Combo Project 8 Output File
Studying and Simulating US (And Other) Electoral College Elections
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12/14/20

1 Probabilities

1.1 Experimental Probability of Democratic Candidate Winning the Electoral Vote Given the Individual Probability of the Candidate Winning Each State is the 2020 Popular Vote Percentage

```
v := [81282896, 74222484];
p := v[1]/(v[1]+v[2]);
WinProb(USEC(),p,1000);
```

```
0.5840000000
```

1.2 Calculated Probability of Democratic Candidate Winning the Electoral Vote Given the Individual Probability of the Candidate Winning Each State is the 2020 Popular Vote Percentage

```
v := [81282896, 74222484]:
p := v[1]/(v[1]+v[2]):
f:=evalf(GFvp(USEC(),p,x)):
evalf(add(coeff(f,x,i),i=270..degree(f,x)));
```

```
0.5896628367
```

1.3 Experimental Probability of Democratic Candidate Winning the Electoral Vote Using (Recent) Historical Data

```
WinProbInformed(USEC2(),1000);
```

```
0.5560000000
```

1.4 Calculated Probability of Democratic Candidate Winning the Electoral Vote Using (Recent) Historical Data

```
f:=evalf(GFvp2(USEC2(),x)):
evalf(add(coeff(f,x,i),i=270..degree(f,x)));
```

```
0.5613012890
```

2 Averages

2.1 Experimental Average Number of Electoral Votes for Democratic Candidate Using Only 2020 Popular Vote as Individual Probability of the Candidate Winning Each State

```
v := [81282896, 74222484];
p:=v[1]/(v[1]+v[2]);
s1:=SimuCount(USEC(),p,1000,4);

[281.4120000, 49.75313314, -0.03161792474, 2.712346039], 0.1530000000
```

2.2 Experimental Average Number of Electoral Votes for Democratic Candidate Using (Recent) Historical Data

```
s2:=SimuCountInformed(USEC2(),1000,4);

[274.4650000, 25.34736229, 0.06630275564, 2.907743535], 0.08900000000
```

2.3 Calculated Expected Average Number of Electoral Votes for Democratic Candidate Using Only 2020 Popular Vote Individual Probability of the Candidate Winning Each State

```
v := [81282896, 74222484]:
p:=v[1]/(v[1]+v[2]):
s1:=evalf(StatAnal(GFvp(USEC(),p,x),x,10)):
s1[1];

281.2134091
```

2.4 Calculated Expected Average Number of Electoral Votes for Democratic Candidate Using (Recent) Historical Data

```
s2:=evalf(StatAnal(GFvp2(USEC2(),x),x,10)):
s2[1];

274.2380952
```

3 (Finite) Sequences

3.1 Sequence for the Number of Ways One of the Candidates can get Exactly i Electoral Votes

```
f:=(GFv(USEC(),x)):
seq(coeff(f,x,i),i=1..degree(f,x));

0, 0, 8, 5, 3, 34, 43, 36, 122, 201, 217, 427, 730, 920, 1434, 2330, 3162,
```

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 3, 5, 8, 0, 0, 1
```

3.2 Sequence for the Probability of Either Candidate Getting Exactly i Votes, Using USEC() and Using Biden's Popular Vote Percentage in 2020 as p

```
v:=[81282896,74222484];
p:=v[1]/(v[1]+v[2]);
f1 := evalf(GFvp(USEC(), p, x));
seq(coeff(f1,x,i),i=1..degree(f1,x));
```

```
0, 0, 3.637868801*10^(-16), 2.273668001*10^(-16), 1.364200801*10^(-16),
1.667212504*10^(-15), 2.128380572*10^(-15), 1.784113138*10^(-15),
6.327781814*10^(-15), 1.065549704*10^(-14), 1.156597235*10^(-14),
2.336625882*10^(-14), 4.091855453*10^(-14), 5.212827776*10^(-14),
8.283821011*10^(-14), 1.375117597*10^(-13), 1.891804349*10^(-13),
2.741423846*10^(-13), 4.229581688*10^(-13), 5.964529940*10^(-13),
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6.144833815*10^(-12), 8.358955482*10^(-12), 1.129973542*10^(-11),
1.513266363*10^(-11), 2.019079275*10^(-11), 2.680343319*10^(-11),
3.536301472*10^(-11), 4.644631296*10^(-11), 6.069394846*10^(-11),
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3.491213111*10^(-10), 4.411863451*10^(-10), 5.553710004*10^(-10),
6.965556582*10^(-10), 8.707677463*10^(-10), 1.084765790*10^(-9),
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```

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0.0001540509010, 0.0001434647399, 0.0001334778621,
0.0001240655879, 0.0001152036761, 0.0001068683352,
0.00009903622533, 0.00009168453344, 0.00008479096381,
0.00007833374201, 0.00007229168697, 0.00006664418709,
0.00006137119663, 0.00005645330753, 0.00005187171738,
0.00004760821584, 0.00004364524921, 0.00003996588670,
0.00003655380287, 0.00003339332836, 0.00003046941434,
0.00002776761452, 0.00002527412486, 0.00002297574265,
0.00002085985076, 0.00001891444971, 0.00001712810734,
0.00001548994753, 0.00001398967824, 0.00001261753419,
0.00001136426308, 0.00001022115520, 9.179983220*10^(-6),
8.232982147*10^(-6), 7.372881846*10^(-6), 6.592846955*10^(-6),
5.886451606*10^(-6), 5.247708973*10^(-6), 4.671021680*10^(-6),
4.151149243*10^(-6), 3.683230521*10^(-6), 3.262746384*10^(-6),
2.885487270*10^(-6), 2.547564920*10^(-6), 2.245381779*10^(-6),
1.975609092*10^(-6), 1.735184668*10^(-6), 1.521286459*10^(-6),
1.331322017*10^(-6), 1.162920766*10^(-6), 1.013902848*10^(-6),
8.822788416*10^(-7), 7.662456522*10^(-7), 6.641476219*10^(-7),
5.744821085*10^(-7), 4.959000364*10^(-7), 4.271673763*10^(-7),
3.671673251*10^(-7), 3.149077619*10^(-7), 2.694861598*10^(-7),
2.300876638*10^(-7), 1.959951440*10^(-7), 1.665601175*10^(-7),
1.412008869*10^(-7), 1.194083968*10^(-7), 1.007251883*10^(-7),
8.474408064*10^(-8), 7.111214913*10^(-8), 5.951228296*10^(-8),
4.966513425*10^(-8), 4.133229405*10^(-8), 3.429794526*10^(-8),
2.837425087*10^(-8), 2.340428273*10^(-8), 1.924513673*10^(-8),
1.577209883*10^(-8), 1.288489749*10^(-8), 1.049166601*10^(-8),
8.511149651*10^(-9), 6.880732029*10^(-9), 5.543377073*10^(-9),
4.447608308*10^(-9), 3.554535156*10^(-9), 2.830461958*10^(-9),
2.243942549*10^(-9), 1.770944873*10^(-9), 1.391873529*10^(-9),
1.089116150*10^(-9), 8.479545473*10^(-10), 6.565157083*10^(-10),
5.062378748*10^(-10), 3.885898840*10^(-10), 2.956924590*10^(-10),
2.239493370*10^(-10), 1.695748625*10^(-10), 1.265964531*10^(-10),
9.353504042*10^(-11), 6.991594776*10^(-11), 5.130807399*10^(-11),
3.653955719*10^(-11), 2.688058705*10^(-11), 1.962180912*10^(-11),
1.321754341*10^(-11), 9.422708386*10^(-12), 7.036364037*10^(-12),
4.421468018*10^(-12), 2.892109389*10^(-12), 2.319612029*10^(-12),
1.388698216*10^(-12), 7.241004765*10^(-13), 6.744976234*10^(-13),
4.185621743*10^(-13), 1.290046751*10^(-13), 1.542961360*10^(-13),
```

1.232317643*10^(-13), 1.171113008*10^(-14), 1.951855014*10^(-14),
3.122968023*10^(-14), 0, 0, 4.275050350*10^(-15)

3.3 Sequence for the Probability of Either Candidate Getting Exactly i Votes, Using USEC2()

```
f2 := evalf(GFvp2(USEC2(), x));
seq(coeff(f2,x,i),i=1..degree(f2,x));
```

0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
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0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.0001386487780, 0, 0, 0,
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0.0005545951120, 0.0003703764559, 0.0001061529707, 0.0001749615532,
0.0004225486568, 0.0009366179730, 0.0009763969676, 0.0003634336288,
0.0002923885795, 0.0008928462550, 0.001541062601, 0.001498052895,
0.001120665270, 0.0006654725814, 0.001225703742, 0.002350218159,
0.002563503286, 0.001795212999, 0.001421930271, 0.002108616255,
0.003303911016, 0.003827907045, 0.002976724822, 0.002436928407,
0.003315418085, 0.004832396921, 0.005351670627, 0.004403079104,
0.003809650569, 0.004915217728, 0.005937619668, 0.007282730446,
0.005935955877, 0.005634155650, 0.006060189953, 0.008350705253,
0.008313896364, 0.008172453862, 0.007560625099, 0.008052672851,
0.009862119832, 0.01046379571, 0.01045045151, 0.008943785795,
0.01082313679, 0.01123800869, 0.01204557266, 0.01195934290,
0.01141976839, 0.01218336118, 0.01257457797, 0.01409347170,
0.01193138875, 0.01390494587, 0.01376761735, 0.01465821537,
0.01366995235, 0.01390858452, 0.01435924335, 0.01483151357,
0.01673369692, 0.01336451717, 0.01486492473, 0.01382033160,
0.01671962612, 0.01532379801, 0.01536401921, 0.01356800152,
0.01417331996, 0.01641718934, 0.01535473257, 0.01549838930,
0.01278504018, 0.01478161519, 0.01411152129, 0.01593008840,
0.01396821122, 0.01291094432, 0.01336763267, 0.01309974560,
0.01468117425, 0.01216257522, 0.01305010223, 0.01118963779,
0.01286892412, 0.01170355531, 0.01192553940, 0.01096767842,
0.01067101962, 0.01142696864, 0.009523873928, 0.01074500510,
0.008864163713, 0.01023851082, 0.008677138026, 0.009067120690,
0.007765093431, 0.008054953172, 0.008306401077, 0.007452743535,
0.007417529884, 0.006023043601, 0.006975592228, 0.006030444458,
0.006807664614, 0.005369267524, 0.005082718447, 0.005091790565,

0.004975963334, 0.005135306332, 0.004105964660, 0.004153937461,
0.003281062026, 0.004141367107, 0.003469324638, 0.003447546058,
0.002756946204, 0.002690319964, 0.002777201194, 0.002466294013,
0.002592107116, 0.001816690133, 0.002095842147, 0.001666656093,
0.001900730828, 0.001471007295, 0.001496663775, 0.001231622305,
0.001210481955, 0.001174779930, 0.0009195877548, 0.001034786870,
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0.0003590899668, 0.0002770226088, 0.0003531918372, 0.0002430249243,
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0.0001577405269, 0.0001291956087, 0.00007317721636, 0.00008723773410,
0.00007161755100, 0.0001024464199, 0.00004559285637, 0.00005148842056,
0.00002193043512, 0.00004256944381, 0.00003794895521, 0.00003147962937,
0.00001819554444, 7.873457830*10^(-6), 0.00002042887981, 0.00001377509558,
0.00001922623143, 4.144023420*10^(-6), 5.758298016*10^(-6),
2.190948312*10^(-6), 9.803905578*10^(-6), 4.395223375*10^(-6),
3.695664076*10^(-6), 9.709037037*10^(-7), 3.499160033*10^(-7),
3.094106289*10^(-6), 1.530124112*10^(-6), 1.861364906*10^(-6),
1.392205768*10^(-7), 2.635246632*10^(-7), 1.039080690*10^(-7),
1.412094422*10^(-6), 1.988865383*10^(-7), 1.802409253*10^(-7),
0, 0, 1.818391207*10^(-7), 6.961028840*10^(-8), 6.961028840*10^(-8),
0, 0, 0, 7.955461532*10^(-8)