Unit 4 Progress Check: FRQ

1. Show all your work. Indicate clearly the methods you use, because you will be scored on the correctness of your methods as well as on the accuracy and completeness of your results and explanations.

At a financial institution, a fraud detection system identifies suspicious transactions and sends them to a specialist for review. The specialist reviews the transaction, the customer profile, and past history. If there is sufficient evidence of fraud, the transaction is blocked. Based on past history, the specialist blocks 40 percent of the suspicious transactions. Assume a suspicious transaction is independent of other suspicious transactions.

(a) Suppose the specialist will review 136 suspicious transactions in one day. What is the expected number of blocked transactions by the specialist? Show your work.

(b) Suppose the specialist wants to know the number of suspicious transactions that will need to be reviewed until reaching the first transaction that will be blocked.

(i) Define the random variable of interest and state how the variable is distributed.

(ii) Determine the expected value of the random variable and interpret the expected value in context.

(c) Consider a batch of 10 randomly selected suspicious transactions. Suppose the specialist wants to know the probability that 2 of the transactions will be blocked.

(i) Define the random variable of interest and state how the variable is distributed.

(ii) Find the probability that 2 transactions in the batch will be blocked. Show your work.

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2. Show all your work. Indicate clearly the methods you use, because you will be scored on the correctness of your methods as well as on the accuracy and completeness of your results and explanations.

Miguel is a golfer, and he plays on the same course each week. The following table shows the probability distribution for his score on one particular hole, known as the Water Hole.

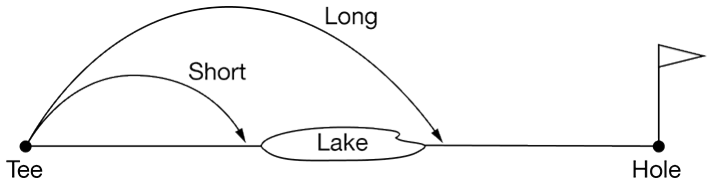
Score	3	4	5	6	7
Probability	0.15	0.40	0.25	0.15	0.05

Let the random variable X represent Miguel's score on the Water Hole. In golf, lower scores are better.

(a) Suppose one of Miguel's scores from the Water Hole is selected at random. What is the probability that Miguel's score on the Water Hole is at most 5 ? Show your work.

(b) Calculate and interpret the expected value of X. Show your work.

The name of the Water Hole comes from the small lake that lies between the tee, where the ball is first hit, and the hole. Miguel has two approaches to hitting the ball from the tee, the short hit and the long hit. The short hit results in the ball landing before the lake. The values of X in the table are based on the short hit. The long hit, if successful, results in the ball traveling over the lake and landing on the other side. The two approaches are shown in the following diagram.



A potential issue with the long hit is that the ball might land in the water, which is not a good outcome. Miguel thinks that if the long hit is successful, his expected value improves to 4.2. However, if the long hit fails and the ball lands in the water, his expected value would be worse and increases to 5.4.

(c) Suppose the probability of a successful long hit is 0.4. Which approach, the short hit or the long hit, is better in terms of improving the expected value of the score? Justify your answer.

(d) Let p represent the probability of a successful long hit. What values of p will make the long hit better than the short hit in terms of improving the expected value of the score? Explain your reasoning.