1/10/18 - Basic Idea of Probability

Wednesday, January 10, 2018

11:00 AM

* + When we're doing anything that involves probability, we do an experiment, which has multiple possible outcomes.
  + Sample Space - a set of possible outcomes, represented by capital S.
  + Experiment: Roll 1d6
    - Possible outcomes {1, 2, 3, 4, 5, 6}
    - Since it's a uniform distribution, all outcomes are equally likely, so the probability is 1/6.
    - If you add the probability of all possible outcomes, the answer will be 1, since you have to have some outcome.
    - Probability of an odd number = P(odd number) = 1/2 or 3/6.
    - So, add up P(1) + P(3) + P(5) = 1/6 + 1/6 + 1/6
  + If rolling 4d6, what is the probability of at least one 6? [ P(at least one 6) ]
    - Start with experimenting on 2d6 rolled 10 times.
      * Done 21 times, Sample space of 210, result is around 3.
    - Now we need to describe the sample space as a set. { }
    - Can do as an ordered pair { (a,b) | a,b,c{12,3,4,5,6} }
    - Since listing all 36 options is a pain, you can list it as a grid.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| . | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 |  |  |  |  |  | X |
| 2 |  |  |  |  |  | X |
| 3 |  |  |  |  |  | X |
| 4 |  |  |  |  |  | X |
| 5 |  |  |  |  |  | X |
| 6 | X | X | X | X | X | X |

* + - * Grid has 36 boxes and each box represents one ordered pair. So checking off each square that has a 6 we have 11/36 = 0.3056 which is pretty close!
    - Now let's do it with 3d6.
      * Sample size = 216 possible outcomes
      * Can't draw it out with a grid, so how would we do it?
      * Sample space S= (a,b,c)
      * Realize you're asking 2 questions: at least one 6, or zero 6es. Each roll has to fall into one of those outcomes.
      * So for the first die there are 5 ways to not be a 6, the second die has 5 ways to not be a 6, and the third dies has 5 ways not to be a 6. Since 5x5x5 = 125, there are 125 ways to roll zero 6's, and 216 - 125 = 91 ways \*to\* roll at least one 6.
      * If the opposite way seems easier, do one that way.
  + In general, experiment E is an event that we're trying to measure the probability of.
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  + C:\A4314B45\2ABE8888-B7F4-420A-813A-CE7AD4E0AA19_files\image002.png
  + Another way to solve with 3d6
    - A - 1st die = 6
    - B - 2nd die = 6
    - C - 3rd die = 6
    - |AuBuC| Union (u) means any of the above, at least one a or b or c.
    - Figure out the size of these
      * |A| = 36
      * |B| = 36
      * |C| = 36
    - 36 x 3 = 108 which is too big.
    - To figure out what's in both, we need to find out the possibility of the extras.
      * A and B = 6
      * A and C = 6
      * B and C = 6
      * Which gives us 18.
    - 108 - 18 = 90 which means we're off by one!
    - Which one did we remove? 6 x 6 x 6
      * So, find the result of A and B and C and add it back in.
      * 90 + 1 = 91 and we're there!

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