STAT2203/7203: Week 10 Practical Questions

1. Recall the "serious gaming technology" experiment from the previous week's tutorial.

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

   (b) 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.

2. A shoe manufacturer claims that athletes can increase their vertical jump heights using their new shoe design. The vertical jump heights of eight randomly selected athletes from an American university were measured. After the athletes had trained with the new shoes for 8 months, their vertical jump heights were measured again. The jump heights (in inches) for each athlete are shown in the table below.

| | Vertical jump height (inches) | | | | | | | | | |
Athlete	1	2	3	4	5	6	7	8	$\bar{x}$	s
before using new shoes	24	22	25	28	35	32	30	27	27.88	4.32
after using new shoes	26	25	26	29	33	34	35	30	29.75	3.92
change	2	3	1	1	-2	2	5	3	1.88	2.03

   (a) A sports scientist wants to use a two-sample t-test to analyse the two sets of measurements here. Briefly argue why this is not a good idea.

   (b) Is there evidence that vertical jump heights increased after training with the new shoes? Answer this question by carrying out an appropriate hypothesis test. You should clearly state the null and alternative hypotheses, compute a p-value, and write a conclusion in a manner that can be understood by a sports scientist.

   (c) Construct a 95% confidence interval for the true average increase in vertical jump heights after training with the new shoes.

   (d) Identify one way in which the results of this study might have been confounded, and suggest one way to fix this issue.

3. A simple alternative to the t-test for paired data is to count the number of cases where there was a positive difference. This is called the sign test. We will look again at the data from Question 3.

   (a) State the null and alternative hypotheses of interest in terms of p, the probability that, a randomly selected athlete experiences a positive change in vertical jumpt height after using the new shoes.

   (b) Assuming H_0 is true, what is the distribution of X, the number of positive changes from the 8 athletes?

   (c) Based on the observed number of positive changes, what is the p-value for this test? What do you conclude?

   (d) How do your results compare with the results Question 3?