

In[31]:= (\* Problem 1 \*)

(\* Create 3 different sized random arrays \*)

small = RandomInteger[{0, 1}, 50];

medium = RandomInteger[{0, 1}, 500];

large = RandomInteger[{0, 1}, 5000];

(\* Equipartition of small \*)

(\* 0 and 1 \*)

smallfrq1 = N[Sum[small[[i]], {i, 1, Length[small]}] / Length[small]]

Out[34]= 0.42

In[35]:= smallfrq0 = 1 - smallfrq1

Out[35]= 0.58

(\* 00, 01, 10, 11 \*)

In[36]:= smallfrq00 = N[
$$\sum_{k=1}^{\text{Length}[\text{small}]-1} ((1 - \text{small}[[k]]) * (1 - \text{small}[[k+1]])) / (\text{Length}[\text{small}] - 1)]$$

Out[36]= 0.306122

NumberForm[smallfrq01, 16]

In[37]:= smallfrq01 = N[
$$\sum_{k=1}^{\text{Length}[\text{small}]-1} ((1 - \text{small}[[k]]) * (\text{small}[[k+1]])) / (\text{Length}[\text{small}] - 1)]$$

Out[37]= 0.265306

In[38]:= smallfrq10 = N[
$$\sum_{k=1}^{\text{Length}[\text{small}]-1} ((\text{small}[[k]]) * (1 - \text{small}[[k+1]])) / (\text{Length}[\text{small}] - 1)]$$

Out[38]= 0.285714

In[39]:= smallfrq11 = 1 - smallfrq00 - smallfrq01 - smallfrq10

Out[39]= 0.142857

In[8]:= (\* 000, 001, 010, 011, 100, 101, 110, 111 \*)

smallfrq000 = N[
$$\sum_{k=1}^{\text{Length}[\text{small}]-2} ((1 - \text{small}[[k]]) * (1 - \text{small}[[k+1]]) * (1 - \text{small}[[k+2]])) / (\text{Length}[\text{small}] - 2)]$$

Out[8]= 0.0833333

In[9]:= smallfrq001 = N[
$$\sum_{k=1}^{\text{Length}[\text{small}]-2} ((1 - \text{small}[[k]]) * (1 - \text{small}[[k+1]]) * (\text{small}[[k+2]])) / (\text{Length}[\text{small}] - 2)]$$

Out[9]= 0.145833

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In[10]:= smallfrq010 = N[
  Sum[(1 - small[[k]]) * (small[[k + 1]]) * (1 - small[[k + 2]]) / (Length[small] - 2),
    {k, 1, Length[small] - 2}]
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Out[10]= 0.145833
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In[11]:= smallfrq011 =
  N[Sum[(1 - small[[k]]) * (small[[k + 1]]) * (small[[k + 2]]) / (Length[small] - 2),
    {k, 1, Length[small] - 2}]]
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Out[11]= 0.125
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In[12]:= smallfrq100 = N[
  Sum[(small[[k]]) * (1 - small[[k + 1]]) * (1 - small[[k + 2]]) / (Length[small] - 2),
    {k, 1, Length[small] - 2}]]
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Out[12]= 0.166667
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In[14]:= smallfrq101 =
  N[Sum[(small[[k]]) * (1 - small[[k + 1]]) * (small[[k + 2]]) / (Length[small] - 2),
    {k, 1, Length[small] - 2}]]
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Out[14]= 0.125
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In[15]:= smallfrq110 =
  N[Sum[(small[[k]]) * (small[[k + 1]]) * (1 - small[[k + 2]]) / (Length[small] - 2),
    {k, 1, Length[small] - 2}]]
```

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Out[15]= 0.145833
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In[17]:= smallfrq111 =
  N[Sum[(small[[k]]) * (small[[k + 1]]) * (small[[k + 2]]) / (Length[small] - 2),
    {k, 1, Length[small] - 2}]]
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Out[17]= 0.0625
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(\* Graphing small \*)