Through Study Required! *Pascal's formula, Binomial Theorem, Probability Axioms, Expected Value, Standard Deviation, Variance, Conditional Probability, Bayes Theorem & Formula, Independent Events, and Binomial Theorem Proof.*

Extra questions:

Section 9.7: Examples: *9.7.1-9.74.* ***Examples:*** *9.7.5-9.7.8.* ***Test Yourself Section.*** ***Exercise 9.7****: 14, 17, 36-41.*

Section 9.8: Examples: *9.8.1-9.8.6.* ***Test Yourself Section, Exercise 9.8:*** *1-4, 7, 11-14, 16, 19-20, 22-23.*

Section 9.9: Examples: *9.9.1-9.9.9.* ***Test Yourself Section, Exercise 9.9:*** *3, 5-6, 8-9, 11, 13-14, 16-17, 19, 23, 25-26, 30-31.*

Applications of Conditional Probability:

Question 1: Stas goes to work by one of two routes A or B. The probability of going by route A is 30%. If he goes by route A the probability of being late for university is 5% and if he goes by route B, the probability of being late is 10%. Draw a probability tree diagram and then find

A: Find the probability that Stas is late for university.

B: Given that Stas is late for university, find the probability that he went via route A?

Question 2: Consider the following contingency table

	Right Handed	**Left Handed**	**Total**
Male	0.41	0.08	0.49
Female	0.45	0.06	0.51
Total	0.86	0.14	1

Find the probability that a randomly selected person is:

A: A male given that he is right handed?

B: Right handed given that he is a male?

C: A female given that she is left handed?

D: Are the events being a female and being left handed independent? Justify?

Question 3: An urn contains 6 red balls and 4 green balls. We draw two balls without replacement and denote, R_i be the i^{th} ball drawn is red and G_i be the i^{th} ball drawn is green. Find.

A: $P(R_1)$?

B: $P(R_2 \mid R_1)$?

C: $P(R_2)$?

D: Are the events R_1 and R_2 independent? Justify.

Applications of Bayes Theorem

Question 4: One of Innopolis student was asked to throw a fair dice. Student is known to speak truth 3 out of 4 times. Student reports that it is 5. What is the probability that the student is speaking truth (or the outcome is really 5)?

Question 5: A company assured 2000 bike, 4000 car and 6000 bus drivers with the probability of accident 0.01, 0.03 and 0.15 respectively. One driver had an accident. Find the probability that the person is bike driver?

Question 6: A poker player hides a card from the pack of 52 cards. Then the player draws two diamond cards from remaining cards. What is the probability that the diamond card is being hide?

Question 7: There are three coins. One is two tailed coin, another is a biased coin that comes up heads 60% of the times and the third is an unbiased coin. One of the coins is chosen at random and tossed and it shows tail. What is the probability that it was a two tailed coin?

Question 8: Assume in our Discrete Math course 10% of girls and 5% of boys have an IQ of more than 150, and 60% of the class consists of boys. If Stas randomly select a student to ask the definition of Bayes theorem, and Stas found that the student has IQ more than 150, what is the probability that the selected student is boy, not girl?

Applications of Expected Value:

Question 9: A student from Innopolis is decided to purchase 1 lottery ticket for university fundraiser. The lottery ticket cost 5 Rub. The University is selling 10,000 tickets. One ticket will be randomly drawn and the winner student will receive 10,000 Rub. Assuming all the tickets are sold. Compute the expected value.

Question 10: A company estimates that 0.2% of their products will fail after the original warranty period but within 2 years of the purchase, with a replacement cost of 250 Rub. If they offer 2 years extended warranty for 28 Rub, what is the company's expected value of each warranty?