HELPFUL HOMEWORK HINTS #02
RE: HW20-5.4
fri.06.25.10
dj

<table>
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| 1       | In this problem you are supposed to find the “probability of at least one birthday match among a group of 46 people.” – note: 46 is the number that the computer gave me. Your number may be different, but the process will be the same. 
 
Now if you read the book, you will see (p.247) that to get the answer when n=25 you must compute 

\[ P(\text{at least one}) = 1 - P(\text{none}) = 1 - \frac{365}{365} \times \frac{364}{365} \times \frac{362}{365} \times \frac{361}{365} \times \ldots \times \frac{341}{365}. \]

To find the “stopping point” – in this case 341, please notice that if there are 25 people in the room, including “you,” then there are 24 “other people,” and 

\[ 365 - 24 = 341. \]

So that takes care of the set-up. Now the problem is how to actually calculate the result for n=46 – without spending the rest of the day doing it.

Well, I’m going to show you one way here. It is not the fastest way, but it’s what I want to show you at this time.

First, since n=46, and 365−45 = 320, OUR problem is:

\[ P(\text{at least one}) = 1 - P(\text{none}) = 1 - \frac{365}{365} \times \frac{364}{365} \times \frac{362}{365} \times \frac{361}{365} \times \ldots \times \frac{320}{365}. \]

OK, get out your calculator and “clear” your “home” screen – this gives us a nice place to start. Now I’m going to give you some key-strokes to do & I’m going to show you what the screen will look like after the key-strokes:

1. Press: \[ 1[\text{ ][}]-[\text{ }2nd][\text{ ]}[\text{ LIST}][\text{ }<][\text{ ]}[6: \text{ prod}()][\text{ ]}[\text{ 2nd}][\text{ LIST}][\text{ ]}>][5: \text{ seq}()][\text{ ]} \] and your screen should look like this:

\[ 1-\text{prod}(\text{seq}(\text{ }) \]

This will compute 1 minus the product of a sequence of numbers. Now what is that sequence?
2. Note: to save typing time, I’m going to call the $[X T \theta n]$ key simply the $[X]$ key, OK?

Press: $[X][\cdot][365][\cdot][X][\cdot][364][\cdot][320][\cdot][-1][)]$. Note: the [-1] is “opposite 1,” not “minus 1.” Anyway, at this stage your screen should look like this:

Let me explain the syntax:

- The $X/365$ is what each term in the sequence “looks like.”
- The $X$ tells the calculator what changes in each term of the sequence.
- The 364 tells the calculator where the sequence starts, i.e. with $364/365$.
- The 320 tells the calculator where the sequence stops, i.e. with $320/365$.
- And the -1 (opposite 1) tells the calculator that the sequence counts down from 364 to 320 by “ones.”
- Then after the calculator does that, it takes the product of all those numbers.
- Then it does 1 minus that product.

3. Finally, let’s press [ENTER] to let the calculator do all these things quickly. This is your final screen:

And when you round this off to 4 decimal places, as per the instructions, you get 0.9483. And that is the answer.

If you do it a couple of times, you’ll find that it’s not that complicated to do.

And if the $n$ were, say 35, instead of 46, you’d simply change the 320 in the above to $365 - 34 = 331$. 