Emanuel Rivera

Cosc 611 Spring 2014

Assignment 4

1 a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Class Inverval | |  |  |  |
| 0-5. |  |  | Sum |  |
|  | 1 | 13 | 13 |  |
|  | 2 | 8 | 16 |  |
|  | 3 | 5 | 15 |  |
|  | 4 | 4 | 16 |  |
|  | 5 | 7 | 35 | Avg |
|  |  | 37 | 95 | 2.567567568 |
| 6-10. |  |  |  |  |
|  | 6 | 5 | 30 |  |
|  | 7 | 3 | 21 |  |
|  | 8 | 6 | 48 |  |
|  | 9 | 2 | 18 |  |
|  | 10 | 5 | 50 | Avg |
|  |  | 21 | 167 | 7.952380952 |
| 11-15. |  |  |  |  |
|  | 11 | 1 | 11 |  |
|  | 12 | 6 | 72 |  |
|  | 13 | 3 | 39 |  |
|  | 14 | 3 | 42 |  |
|  | 15 | 2 | 30 | Avg |
|  |  | 15 | 194 | 12.93333333 |
| 16-20 |  |  |  |  |
|  | 17 | 2 | 34 |  |
|  | 18 | 3 | 54 |  |
|  | 19 | 1 | 19 |  |
|  | 20 | 1 | 20 | Avg |
|  |  | 7 | 127 | 18.14285714 |
| 21-25 |  |  |  |  |
|  | 22 | 3 | 66 |  |
|  | 23 | 2 | 46 |  |
|  | 24 | 2 | 48 | Avg |
|  |  | 7 | 160 | 22.85714286 |
| 26-30 |  |  |  |  |
|  | 28 | 1 | 28 |  |
|  | 29 | 3 | 87 | Avg |
|  |  | 4 | 115 | 28.75 |
| 31-35 |  |  |  |  |
|  | 32 | 1 | 32 |  |
|  | 33 | 1 | 33 |  |
|  | 34 | 1 | 34 | Avg |
|  |  | 3 | 99 | 33 |
| 36-40 | 39 | 1 | 39 |  |
|  | 40 | 2 | 80 | Avg |
|  |  | 3 | 119 | 39.66666667 |
| 41-45 | 45 | 1 |  | Avg |
|  |  |  |  | 45 |
|  |  |  |  |  |
| 46-50 | 46 | 1 |  | Ave |
|  |  |  |  | 46 |
|  |  |  |  |  |
| 50> | 54 | 1 |  | Avg |
|  |  |  |  | 54 |

1b.

|  |  |  |  |
| --- | --- | --- | --- |
| Class | Freq | Prob | Avg |
| 0-5. | 37 | 37.00% | 2.56 |
| 6-10. | 21 | 21.00% | 7.95 |
| 11-15. | 15 | 15.00% | 12.93 |
| 16-20 | 7 | 7.00% | 18.14 |
| 21-25 | 7 | 7.00% | 22.85 |
| 26-30 | 4 | 4.00% | 28.75 |
| 31-35 | 3 | 3.00% | 33 |
| 36-40 | 3 | 3.00% | 39.66 |
| 41-45 | 1 | 1.00% | 45 |
| 46-50 | 1 | 1.00% | 46 |
| 50> | 1 | 1.00% | 54 |
| Sum | 100 | 100.00% |  |

1c.

Its looks to be an Exponential Distribution

|  |  |  |
| --- | --- | --- |
| CDF |  |  |
| Class | Freq | Prob |
| 0-5. | 37 | 37.00% |
| 6-10. | 21 | 58.00% |
| 11-15. | 15 | 73.00% |
| 16-20 | 7 | 80.00% |
| 21-25 | 7 | 87.00% |
| 26-30 | 4 | 91.00% |
| 31-35 | 3 | 94.00% |
| 36-40 | 3 | 97.00% |
| 41-45 | 1 | 98.00% |
| 46-50 | 1 | 99.00% |
| 50> | 1 | 100.00% |

CDF Plot

y = 20/225

CDF of cdf1

5 0.35881961157

10 0.588887709493

15 0.736402861884

20 0.830986684594

25 0.891631976778

30 0.930516548777

35 0.955448573756

40 0.971434499215

45 0.981684361111

50 0.988256371543

d)

|  |  |  |  |
| --- | --- | --- | --- |
| Class | Observed Prob | Expected Freq | ChiSqr |
| 0-5. | 37.00% | 35.9% | 0.000348367 |
| 6-10. | 21.00% | 23.0% | 0.001750475 |
| 11-15. | 15.00% | 14.8% | 4.18565E-05 |
| 16-20 | 7.00% | 9.5% | 0.006389722 |
| 21-25 | 7.00% | 6.1% | 0.00144299 |
| 26-30 | 4.00% | 3.9% | 3.19967E-05 |
| 31-35 | 3.00% | 2.5% | 0.001030176 |
| 36-40 | 3.00% | 1.6% | 0.01228545 |
| 41-45 | 1.00% | 1.0% | 6.09091E-06 |
| 46-50 | 1.00% | 0.7% | 0.001788054 |
| 50> | 1.00% | 0.3% | 0.016333333 |
|  | Sum of Chi-Squares = | | 0.041448513 |

e)

a =numpy.random.exponential(float(20)/float(225),1000)

[ 9.24237663e-02 7.55283991e-02 2.18738845e-02 3.10026013e-01

3.94198538e-02 7.09006441e-02 1.04831769e-01 6.54550113e-02

8.16809609e-03 8.80873111e-02 1.74225162e-02 2.02264464e-01

1.69686507e-01 2.94320204e-02 1.67733290e-01 4.91569638e-02

6.19044747e-03 9.38749213e-02 5.76109955e-02 4.64108719e-02

1.22894485e-01 6.29485558e-02 1.44406686e-01 1.46672729e-03

5.03582479e-02 3.51898726e-02 9.18197078e-03 1.17740655e-01

8.73376731e-02 1.08602445e-02 5.22088075e-02 1.97093406e-01

1.14504494e-01 1.39039182e-01 1.12417089e-01 8.92316907e-02

6.31651482e-02 1.32871153e-02 1.01558184e-01 1.32850317e-01

1.53505128e-01 4.04535704e-02 1.05489818e-02 8.35896330e-02

3.28914098e-02 3.20202755e-02 3.05406726e-02 7.45445158e-02

1.78548254e-02 5.59563676e-02 2.19494468e-01 1.05825109e-01

6.50830625e-02 2.40522521e-01 2.04499903e-02 1.38747933e-01

2.41082698e-01 1.65989359e-02 3.31981633e-03 2.02797444e-01

2.03672490e-02 1.10116574e-01 2.50447189e-01 3.16701867e-02

5.98060523e-03 6.85168103e-02 4.31293602e-02 1.56808483e-02

9.20382831e-02 2.48625671e-01 6.26121499e-02 8.63622873e-02

5.03175214e-02 4.86700152e-02 1.62547420e-01 1.45843037e-01

2.78720753e-02 2.99595570e-02 2.72250060e-02 5.04618883e-03

1.57821943e-01 3.52890105e-02 9.15677521e-03 8.06990512e-04

2.07809905e-01 8.14475159e-02 8.47684887e-02 5.75496231e-02

1.16194251e-01 2.26429409e-01 9.04748379e-02 1.68336949e-01

6.32301573e-02 1.43744796e-01 1.24108014e-01 6.93049589e-02

7.36740763e-02 1.29209168e-01 5.20171901e-03 7.00556997e-02

2.16500970e-01 9.08028506e-04 7.26997880e-02 9.57484253e-02

1.39595896e-01 2.95717519e-02 1.45562797e-01 8.21153498e-02

4.98061409e-02 3.25712736e-02 2.71527176e-03 5.70086502e-02

2.31151658e-02 5.76384073e-03 1.51823564e-01 3.73121644e-02

9.23296186e-02 1.43125115e-02 4.70569286e-03 1.74715507e-02

1.76777377e-01 5.60740605e-02 3.28621436e-02 2.09439869e-02

2.46607506e-01 1.04811519e-01 1.63905033e-01 3.63309482e-02

1.29325002e-01 2.53020374e-01 3.18223299e-02 1.25912849e-01

1.81736565e-01 7.91687601e-02 1.72866856e-01 1.22046609e-01

7.76974088e-02 1.45303588e-03 3.22642290e-03 2.25653594e-02

1.52974588e-01 5.15120053e-02 3.99360077e-03 7.33563792e-03

2.24939929e-01 3.03506781e-01 7.41562557e-02 1.00540650e-01

2.16475037e-03 4.70806936e-01 3.58771105e-02 5.20827524e-02

7.21986015e-02 8.45422371e-02 3.53169331e-05 1.68683468e-02

4.85142796e-02 2.41522541e-01 3.62436221e-02 7.13707396e-03

2.74942361e-02 8.42430207e-02 3.41219248e-02 8.27613319e-02

8.35810248e-04 3.53602976e-01 4.68841956e-02 8.55532930e-02

4.33154863e-02 1.03342233e-01 1.29727357e-01 1.33140438e-02

1.18576449e-02 5.50952599e-02 1.29369421e-02 1.54111506e-02

3.84768362e-03 1.52126495e-02 2.53345237e-01 2.43403291e-02

1.59632111e-02 6.35037164e-02 8.77862409e-02 2.35999099e-02

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5.33906185e-02 1.24732358e-02 9.32646055e-02 4.06979923e-02

4.13765760e-02 1.41014034e-01 8.07289966e-02 1.04725394e-01

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5.45285336e-02 1.88005829e-01 4.12202829e-02 3.17344697e-02

1.82729962e-01 3.19572002e-02 1.26982173e-01 2.32498425e-01

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5.53646437e-02 3.42750853e-03 5.40560560e-02 4.02361050e-01

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4.50111106e-02 6.10855905e-02 1.03351484e-01 2.26222104e-02

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1.61456370e-02 2.93585705e-03 1.76115876e-02 1.47608722e-01

1.25108716e-01 2.07650488e-02 2.22600087e-02 2.92780422e-02

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4.98216261e-02 5.49206596e-02 2.22078038e-01 2.36166260e-01

5.58982554e-03 2.88953665e-03 1.02690852e-01 4.44572424e-02

1.58337899e-01 3.44374078e-01 1.61683309e-01 2.79935518e-01

3.52371836e-02 2.46559058e-02 1.29961707e-01 3.11945233e-02

2.41032991e-01 3.16297950e-02 1.89929536e-01 1.79957141e-02

2.82545783e-02 3.47367335e-02 7.10819346e-04 1.24631750e-01

7.90156724e-02 1.14679526e-03 8.22367530e-02 1.37398907e-01

1.92954892e-03 2.61116525e-01 1.27465472e-03 8.24453885e-02

2.50863713e-03 1.16288118e-01 6.80310384e-02 1.99674610e-02

9.91563721e-03 6.21926728e-02 1.28228503e-01 2.93099975e-01

1.47173735e-01 1.17328291e-03 6.82951109e-02 5.60738413e-05

3.90533927e-02 4.42742658e-02 7.38800704e-02 5.84480139e-02

5.88417611e-02 2.33086487e-03 2.46292921e-02 1.52957483e-02

4.21668445e-02 2.90459582e-02 1.31807665e-01 3.60744620e-02

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3.04411897e-02 2.50808752e-01 8.87719497e-02 8.58969421e-02

4.77640122e-02 2.26936424e-02 4.65894457e-02 3.69774035e-02

9.90748105e-02 9.05121969e-02 1.39279973e-01 7.57746991e-03

7.96032684e-03 8.36764837e-02 6.85935172e-02 1.49858786e-01

3.81894008e-01 1.90667483e-01 3.64079490e-02 4.55824249e-02

1.34310890e-01 2.27592450e-01 3.20215758e-02 6.18747432e-02

2.70049599e-01 2.16499277e-02 3.38940960e-02 3.19310524e-02

5.20180085e-02 4.09087804e-01 2.00885204e-02 3.95024351e-02

2.87151215e-02 3.15378614e-02 2.56821895e-02 8.35294113e-02

1.27803831e-01 1.27743483e-01 2.31389823e-02 2.84490601e-02

7.11519190e-03 2.64824244e-02 4.04982269e-02 3.99844356e-03

9.67818082e-03 1.44726110e-02 7.13249066e-02 4.84665598e-03

8.44804410e-02 2.80027330e-01 3.87794659e-02 1.32524579e-01

3.68973191e-02 2.62889896e-02 2.02566731e-01 1.73101695e-01

1.28689206e-02 2.06670632e-01 1.02908397e-01 1.70467655e-01

2.94314026e-03 1.27600869e-01 3.01649961e-01 2.98554759e-01

3.03834040e-01 8.99871993e-02 3.21467982e-02 1.98233641e-02

8.52062304e-02 5.93677969e-02 3.91574853e-01 5.75400755e-02

5.56865396e-02 4.07968679e-02 4.16132635e-02 8.23949790e-02

4.87095764e-02 4.38692202e-02 1.19765093e-02 5.66257793e-02

6.43265824e-01 1.94549968e-01 1.30851210e-01 5.11570987e-03

8.75202242e-02 6.46893758e-02 3.18945594e-02 3.61488954e-01

1.48607415e-02 5.09194446e-02 3.15163423e-03 1.73694415e-02

1.60126633e-01 4.23269018e-02 3.31575530e-01 3.82080307e-02

4.07879532e-02 2.24603782e-02 3.71628436e-02 1.30125062e-02

1.14782219e-01 6.91349613e-02 1.01930773e-01 1.07599325e-02

7.56938011e-02 9.33534192e-03 2.74218245e-02 6.66325464e-02

1.99058578e-02 1.19216240e-01 8.02042861e-03 6.67106527e-02

2.89183799e-03 9.39890841e-03 1.66818731e-01 4.35129915e-02

2.64834635e-02 2.09293976e-01 4.68970096e-03 1.19624409e-01

1.95162047e-01 2.07078267e-03 1.34609175e-01 8.87068216e-02

3.90607035e-02 2.97920921e-01 5.38909653e-02 1.65295517e-01

2.83790678e-02 1.09785544e-01 4.80182501e-02 1.12649950e-01

1.14442394e-01 1.42365737e-01 1.15479890e-02 1.51579573e-01

1.80726667e-01 1.21150900e-01 1.08460211e-01 1.61655243e-01

4.22997608e-02 1.58564814e-02 2.69191587e-01 7.83311223e-02

1.77967010e-02 5.16676293e-02 6.20926008e-02 1.42704973e-01

2.29524850e-02 8.15864836e-02 5.72342438e-03 6.18681499e-02

2.43385933e-03 1.17894442e-02 5.13710875e-02 4.09680056e-02

9.20958441e-02 9.58427392e-04 5.87867216e-03 6.13567118e-02

2.76958476e-01 4.40120722e-02 3.31603533e-02 1.93011287e-01

4.53742900e-02 7.07151481e-02 9.55286518e-02 7.67934773e-02

1.07018931e-01 2.22402853e-01 1.78748500e-01 1.35310385e-01

7.61112289e-03 4.15156919e-02 8.40420229e-02 6.67330202e-02

2.44889073e-01 1.50592747e-02 1.70642861e-02 1.37426437e-01

2.78288292e-01 4.18108076e-02 1.55939679e-01 2.62058359e-03

5.91436122e-02 2.43469223e-01 8.58230960e-02 2.01314703e-01

2.78425217e-02 3.74274335e-02 9.87226091e-02 6.17895067e-02

2.99090521e-02 1.33550479e-01 3.81833420e-03 2.58808988e-02

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6.17418932e-03 8.88498375e-02 5.99651665e-02 4.26773276e-02

9.69951528e-02 1.11976166e-01 1.09361252e-02 1.15312287e-02

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2.16463067e-02 5.86611919e-02 9.02388843e-03 4.97762645e-04

6.96400010e-03 4.04563671e-02 8.80454939e-02 2.94841045e-02

2.29719171e-01 7.32619507e-02 4.07048897e-01 1.78113819e-01

2.93453121e-02 1.60427831e-01 5.11863510e-02 7.97602471e-03

3.43492830e-01 1.36010496e-01 4.19768946e-01 1.44389593e-01

1.78834432e-02 3.48237879e-02 2.01246160e-02 1.01617726e-01

2.44161223e-02 1.00246287e-01 1.51961484e-02 3.39877185e-02

2.65535681e-02 2.81519571e-02 3.65363836e-02 8.91525465e-02

1.35393114e-02 7.20836382e-02 3.80628052e-02 9.81624881e-02

1.88564417e-02 2.32864319e-01 1.61972236e-01 9.44267518e-02

1.06501008e-02 2.90913884e-01 2.97269185e-01 2.09833312e-02

2.51664458e-02 1.81990601e-01 7.39635250e-02 1.12059365e-02

2.05451797e-02 7.38495182e-02 2.56824374e-02 7.55191385e-02

1.92308507e-01 2.85433246e-02 3.43805316e-02 4.34394201e-02

1.79619715e-01 4.05075388e-03 1.46613298e-03 1.55000454e-01

6.36945424e-02 5.50098864e-02 1.07356872e-01 1.01512630e-02

5.53560449e-02 1.87235012e-01 2.95266665e-02 5.44880787e-02

3.65101166e-02 1.07802458e-02 1.03733706e-02 1.82682100e-02

6.02224678e-02 2.47955345e-01 6.10580039e-02 8.02527140e-02

2.75103488e-02 1.72105233e-02 1.21301852e-01 6.18243650e-01

1.15427165e-02 2.24242073e-02 5.10704145e-02 1.65055468e-02

2.02344209e-02 1.02112304e-01 1.24276044e-01 1.34819677e-02

5.89596336e-02 2.17445728e-02 2.17610768e-03 9.13085378e-02

1.04571424e-01 5.60190405e-03 1.51437209e-02 2.90278208e-02

6.48403934e-02 3.40048210e-02 1.28030980e-01 4.79898857e-02

1.08797875e-02 1.05142641e-01 3.12655538e-02 2.95271791e-02

5.25247132e-03 3.44321946e-03 2.88908816e-01 4.77236834e-02

2.75619117e-01 1.83507931e-02 9.46424463e-02 1.09666457e-02

2.78515978e-02 1.21507854e-02 5.78732744e-03 4.07489716e-02

1.84947865e-01 6.46745652e-03 4.58791652e-01 1.06946751e-02

7.63167905e-02 2.03158660e-02 6.74028292e-02 1.08678759e-01

2.10480908e-02 9.54235837e-03 7.30242071e-04 2.56669721e-04

1.84894479e-01 1.02221941e-01 3.69008646e-02 3.79929490e-02

5.97785932e-02 1.51359358e-01 2.41188310e-01 1.38641872e-01

1.19378028e-02 4.84341791e-02 7.54290149e-02 3.20272399e-02

2.60171698e-01 3.01902487e-02 1.58663371e-02 5.11736788e-02

2.66246169e-02 5.72627910e-02 7.43140567e-02 1.07931366e-01

1.45987898e-01 5.37486985e-02 6.58897602e-02 5.93340984e-02

4.72273087e-02 2.45318760e-01 1.20435415e-01 1.30034108e-01

8.48869671e-03 6.23413937e-02 2.57259741e-01 3.62787196e-02

7.92310346e-02 1.54640694e-01 1.67334873e-01 4.72595036e-02

1.24742136e-02 3.27784185e-02 1.64244454e-01 2.18564795e-03

1.76025636e-02 8.07552653e-02 1.62682628e-01 8.90212191e-02

8.97855152e-03 2.91687335e-01 5.81703074e-02 4.96898243e-02

6.83848593e-02 2.32371083e-01 4.68713104e-02 7.58936197e-03

5.58090036e-02 2.32623888e-01 1.00951677e-02 8.45366395e-02

6.11008160e-02 1.40378159e-01 9.17972590e-02 2.52902721e-01

1.13270095e-02 1.58148728e-01 2.07132874e-01 9.38673360e-02

1.12182725e-01 4.22482739e-03 5.84841492e-02 1.08050896e-01

3.65753931e-02 1.22682072e-02 9.03582050e-03 7.43495591e-03

8.48192087e-02 1.94586755e-02 1.36476206e-01 4.05183728e-02

1.51740795e-02 4.06447724e-02 5.28731171e-02 4.43795100e-02

2.21640425e-02 1.12777881e-01 1.00737488e-01 1.52104225e-01

8.31946446e-02 9.95647209e-02 5.63168904e-02 3.15489545e-02

4.04720365e-02 2.30987610e-01 1.69865068e-01 1.32084672e-01

1.89162161e-01 3.91232140e-02 9.33383508e-02 1.22891962e-01

3.21093124e-02 8.20991165e-03 2.87656280e-02 2.57983442e-01

1.71302234e-01 1.74689269e-02 4.02951508e-02 3.58285765e-01

9.70234133e-02 2.38490524e-02 3.15152219e-02 2.01731264e-01

3.49171994e-02 1.68992393e-01 5.05146850e-02 1.08501759e-01

7.13310655e-02 1.48123523e-01 1.52828600e-01 2.56354447e-01

1.26247088e-01 6.98925193e-02 6.85119100e-02 4.51711892e-02

1.20148995e-02 1.62718241e-02 4.41671814e-02 1.17439494e-01

3.48701938e-02 4.96737663e-02 1.12035401e-01 4.59548407e-02

5.32256541e-02 1.56284361e-02 1.61070006e-02 2.41687650e-02

2.19311484e-03 2.02673350e-02 2.09863821e-01 6.24765692e-02

1.55910253e-02 3.11437532e-02 2.49268410e-01 1.81775095e-01

2.02884573e-01 1.32732782e-01 4.70536792e-02 1.02309529e-02

4.30288284e-02 1.10379565e-01 1.01066521e-01 1.10538975e-01

6.72429432e-02 1.92306027e-01 5.04157205e-02 1.45531627e-02

3.55266622e-02 6.95776165e-02 2.89229837e-02 2.28759848e-02

1.04860516e-01 9.33297291e-02 7.18834379e-02 1.31824840e-02

1.54101628e-02 1.35695690e-02 1.12299642e-02 3.98006310e-02

7.73536910e-02 3.49373154e-02 6.24040132e-02 2.67915952e-01

1.66373059e-01 1.20905507e-02 2.60285787e-02 1.20767133e-01

3.03802444e-02 6.01725929e-02 7.72001723e-02 1.63831097e-01]

PYTHON PROGRAM

obvers = [18,13,3,40,9,29,10,3,8,10,

1,17,29,2,22,1,22,1,4,32,

20,5,8,6,10,3,1,11,13,2,

15,8,1,23,29,9,34,17,10,4,

15,2,1,1,40,8,6,6,8,1,

3,24,14,24,8,14,28,12,18,7,

1,5,6,10,54,12,13,1,22,45,

5,12,2,14,12,1,33,23,7,5,

12,5,46,18,2,2,6,2,39,7,

4,4,2,19,1,5,12,3,5,1]

obvers.sort()

#print obvers

freq = {}

for obv in obvers:

if freq.get(obv):

freq[obv] = freq.get(obv) + 1

else:

freq[obv] = 1

print freq

interval = 5

start = 0

end = 50

bins\_dict = 0

print int(end) / int(interval)

# for k,v in freq.iteritems():

# print '%s\t%s'%(k,v)

import math

past=0

for m in range(5, 60, 5):

p = float(m)

x = float(20) / float(225)

d= -1.0 \* p \* x

pre = 1 - math.pow(math.e, d )

fut = past - pre

past = 1 - math.pow(math.e, d )

print *'%s\t%s'*%(m, -fut)

import numpy

a =numpy.random.exponential(float(20)/float(225),1000)