**Student 2: High Merit**

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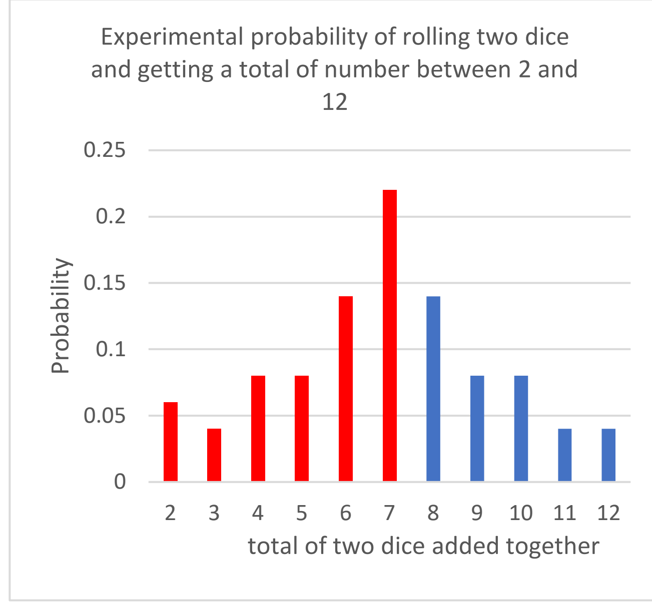
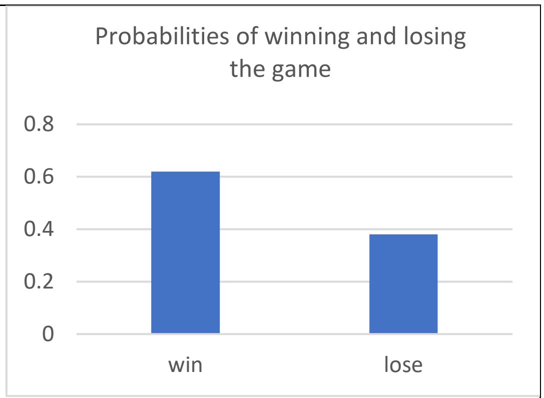
I want to investigate the probability of winning if winning means getting a total of 2-7 from two dice when they are thrown together, and the numbers shown are added? 1

I will use 2 dice to carry out my experiment to find out the probability of my problem which is “me winning a game of dice, where a total of 2-7 are found when throwing 2 dice. I will play my probability game rolling 2 dice 50 times and each time I roll the two die I will then add the two dice together and that will be my sum. After I have calculated my sum I will then mark it in tally chart next to which option it sums up to. After my 50 rolls I will use my tally marks to calculate the outcomes of my frequency’s. After my frequency’s calculations I will use my frequency’s to find out the probabilities percentages that will be out of 100. I will transfer my data I collected drawing appropriate displays and analyse my results, explaining my data. 2 The possible outcomes for the total sums in this experiment are rolling totals of 2, 3, 4, 5, 6, 7, 8, 9,10,11 and 12 when throwing 2 dice. This means that there will be a win if there is a total of 2,3,4,5,6 or a 7 when throwing 2 dice.




The red bars show the probability of getting the total that would give me a win. The blue bars show the probabilities when I would lose. I can see from this that a total of 7 has the highest probability of being rolled (22%) whereas totals of 3, 11 and 12 have the lowest probability of being rolled (4%). I also noticed that both the totals of 6 and 8 have the same probability of being rolled (14%) and when I look at the distribution of the graph I see that is fairly symmetrical around the total the two dice being 7. 4

If I add up all the probabilities of rolling 2 dice and getting a total of between 2 and 7 I found that I had .62 or 62% chance of winning the game. There is a 0.38 or 38% chance of losing the game. 3 7

I wonder if the theoretical probability follows the same general pattern. I will need to calculate these.

- So the theoretical probability of rolling a total of 2 which means rolling 2 ones only so is $= \frac{1}{6} \times \frac{1}{6}$ = 0.0277
- The theoretical probability of rolling a total of 3 which means rolling a 2 and 1 or a 1 and 2
- $= \frac{1}{6} \times \frac{1}{6} = \frac{1}{36} + \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$ so therefore the theoretical probability of rolling a total of 3
- $= \frac{1}{36} + \frac{1}{36}$ = 0.0555
- The theoretical probability of rolling a total of 4 is rolling a 2 on each dice, a 1 and 3 or a 3 and 1 so therefore I would get = $\frac{1}{36} + \frac{1}{36} + \frac{1}{36}$ = 0.0833
- The theoretical probability of rolling a total of 5 is rolling a 2 and 3 on each dice, a 3 and 2, a 1 and 4 and a 4 and 1 = 0.111
- The theoretical probability of rolling a total of 6 is rolling a 3 on each dice a 4 and 2, a 2 and 4, a 5 and 1 and a 1 and 5 = 0.1388
- The theoretical probability of rolling a total of 7 is rolling a 4 and 3 on each dice, a 3 and 4, a 2 and 5, a 5 and 2, a 6 and 1 and a 1 and 6 = 0.1666
- The theoretical probability of rolling a total of 8 is rolling a 4 on each dice, a 2 and 6, a 6 and 2, a 5 and 3 and a 3 and 5 = 0.1388
- The theoretical probability of rolling a total of 9 is rolling a 5 and 4on each dice, a 4 and 5, a 6 and 3 and a 3 and 6 = 0.111
- The theoretical probability of rolling a total of 10 is rolling a 5 on each dice and a 6 and 4 and a 4 and 6 = 0.0833
- The theoretical probability of rolling a total of 11 is rolling a 5 and 6 aon each dice and a 6 and 5 = 0.05555
- The theoretical probability of rolling a 12 is rolling a 6 on each dice = 0.0277

It is interesting to see that the theoretical follows reasonably closely to my experimental probability. For example, both graphs peak at rolling a total of 7. My experimental probability does not exactly match the theoretical for example for rolling a total of 2 my experimental (5) probability was 6% whereas the theoretical probability was 2.7% likewise for rolling total of 7 my experimental probability was 22% whereas the theoretical was only 16.6%. A possible reason why this might have occurred was that when I was rolled the dice I may not have (7) rolled them the same each time as I was getting tired and was under time pressure to complete.

From my trial investigation I can see it was pretty obvious and predictable given the likelihood to rolling each number and this is shown in graph the less number of possible outcomes the lower the times the number was rolled. The highest value of the outcomes in both my experiment and theoretical was 7. This is because 7 has the most possible combinations of being rolled (6). I am surprised with 3 only having a experimental probability of 4%

From the data and given what I have found out about the frequency of the possible number of different combinations to get certain numbers I can say that it would be likely for me win more times with a total of 2-7 as my experimental probability gave me a result of 62% chance (6) and this is supported when I compared to the theoretical probability which was 58.3%. If 7 was not included as a total then I think I would win as many games as someone who had number 8-12 based off my theoretical and experimental results. However as 7 is included in my numbers I believe from experiment I will win more games than my opponent