Calculus en Kansrekening

Assignment 7, October 16, 2014

Handing in your answers: To read the full story, see

`http://www.ru.nl/ds/education/courses/analyse_2014/`

Briefly,

- make sure to put
  - your name;
  - your student number and
  - the name of your TA (Ana Helena OR Gergely)

  on your solution sheet;
- submit via Blackboard (`http://blackboard.ru.nl`);
- it is one single pdf file.

Deadline: Friday, October 24, 13:30 sharp!

Goals: After completing these exercises successfully you should be confident with the following topics.

- Understanding random events;
- Applying the properties of probability measures;
- Recognizing and working with uniform and binomial distributions;
- Computing conditional probabilities with the possible application of Bayes' rule.

Marks: You can score a total of 100 points. Note that you have to **explain your answers**, so it is clear how you have got the result. In order to get full points, you need to make sure that the reader can understand each step in your solution.

1. **(20 points)** An experiment consists of drawing 3 cards in succession from a well-shuffled ordinary deck of cards.[1] Let A_1 denote the event "Ace on first draw", A_2 the event "Ace on second draw" and A_3 the event "Ace on third draw". State in words the meaning of each of the following probabilities.
   (a) $P(A_1 \cap \neg A_2)$;
   (b) $P(A_1 \cup A_2)$;
   (c) $P(\neg A_1 \cap \neg A_2 \cap \neg A_3)$;
   (d) $P[(A_1 \cap \neg A_2) \cup (\neg A_2 \cap A_3)]$.
   (e) $P(\neg A_1 \cup \neg A_2 | A_1)$;
2. **(25 points)** Compute the probabilities (a)-(e) in Exercise 1.
3. **(20 points)** Assume that a pair of fair dice are to be tossed, and let the random variable X denote the sum of the points.
   (a) Make a table of the probability function containing the possible values of X and their probabilities.
   (b) Draw a histogram of this probability function.
   (c) What is $P(X \text{ is even})$?
   (d) What is $P(X \text{ is even} | X = 2)$?
   (e) What is $P(X = 2 | X \text{ is even})$?

Turn page

[1] If you are not familiar with the standard 52-card deck, visit Wikipedia: `http://en.wikipedia.org/wiki/Standard_52-card_deck`.

4. **(20 points)** If 10% of the bolts produced by a machine are defective, determine the following probabilities.
   (a) Out of four bolts chosen at random 1 bolt will be defective.
   (b) Out of four bolts chosen at random 0 bolt will be defective.
   (c) Out of four bolts chosen at random less than 2 bolts will be defective.
   (d) Out of four bolts chosen at random 2, 3 or 4 bolts are defective.
5. **(15 points)** Urn A has 2 white and 3 red balls. Urn B has 4 white and 1 red ball. And Urn C has 3 white and 4 red balls. An urn is selected at random and a ball drawn at random is found to be white. Find the probability that Urn A was selected.