

**Mathematical Statistics 2020/2021, Problem set 14**  
**Tests of independence and goodness-of-fit**

1. A group consisting of 150 men and 250 women was surveyed. Respondents were asked to indicate their preferred desert, out of three possibilities. The results are summarized in the following table.

Desert \ Sex	Male	Female	Total
Fruit salad	20	70	90
Ice cream	80	160	240
Chocolate cake	50	20	70
Total	150	250	400

Verify the hypothesis of independence of sex and preferences for a significance level of  $\alpha = 0.05$ .

2. A manufacturer of chocolate bars wants to verify whether consumers have a preference for the color of the chocolate wrapping. A random sample of 80 clients yielded the following results of color selection:

gold	red	silver	black
12	40	8	20

Verify the hypothesis of lack of preferences for  $\alpha = 0.1$ .

3. A shop assistant believes that orange juice is bought three times more frequently than apple juice, while the latter is bought twice as frequently as tomato juice. Is her assumption justified on a 0.025 significance level, if among 360 cartons sold, there were 220 orange and 90 apple?
4. The consequences of 300 traffic collisions were analyzed. The empirical distribution of the number of casualties was the following:

number of casualties	0	1	2	3	4
number of collisions	160	85	30	15	10

Based on the sample verify whether the number of casualties has a Poisson distribution (for a significance level  $\alpha = 0.05$ ).

5. The following numbers were returned by a computer pseudorandom number generator:

-1.5, 0.3, 0.8, 2.0, -2.0, -0.8, 0.6, -0.6, 1.5, -0.3

Verify the hypothesis that the sample resembles a standard normal distribution against the alternative that the sample comes from a different distribution, using the Kolmogorov test for  $\alpha = 0.1$ .