Roll No:

Date:

Formative assessment 2
ME-781, Aug 4, 2023

Max Marks: 10, Total time: 15 minutes

- No explanation for any question would be provided.
- Please make any assumptions as you see fit and solve the questions.
- This is an open-notes exam.
- You need not derive anything from scratch if it was derived in the class.
- You are not allowed to use a computer or calculator.

4.0

1. The host of a game show offers the guest a choice of three doors. Behind one is an expensive car, but behind the other two are empty boxes. After a guest has chosen one door, the host reveals one of the other two doors behind, which is an empty box (he wouldn't reveal a car). Now the host gives the guest a chance to switch to the other unrevealed door or stay at their initial choice. The guest will get whatever is behind the chosen door. The guest cannot, in any way, know which door has the car. What should be the strategy of the guest (stay, switch, or either) if the guest wants to maximize their chances of winning the expensive car? Provide a brief (mathematical) explanation for your answer.

The strategy of the guest should be to **switch the doors**. This because the first choice has a 1/3 chance of having the car, and that does not change.
The other two doors HAD a combined chance of 2/3 of having a car, but now the empty door has been revealed; hence, all the 2/3 chance is with the other door.

3.0

2. A family has two kids, one of them is a girl. Assume that the probability of each gender is 1/2. What would be the probability that the other kid is also a girl? Provide a brief (mathematical) explanation for your answer.

All possible combinations are GG, GB, BG, BB each having 1/4 probability.

If one of the kids is girl, then the only possibilities are GG, GB, BG. Among these two cases have the other kid as a Boy and only one has the other kid as a girl. Thus, the probability the other kid is a girl is **1/3**.

3.0

3. A family has two kids who are playing in a park. You randomly meet one of the kids, who happens to be a girl. Assume that the probability of each gender is 1/2 and the probability of you meeting any of the two kids (in the park) is also 1/2. What would be the probability that the other kid is also a girl? Provide a brief (mathematical) explanation for your answer.

If one of the kids is girl, then the only possibilities are GG, GB, BG, each having equal (1/3) probability. If you randomly meet one of the two kids and the kid happens to be a girl, then the probability of this is 1, 1/2, 1/2 for the three cases (GG, GB, BG). Thus, given that you have randomly met one of the two kids who is a girl, then the possible occurrence of the pair being GG, GB and BG is 1/3x1, 1/3x1/2 and 1/3x1/2,respectively. Thus, possibility of occurrence of GG is double of that of GB or BG. However, the later two cases imply that the other kid is a boy, whereas only the first case implies that the other kid is a girl. Therefore, double cases imply that the other kid is a boy, but the probability of the case that it is a girl is double of that of a boy. Hence, both compensate each other and so the probability that the other kid is a girl is equal to that the other kid is a boy, which is **1/2**.