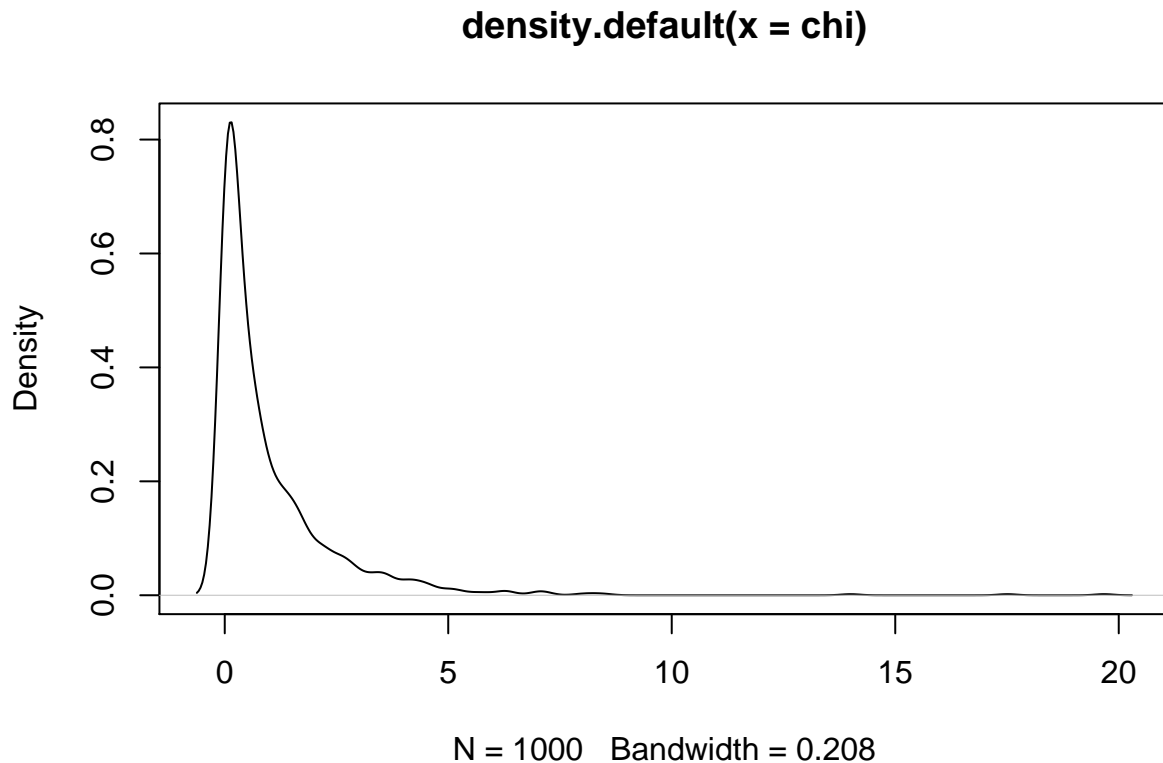
```
plot(dnorm)
```

**density.default(x = sqnorm)**



N = 1000 Bandwidth = 0.2243

```
plot(dchi)
```



I am very shocked to observe that in both cases of the histogram and the density are very similar.

(b) Recall (or obtain from `qnorm(0.975)`) that the *2-sided 95%* critical values for the standard normal distribution are  $\pm 1.96$ . Use `qchisq()` to compare the *square* of these 2-sided 95% critical values from the standard normal to the *one-sided 95%* critical value for the Chi-squared(1). What does this suggest about tests based on these two reference distributions?

```
qnorm(0.975)
```

```
## [1] 1.959964
```

```
sqrt(qchisq(chi, df = 1))
```

```
## Warning in qchisq(chi, df = 1): NaNs produced
```

```
##      [1]      NaN 9.241428e-01 1.765866e-01 7.314857e-01 1.411987e-02
##      [6] 2.737573e+00 8.415551e-01      NaN      NaN      NaN
##     [11] 1.193432e+00      NaN      NaN      NaN 5.420398e-01
##     [16] 3.505807e-01 1.987117e-01      NaN      NaN 1.221380e+00
##     [21] 6.284837e-01 5.630003e-01 8.833983e-02      NaN 1.398559e+00
##     [26] 4.926465e-01      NaN 5.292219e-01 5.426213e-01      NaN
##     [31] 4.253182e-02      NaN      NaN 1.139676e+00 1.858709e-03
##     [36] 6.952393e-02      NaN 5.316896e-01 2.450930e-02      NaN
```

##	[41]	1.124641e-01	8.658539e-04	NaN	9.284227e-01	9.649041e-02
##	[46]	3.789142e-01	1.985081e-02	2.487733e-02	1.496415e-01	3.144370e-02
##	[51]	NaN	6.223197e-01	NaN	NaN	1.316590e-01
##	[56]	8.588996e-02	5.814763e-01	3.871477e-02	2.424161e-01	NaN
##	[61]	6.673114e-01	3.424996e-01	NaN	3.061581e-01	NaN
##	[66]	4.199144e-02	4.530534e-02	1.358049e-01	2.616740e-01	NaN
##	[71]	7.141648e-01	8.331468e-01	2.626962e-02	4.698936e-01	NaN
##	[76]	2.397333e+00	3.873633e-02	2.635582e-01	4.195342e-02	9.201345e-01
##	[81]	9.351527e-02	1.595795e-01	NaN	NaN	1.101568e-01
##	[86]	NaN	NaN	NaN	NaN	6.836949e-01
##	[91]	NaN	1.817712e-01	NaN	NaN	NaN
##	[96]	2.353019e+00	NaN	NaN	1.258398e+00	9.076917e-04
##	[101]	NaN	5.418468e-01	NaN	NaN	NaN
##	[106]	NaN	NaN	3.947363e-01	4.250102e-01	4.097649e-01
##	[111]	1.699305e-01	8.475837e-01	NaN	2.139904e+00	8.748436e-02
##	[116]	9.754131e-01	NaN	9.460677e-01	NaN	5.678627e-01
##	[121]	9.592408e-02	NaN	2.178643e+00	1.605822e-01	7.730727e-01
##	[126]	NaN	4.009829e-01	9.440006e-01	NaN	7.382535e-01
##	[131]	4.252916e-01	NaN	5.922173e-02	5.148060e-01	3.132049e-01
##	[136]	3.502743e-01	NaN	NaN	NaN	7.806157e-01
##	[141]	9.841552e-02	1.493454e-01	5.190362e-01	2.271142e-01	8.779634e-01
##	[146]	1.004686e-01	9.302172e-01	1.284992e-01	1.113869e-02	3.488330e-01
##	[151]	4.649794e-01	5.040941e-01	NaN	NaN	NaN
##	[156]	1.049595e-02	NaN	1.282297e-03	5.445375e-01	4.131358e-01
##	[161]	4.223246e-02	2.736920e-01	1.067894e-01	2.282760e-02	NaN
##	[166]	4.165784e-02	1.348757e-01	1.233571e-01	NaN	NaN
##	[171]	NaN	6.839981e-02	NaN	1.307395e-01	NaN
##	[176]	NaN	NaN	NaN	1.603685e-01	NaN
##	[181]	NaN	1.183933e+00	9.411310e-02	5.755428e-01	2.252178e-01
##	[186]	7.130408e-01	2.539786e-01	5.200511e-01	1.256484e-02	4.972173e-02
##	[191]	NaN	NaN	1.270957e-02	NaN	NaN
##	[196]	2.598913e-01	NaN	4.347550e-01	1.883614e-01	2.527255e-01
##	[201]	5.062260e-03	NaN	2.442863e-01	NaN	9.114760e-02
##	[206]	2.041995e-03	NaN	NaN	NaN	1.214938e+00
##	[211]	5.369345e-04	NaN	NaN	NaN	1.499282e-03
##	[216]	1.106824e+00	2.179655e-01	1.014506e+00	3.566367e-02	3.155206e-01
##	[221]	NaN	2.644991e-02	NaN	NaN	4.354842e-03
##	[226]	4.226965e-01	NaN	2.580794e-01	NaN	NaN
##	[231]	5.953903e-04	NaN	6.121293e-03	NaN	6.344117e-01
##	[236]	7.653041e-01	8.154112e-02	NaN	4.560254e-01	1.389982e-01
##	[241]	7.196350e-02	NaN	NaN	3.258683e-02	NaN
##	[246]	NaN	3.979619e-01	NaN	3.660690e-02	8.494718e-02
##	[251]	1.702716e-01	8.396225e-02	NaN	2.507067e+00	5.867287e-04
##	[256]	2.028404e-02	3.211474e-01	4.089349e-02	2.128781e-03	NaN
##	[261]	NaN	1.025066e+00	1.605704e+00	8.752790e-01	3.713610e-01
##	[266]	6.016391e-02	1.460661e-01	NaN	2.334848e-03	1.680425e-01
##	[271]	1.488617e-01	7.504321e-01	NaN	2.174909e-01	1.496403e-01
##	[276]	NaN	NaN	2.325273e-01	NaN	NaN
##	[281]	1.357722e-04	1.007201e+00	3.298075e-01	2.807076e-01	4.038249e-01
##	[286]	NaN	1.076683e+00	1.040720e+00	1.013465e+00	8.917596e-02
##	[291]	NaN	1.397136e+00	7.409861e-01	4.951799e-01	2.872279e-02
##	[296]	4.531881e-01	2.584689e-01	5.356226e-02	8.745883e-02	8.165662e-01
##	[301]	2.031861e-01	6.063550e-02	NaN	5.908914e-01	4.170204e-01
##	[306]	NaN	6.041487e-01	1.091914e-01	1.860515e-01	2.258959e-01

##	[311]	2.789458e-04	NaN	9.434807e-01	6.028468e-02	2.225633e-01
##	[316]	9.154453e-01	9.212866e-02	2.069511e-01	NaN	1.081713e-01
##	[321]	NaN	1.575255e+00	6.994567e-01	NaN	7.539326e-02
##	[326]	NaN	4.447404e-01	NaN	4.780596e-03	1.702274e+00
##	[331]	1.119953e-02	1.766320e-01	3.489965e-01	1.455912e+00	NaN
##	[336]	4.900987e-01	5.561273e-07	8.759317e-04	1.480550e+00	NaN
##	[341]	5.254731e-03	1.783784e-01	8.350559e-01	NaN	NaN
##	[346]	3.544221e-01	1.693796e-01	2.349249e-01	1.106406e-03	4.400981e-01
##	[351]	3.015602e-01	1.774440e+00	NaN	7.705664e-02	NaN
##	[356]	NaN	NaN	8.278710e-01	2.641934e-01	NaN
##	[361]	9.934476e-02	5.778805e-01	2.945727e-01	1.007541e-01	NaN
##	[366]	NaN	9.545944e-01	NaN	1.695313e-02	1.207825e-01
##	[371]	NaN	3.525255e-02	8.465697e-02	NaN	2.217703e-01
##	[376]	1.128894e+00	NaN	7.740075e-01	5.454392e-03	4.699842e-02
##	[381]	2.523263e+00	4.727035e-04	NaN	4.347833e-02	1.360465e-02
##	[386]	2.545381e-04	9.287228e-02	3.440393e-02	1.232266e-02	2.479366e-01
##	[391]	NaN	1.907999e-01	3.897555e-01	8.250426e-01	2.269038e+00
##	[396]	3.227389e-02	4.942079e-01	NaN	7.474211e-02	6.956899e-02
##	[401]	2.852834e-01	5.220885e-03	NaN	9.714217e-02	NaN
##	[406]	5.120252e-01	NaN	8.837683e-01	8.033109e-03	8.583176e-01
##	[411]	1.122866e+00	1.158334e+00	1.737066e-01	NaN	3.916014e-02
##	[416]	3.101499e-03	6.961898e-03	1.459851e-03	3.708236e-02	NaN
##	[421]	1.409765e-02	3.206905e-02	1.121399e+00	NaN	7.568553e-01
##	[426]	9.518396e-01	4.932455e-01	9.489947e-01	1.146301e+00	1.097315e+00
##	[431]	5.401783e-02	7.934885e-03	NaN	1.080077e-03	NaN
##	[436]	2.198873e-01	NaN	6.123104e-02	4.498781e-03	1.594107e-01
##	[441]	1.158451e+00	NaN	3.953718e-02	8.600274e-01	1.594173e-02
##	[446]	2.995294e-01	6.002007e-03	6.523373e-01	NaN	NaN
##	[451]	2.172483e+00	NaN	2.614415e-01	4.655458e-01	7.184271e-02
##	[456]	6.253414e-02	7.723803e-02	1.567441e-01	8.117736e-02	5.167308e-04
##	[461]	NaN	NaN	1.883995e-02	3.627184e-01	9.279257e-01
##	[466]	1.663500e-01	4.322861e-01	5.651350e-02	2.906537e+00	NaN
##	[471]	NaN	NaN	4.297465e-01	NaN	4.788473e-01
##	[476]	NaN	8.177012e-03	9.405866e-02	1.863021e-02	5.308817e-01
##	[481]	1.038654e-02	4.116865e-01	6.045132e-01	1.015956e+00	NaN
##	[486]	1.388041e-03	7.811380e-01	3.239258e-02	3.616872e-01	NaN
##	[491]	NaN	NaN	5.149550e-05	NaN	7.342995e-01
##	[496]	NaN	1.104083e-01	NaN	7.600703e-02	5.658634e-02
##	[501]	3.085163e-01	6.772928e-03	3.894238e-01	5.422676e-01	2.913789e-02
##	[506]	4.053713e-02	1.485318e-02	NaN	1.076611e-02	1.343103e+00
##	[511]	1.281890e-01	1.376665e-01	5.112200e-02	5.034674e-01	1.215233e-01
##	[516]	3.431451e-03	NaN	1.287171e+00	8.351572e-02	3.743589e-01
##	[521]	6.742877e-02	NaN	NaN	NaN	5.125227e-01
##	[526]	NaN	6.766524e-02	2.547197e-01	NaN	3.520040e-01
##	[531]	2.473426e-02	NaN	2.437055e-02	NaN	1.131055e-03
##	[536]	NaN	2.953128e-02	9.876382e-02	2.492502e-01	1.294043e-01
##	[541]	1.516078e+00	4.441956e-01	2.371066e-02	1.305711e+00	1.442903e+00
##	[546]	1.429805e+00	2.591483e-01	3.217898e-01	1.077318e-01	2.336359e+00
##	[551]	NaN	NaN	3.295054e-01	5.938472e-02	NaN
##	[556]	1.649058e-01	4.681100e-01	5.200065e-01	2.371721e-01	2.968321e-01
##	[561]	3.291613e-02	1.156345e-02	1.816931e-04	5.075415e-02	6.641864e-01
##	[566]	2.304485e-01	1.358375e-01	4.655261e-01	4.496386e-01	1.602206e-02
##	[571]	1.865592e+00	1.072052e+00	7.092848e-01	1.431610e-01	4.614900e-03
##	[576]	NaN	NaN	NaN	2.469098e+00	1.676094e-01



##	[581]	1.115976e+00	3.443744e-01	4.151259e-02	4.791851e-02	NaN
##	[586]	2.581795e-01	NaN	4.291182e-01	1.416737e+00	NaN
##	[591]	1.010940e+00	1.144532e+00	NaN	NaN	NaN
##	[596]	3.956692e-01	NaN	4.983126e-02	3.238766e-02	8.382190e-01
##	[601]	NaN	NaN	4.096416e-01	3.648670e-01	NaN
##	[606]	4.173986e-01	NaN	1.070031e-01	6.276994e-01	NaN
##	[611]	2.040672e-01	1.455316e-01	NaN	2.420227e-02	1.248297e+00
##	[616]	2.019406e-01	1.155776e-01	NaN	1.273406e-01	NaN
##	[621]	6.666823e-01	NaN	4.105724e-01	2.088311e-01	1.673487e-01
##	[626]	7.082412e-02	1.161216e+00	NaN	2.567494e-01	NaN
##	[631]	9.054884e-01	1.208744e-01	2.009252e-03	1.134125e-01	1.329690e-02
##	[636]	1.004161e-01	1.750539e-01	1.697414e+00	4.485700e-01	9.669352e-01
##	[641]	1.760681e-01	8.178256e-02	4.352689e-01	1.071508e+00	NaN
##	[646]	2.972625e-02	1.076735e-02	1.205640e+00	4.849961e-03	6.304150e-01
##	[651]	4.747553e-01	4.893241e-03	NaN	3.827593e-01	6.433392e-01
##	[656]	2.722482e-01	1.836463e+00	4.859727e-01	NaN	NaN
##	[661]	2.212730e+00	4.765717e-01	NaN	4.210593e-01	1.354908e+00
##	[666]	3.791113e-01	NaN	NaN	1.334149e-02	5.795811e-04
##	[671]	7.643888e-01	1.643526e-01	5.628800e-02	1.147355e+00	5.523642e-01
##	[676]	1.554868e+00	8.738607e-01	NaN	NaN	NaN
##	[681]	1.006152e+00	3.814749e-02	7.897969e-01	1.008202e+00	7.662823e-02
##	[686]	3.999612e-01	4.901351e-01	6.667253e-01	NaN	4.820069e-01
##	[691]	NaN	NaN	NaN	1.270181e-02	NaN
##	[696]	1.366137e-02	NaN	NaN	5.248085e-01	2.189310e-01
##	[701]	1.824998e-01	NaN	NaN	5.752004e-01	4.172159e-01
##	[706]	4.571555e-01	NaN	5.410024e-03	2.272924e-01	NaN
##	[711]	6.146138e-01	NaN	1.143491e-03	6.951312e-02	2.196401e-01
##	[716]	1.738856e-02	4.843261e-02	1.630990e-02	NaN	NaN
##	[721]	2.031447e-01	2.014633e-01	NaN	NaN	NaN
##	[726]	4.287648e-02	1.031868e+00	NaN	7.017905e-01	5.358665e-03
##	[731]	1.242286e+00	4.208144e-01	1.705612e+00	2.514552e-01	NaN
##	[736]	4.292324e-01	3.177489e-01	NaN	2.287112e+00	3.666454e-02
##	[741]	NaN	8.980656e-01	NaN	2.116972e-01	NaN
##	[746]	NaN	1.134250e+00	NaN	2.515894e+00	1.998237e-01
##	[751]	NaN	NaN	NaN	2.568233e-01	6.046874e-02
##	[756]	NaN	NaN	NaN	NaN	1.145682e+00
##	[761]	5.306017e-01	3.740543e-04	6.705610e-01	1.144959e+00	3.400823e-03
##	[766]	NaN	1.638721e+00	1.326725e+00	3.072010e-02	NaN
##	[771]	3.253286e-01	8.404441e-01	NaN	NaN	2.743910e-01
##	[776]	1.175810e+00	6.827290e-01	NaN	NaN	1.921039e-01
##	[781]	NaN	NaN	1.247192e-01	5.534176e-01	2.225252e+00
##	[786]	1.361761e+00	NaN	9.176077e-01	4.890234e-01	NaN
##	[791]	NaN	1.107876e+00	NaN	NaN	1.006569e+00
##	[796]	NaN	5.564226e-01	2.462052e-03	2.222431e+00	NaN
##	[801]	1.986877e-02	1.794013e-01	2.882131e-03	3.224391e-01	NaN
##	[806]	1.017663e+00	8.512762e-04	6.553933e-01	1.275308e+00	NaN
##	[811]	1.625302e-01	4.579798e-02	NaN	4.999511e-01	1.818485e-01
##	[816]	8.061577e-01	7.490837e-02	NaN	2.578395e-01	1.424314e-01
##	[821]	1.367955e-02	1.403360e+00	1.082423e+00	NaN	NaN
##	[826]	1.963751e-01	2.614183e-01	NaN	1.590958e-01	NaN
##	[831]	1.809043e-03	7.109750e-01	NaN	2.289461e-01	8.542740e-04
##	[836]	1.467186e-02	1.396349e-03	NaN	1.894912e-01	1.577501e-01
##	[841]	5.071279e-02	NaN	4.985089e-02	2.629741e+00	NaN
##	[846]	6.261965e-05	NaN	5.040423e-02	4.301115e-02	5.746217e-01

##	[851]	2.298800e-03	4.117555e-01	3.790918e-01	1.410627e-01	1.002662e-01
##	[856]		NaN	1.102050e-02	1.888431e-01	1.259719e-01
##	[861]		NaN	1.769017e-01		NaN
##	[866]	4.496049e-01		NaN		NaN
##	[871]	4.150428e-03		NaN	4.480138e-01	
##	[876]	9.352384e-01	1.190376e+00	3.181405e-02		NaN
##	[881]		NaN	1.491463e-01	1.399885e-01	1.200296e-04
##	[886]		NaN	3.219742e-01	1.011913e-01	8.613240e-02
##	[891]	1.313493e-01		NaN	4.174607e-01	1.335501e+00
##	[896]		NaN		NaN	3.882983e-05
##	[901]	8.516392e-02	9.734076e-03	1.162239e-01	1.550864e+00	6.599971e-01
##	[906]		NaN	8.106463e-01	6.565364e-01	5.830930e-02
##	[911]		NaN	3.943627e-02	4.526782e-02	6.094111e-02
##	[916]		NaN		NaN	3.003820e-05
##	[921]	3.244614e-01		NaN		NaN
##	[926]	1.629936e+00		NaN	9.902017e-01	
##	[931]	8.322079e-03	7.692433e-02	1.890804e+00	5.096248e-02	8.891806e-02
##	[936]		NaN	1.699058e-01	7.551628e-01	
##	[941]	7.023805e-01	8.093598e-02	7.508551e-01	9.028309e-01	
##	[946]		NaN		NaN	4.908579e-02
##	[951]	2.054930e-01	9.979203e-01	4.952409e-01		NaN
##	[956]	7.892941e-02	2.473249e-03		NaN	6.238840e-02
##	[961]	1.811714e-01	7.280400e-03		NaN	5.302304e-01
##	[966]	9.764124e-04		NaN	1.558237e+00	4.850858e-02
##	[971]		NaN	8.165351e-01	2.216764e-01	1.040269e+00
##	[976]		NaN	1.071601e+00	2.074135e-02	
##	[981]		NaN		NaN	4.733809e-07
##	[986]	3.342628e-02		NaN		NaN
##	[991]	9.302759e-01	3.011836e-03	1.098468e-01	3.901807e-01	1.803131e-01
##	[996]		NaN	4.112948e-02	1.980566e-01	