EXERCISE - STATISTICS FOR AI
Summer Semester 2025 (Mag. Thomas Forstner)

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91. A basketball player makes a successful free throw with a probability of 70%. What is the exact probability that the player scores more than two successful free throws in exactly 10 attempts? 99.841%

92. The probability that a person will not tolerate a certain medication is 0.04. A total of 400 patients were treated with this medication. What is the approximate probability that at least 2 patients do not tolerate the medication? 100%

93. A printing company produces 300 posters. Each poster has a 7% chance of having a printing error. The posters are produced independently. Calculate the exact probability that there is at most one poster with a printing error among these 300 posters. 0%

94. At a busy intersection (500,000 cars per week) on average seven traffic accidents per week happen. What is the approximative probability for exactly one accident to occur in a week? 0.638%

95. On weekdays between 12:00 and 13:00 one customer enters a specific store on average every two minutes. Assuming that customers enter this store independently, calculate the probability that exactly three customers enter this store on weekdays between 12:55 and 13:00. 21.376%

96. Three different routes with different degrees of difficulty can be used to climb a mountain. Of the people who attempt to climb the mountain, experience shows that 75% use route I, 15% use route II and 10% use route III. The probability of success is 80% on route I, 50% on route II and 25% on route III.

    What is the probability that a successful climber has used route II used? 10.714%

97. A call center of a large company receives on average 20 calls per hour. Calculate the probability that the call center receives exactly 24 calls in two hours. 0.193%

98. At a conference, 60% of the participants are citizens of the United Kingdom (UK). Every 8th of the UK citizen and every 80th non-UK citizen drinks tomato juice for breakfast.

    a) What proportion of breakfast place settings should be provided with tomato juice? 8%
    b) What is the probability that a random person is a UK citizen, if this person is observed drinking tomato juice at breakfast? 93.75%

99. Chantal-Jacqueline has forgotten the 4-digit PIN of her mobile phone and is totally desperate. She is sure that the digit 0 does not appear in her PIN and that the digits are all different.

    a) How many different 4-digit PINs are possible under these conditions? 3024
    b) She has three attempts to enter the correct PIN, otherwise her mobile phone will be locked. How likely is it that she will not enter the correct PIN in these three attempts if she tries three different PINs out of all possible PINs? 99.90%

100. A car rental company tracks the number of accidents reported by its customers. Over the past year, 80% of customers reported no accidents, 12% reported one accident, 5% reported two accidents, 2% reported three accidents, and 1% reported four accidents. How many accidents can the car rental company expect per customer? 0.32

101. Long-term experience shows that of the students of a university who take the exams in statistics and mathematics in one semester, 15% fail the statistics exam, 12% fail the mathematics exam, and 5% fail both exams.

     What is the probability that a randomly selected student fails …

     a) at least one of the two subjects? 22%
     b) fails the exam in exactly one subject? 17%

102. A company receives a shipment of 200 specific parts. The delivery conditions allow a maximum of 5% defective parts in a shipment. In the case of 5% or more defective parts, the shipment is returned at the supplier's expense.

     What is the exact probability that a shipment that is still okay, i.e. a shipment with exactly 5% defective parts, is returned if the company uses the following quality test plan: 15 units of the shipment are randomly selected without replacement and checked. If there is more than one defective unit among these 15 checked units, the shipment will be returned without further verification. 16.646%

103. Anton has 8 eggs and these eggs look all the same. Among these 8 eggs, exactly one egg is spoiled. He needs exactly 2 eggs to make porridge, and so he takes 2 eggs at random out from the box with the 8 eggs. What is the probability that the porridge is spoiled because one used egg was spoiled? 25%

104. A large pile of tires contains 6% defective tires. 4 tires have to be selected for a car. Now, Anton takes tires from this pile at random. Calculate the probability that Anton selects 2 defective tires before 4 good tires. 3.187%

105. Every week, a travel agency organizes a trip to a casino. The bus used for this trip has 30 seats. The travel agency knows from experience that on average, 5% of those registered for the trip, do not show up for the trip. To avoid empty seats, the travel agency accepts 32 registrations and hopes that at least two people will not show up for the trip. What is the exact probability that ...

a) all 32 registered persons show up for the trip? 19.371%
b) all the people who show up for the trip find a place on the bus? 48.004%

106. At a gym, 70% of members are enrolled in a fitness program, and 50% of members are enrolled in a yoga program. All members are enrolled in at least one of these programs. What is the probability that a randomly selected member of this gym ...

a) is enrolled in both the fitness program and yoga program? 20%
b) is enrolled in the yoga program, given that the member is enrolled in the fitness program? 28.571%
c) is enrolled in the fitness program, given that the member is enrolled in the yoga program? 40%
d) is enrolled in the yoga program but not in the fitness program? 30%
e) is enrolled in at most one of the two programs? 80%

107. Suppose you are on a game show, and you are given the choice of three doors: Behind one door is a car; behind the others, goats. You pick a door, say door number 1, and the host, who knows what is behind the doors, opens another door, say door number 3, which has a goat. He then says to you, “Do you want to switch to door number 2?”

Calculate the probability of winning the car, if you are switching from your originally chosen door to door number 2? 66.667%

Hint: The described situation is a famous statistical problem based on a question from Craig F. Whitaker to Marilyn vos Savant (Marilyn vos Savant had a column “Ask Marilyn” in a magazine called “Parade”)

Please keep the formal guidelines for submitting the homework assignments in mind to avoid losing points unnecessarily.