STAT2203: Probability Models and Data Analysis for Engineering
STAT7203: Applied Probability and Statistics
Week 10 Exercises

1. A study was conducted to compare the effects of using an existing drug (Prochloroperazine) with using THC (the active ingredient in marijuana) for nausea relief in patients undergoing chemotherapy for cancer. A total of 157 patients being treated in a cancer clinic were divided into two groups in a randomised, double-blind, comparative experiment. Among the patients recieving THC, 36 patients found it effective for nausea relief and 43 found it not effective. Among patients receiving Prochloroperazine, 16 patients found it effective for nausea relief and 62 found it not effective.

   Compute a 99% confidence interval for the true difference in nausea relief rates between THC and Prochloroperazine.

2. Serious gaming technology is increasingly being used as a method of training. A 2010 study compared the efficacy of a serious game 'Triage Trainer' to traditional card-sort exercises in preparing learners for a major incident triage. In this study 91 learners were randomly distributed into one of two training groups: 44 participants practiced triage sieve protocol using a card-sort exercise, whilst the remaining 47 participants used 'Triage Trainer'. After the training sessions, each participant was evaluated by triaging eight casualties in a simulated live exercise. Their performance was assessed in terms of accuracy and speed.

   Accuracy: In the card-sort group, 24 of the 44 participants got a score of 8/8. In the triage trainer group, 34 of the 47 participants got a score of 8/8.

   Speed: The average time taken to triage all eight casualties in the card-sort group was 435s with a sample standard deviation of 74s, whereas the average time taken to triage all eight casualties in the 'Triage Trainer' group was 456s with a sample standard deviation of 62s.

   (a) Construct a 90% confidence interval for the difference in the true proportion of learners from the two training methods who correctly assign all eight casualties.

   (b) Construct a 99% confidence interval for the true proportion of learners from the card-sort method who correctly assign all eight casualties.

   (c) Construct a 95% confidence interval for the mean time taken to triage eight casualties by a person trained using the 'Triage Trainer' game.

   (d) Construct a 95% confidence interval for the difference in mean time taken to triage eight casualties by a persons trained using the two methods.

3. To compare the antioxidant capacities of green and black teas, a researcher bought 43 different brands of tea bags that were widely available in supermarkets across Europe. A random tea bag was selected from each brand and brewed in a cup with 200 mL of purified water at 100^c for 2 minutes. After 2 minutes, the antioxidant capacity (in milligrams) of each cup of tea was measured. For black tea, from the 24 tea bags used, the mean antioxidant capacity was 239 mg with a standard deviation of 102 mg. For green tea, from the 19 tea bags used, the mean antioxidant capacity was 336 mg with a standard deviation of 139 mg.

   Construct an approximate 90% confidence interval for the true mean difference in antioxidant capacities between green and black teas.