

### Question 1. Clinical trials

A pharmaceutical company has obtained the following data from clinical trials regarding adverse effects depending on the type of drug given to patients for the relief of various seasonal allergies.

Suppose that one of the 406 patients who participated in these trials is chosen at random.

	Medication			Total
	Allergol (VS)	Sinufed (D)	Placebo (E)	
Side effects				
Headache (A) No	65	49	43	157
headache (B) Total	124	91	34	249
	189	140	77	406

- What is the probability that this patient was treated with Allergol or placebo?
- What is the probability that this patient was treated with Allergol or that he did not have a headache?
- What is the probability that this patient was treated with a placebo or suffered from a headache?
- What is the probability that this patient suffered from headaches since he was treated with Allergol?

## Question 2. Credit at Lion

The Vancouver Lion store credit department found that its sales are paid as follows: 30% in cash, 30% by check at time of purchase, and 40% to account. Additionally, 20% of cash purchases, 90% of check purchases, and 60% of account purchases are over \$ 50, respectively.

- a) Prepare a tree diagram that shows the different possible events and the corresponding probabilities.
- b) A customer of the Lion store is chosen at random.
  - i. What is the probability that this customer will pay \$ 50 or less in cash?
  - ii. What is the probability that this customer will pay more than \$ 50?
- c) Ms. Tina Do just bought a new outfit for \$ 120 from Lion. What is the probability that she paid in cash?
- d) Are the "pay more than \$ 50" and "payment method" events independent?
- e) In order to conduct a study on the purchasing behavior of its customers, the Lion store is carrying out a survey. In a group of 10 randomly contacted customers, what is the probability that at least 2 of them made purchases over \$ 50. Suppose the probability of a customer making a purchase over \$ 50 is 20% (regardless of your answer to b.ii).

### Question 3. Quality control

A manufacturer receives a certain component from a supplier in batches of 100 units. Two units from each lot to be shipped are randomly selected and tested. If one of the units is defective, the lot is rejected. Suppose a lot contains 5 defective units.

- To) Build the probability distribution for the number of defective units in such a sample. (A tree diagram can be useful).
- b) Find the probability that such a lot will be accepted.
- vs) Find the average number of defective units in a batch of 100 units.
- d) Find the standard deviation of the number of defective units in a batch of 100 units.

### Question 4. Other clinical trials

A pharmaceutical company claims that a drug causes negative side effects in 3 out of 100 patients. To confirm this claim, another laboratory randomly chooses 5 people who have consumed the drug.

What is the probability of the following events?

- To) None of the five patients experienced any side effects.
- b) At least two experience side effects.
- vs) What is the average number of patients the company should expect to experience side effects if they randomly select 100 patients?

### Question 5. Emergency room

The number of patients arriving each hour at the emergency room of a hospital in the region is considered a Poisson variable with  $\lambda = 5.8$ .

- a) According to this probabilistic model, what is, on average, the number of patients presenting to this emergency room during a period of one hour? What is its standard deviation?
- b) What is the most likely number of arrivals in a one hour period?
- c) What is the probability that the number of patients presenting in a one hour period is less than the average number obtained in a)?
- d) Additional staff will be required if the number of patients arriving in the emergency room in a one hour period exceeds 10. What is the likelihood of additional staff being required?