University of Geneva
Probability 1
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ASSIGNMENT 09

Bachelor in Economics and Management
Bachelor in International Relations
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1 Exercise 1:

Let $Z \sim N(0,1)$. Compute:

1. $P(Z \leq 2.67)$
2. $P(Z \leq 6.2)$
3. $P(Z \leq -1.2)$
4. $P(Z \geq 0.68)$
5. $P(Z \geq -1.55)$
6. $P(0 \leq Z \leq 0.55)$

Find a such that:

1. $P(Z \leq a) = 0.9099$
2. $P(Z \leq a) = 0.0044$
3. $P(Z \geq a) = 0.7704$
4. $P(Z \leq a) = 0.93$

Exercise 2:

On a highway where the speed is limited to 80km/h, a radar measures the speeds of all the cars during the day. Assuming that the collected speeds are distributed according to a normal law with mean 72 km/h and standard error 8km/h:

1. what is the proportion of the drivers who will have to pay a penalty for speeding?
2. knowing that in addition to the penalty, a speeding higher than 30 km/h implies a withdrawal of their driving license, what is the proportion of the drivers who will lose their driving licenses among those who will have a penalty ?

Exercise 3:

The length of the screws produced by a device of type A varies according to a normal random variable, with expectation 8mm and variance 4mm, and the length of the screws produced by a device B varies according to a normal random variable with expectation 7.5mm and variance 1mm.

1. If you want to produce screws with length $8 \pm 1mm$, which device would you choose ?

2. If the average length of the screws produced by device A remains 8mm, what should be its variance to get the same performance as device B.

Exercise 4:

'MailCopy' has just bought two photocopiers of two different brands: 'Minulta' and 'Canyon'. Both machines have a system that can stop working when they need maintenance. The operating time in days before a machine stops follows a normal distribution. The expectation of 'Minulta' is 200 days and its variance is 81. For 'Canyon', the expectation is 210 days and the variance is 144.

It is assumed that the operating time of the photocopiers is independent of each other.

1. What is the probability that the machine 'Canyon' will require maintenance in the next 7 months (assuming 1 month contains 30 days)? Redo the calculation for 'Minulta'.

2. What is the probability that the machine 'Canyon' will stop before 'Minulta' for the first time?

3. What is the probability that the machine 'Minolta' will stop before 'Canyon' for the first time?

4. What is the probability that both machines will stop at the same time for the first time?