The University of Zambia
Department of Mathematics and Statistics
Mat 3110-Engineering Mathematics II

Tutorial Sheet 9

November, 2018.

Submit question 3,4, 5 and 6 for assessment: Submit on Friday, November 9th, 2018 during class from 11-13hrs.

1. X is a normally normally distributed variable with mean $\mu = 30$ and standard deviation $\sigma = 4$. Find
   (a) $P(X < 40)$ (b) $P(X > 21)$ (c) $P(30 < X < 35)$

2. A radar unit is used to measure speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 km/h and a standard deviation of 10 km/h. What is the probability that a car picked at random is travelling at more than 100 km/h?

3. Entry to a certain University is determined by a national test. The scores on this test are normally distributed with a mean of 500 and a standard deviation of 100. Tom wants to be admitted to this university and he knows that he must score better than at least 70% of the students who took the test. Tom takes the test and scores 585. Will he be admitted to this university?

4. If X is a random variable with a distribution of $N(\mu, \sigma)$, find:
   $P(\mu - 3\sigma \leq X \leq \mu + 3\sigma)$

5. Calculate the value of a in a normal distribution with a mean of 4 and a standard deviation of 2 for which:
   $P(4 - a \leq x \leq 4 + a) = 0.5934$

6. An IQ test shows that the scores follow a distribution of $N(65, 18)$. It is desirable to arrange the participants into three groups (low intelligence, average intelligence and high intelligence) so that 20% of the partipants are filled under the first group, 65% in the second and 15% in the third. What are the scores that differentiate each intelligence group from one another?

7. The number of hours of sunshine at a resort has been recorded for each month for many years. One year is selected at random and H is the number of hours of sunshine in August of that year. H can be modelled by a normal variable with mean 1.30.
   (a) Given that $P(H < 179) = 0.975$, calculate the standard deviation of H.
   (b) Calculate $P(100 < H < 150)$

8. The random variable X represents the weight, in grams, of chocolate chips in packets sold by a supermarket. It is suggested that X can be modelled by a normal distribution with X $N(100, 25)$.
   (a) Find $P(X > 108)$.
   (b) Show that $P(|X - 100| < 6.8) = 0.8262$

9. Bags of flour packed by a particular machine have masses which are normally distributed with mean 500g and standard deviation 20g. 2% of bags are rejected for being underweight and 1% of the bags are rejected for being overweight. Between what range of values should the mass of a bag of flour lie if it is to be accepted?

10. The lengths of metal strips are normally distributed with a mean of 120cm and a standard deviation of 10cm. Find the probability that a strip selected at random has a length
    (a) greater than 105cm
    (b) within 5cm of the mean

    Strips that are shorter that L cm are rejected. Estimate the value of L, correct to one decimal place, it 9% of all the strips are rejected.

11. The number of shits sold in a week by the world's largest menswear store are normally distributed with mean of 2080 and standard deviation of 50. Estimate
    (a) the probability that in a given week fewer than 2000 shirts are sold,
    (b) the number of weeks in a year that between 20160 and 2130 shirts are sold,
    (c) the least number n of shirts such that the probability that more than n are sold in a given week is less that 0.02.