

PROBABILITY AND STATISTICS, CLASS EXERCISE 7

- (1) The article "Procedure to verify the maximum speed of automatic transmission mopeds", *J. of Automobile Eng.*, 2008, 1615-1623, asserts that the maximum moped speed follows a normal distribution with mean value of 46.8km/h and standard deviation of 1.75km/h. You bought (randomly) one such moped.
 - a) What is the probability that the maximum speed of your moped is at most 50km/h?
 - b) What is the probability that the minimum speed of your moped is at least 48km/h?

- (2) Suppose that blood chloride concentration (mmol/L) has a normal distribution with mean 104 and standard deviation 5.
 - a) What is the probability that the chloride concentration equals 105? Is less than 105? Is at most 105?
 - b) What values correspond to the 0.1% most extreme (highest or lowest) chloride concentrations?

- (3) Suppose that the number of days that it takes for a patient on this drug to fully recover from malaria is a random variable that is normally distributed with mean 21 and a standard deviation of 4 days.
 - (a) What is the probability that a randomly selected person on this drug will fully recover from malaria in less than 14 days?
 - (b) What is the probability that a randomly selected person on this drug will take 11 to 31 days in order to make a full recovery?
 - (c) What standard deviation in days, would be required so that the probability in part (b) is 99%?
 - (d) If five people were selected at random, what is the probability that at least two of them would have taken more than 32 days to recover from malaria on this drug? Assume that recovery periods for patients are independent.
 - (e) 99.9% of people on this drug take at most how many days to fully recover from malaria?

- (4) The price of hazmat suits on Amazon.com is a normally distributed random variable with a mean of \$37.69 and a standard deviation of \$4.57.
- (a) What is the probability that a randomly selected hazmat suit retailing on Amazon.com will cost more than \$40.67?
 - (b) What is the probability that a randomly selected hazmat suit sells for less than \$22.99 on the website?
 - (c) Prices for the middle 80% of all hazmat suits sold on Amazon.com can be found between which values?
 - (d) If 10 hazmat suits were randomly selected on Amazon.com, what is the probability that at most two of them cost less than \$28.54? Assume that prices are independent.
 - (e) If the standard deviation remains at \$4.57, what does the average price have to be set at in order for Amazon to claim that 95% of the hazmat suits on their site retail for less than \$30.00?
- (5) Every year Montreal welcomes 36000 foreign students from more than 150 countries at its Universities. 5800 of the foreign students are from the US. Use normal approximation to estimate the probability that in a random sample of 1100 foreign students between 175 and 180 (inclusive) are from the US.
- (6) Careful observations show that, in the fall, the chipmunk living in my backyard stashes nuts for the winter according to a Poisson process with a mean of 6 nuts per hour. Use normal approximation to approximate the probability that the chipmunk will stash between 45 and 50 nuts (inclusive) in 8 hours. Compare this approximate value with the true value (computed using software).