

## THE STATISTICS OF COMMUTING

Over the course of the last 16 months, I have recorded how long it takes me from my house to the Australian Science and Mathematics School. There are more than 200 recordings I have taken and it is only recently that I have looked at a sample of the fifty most recent results. Through computing these values in Excel, I found that the mean duration it takes me to get from my house to school is 15 minutes with a standard deviation of approximately 1.5 minutes. For the purpose of this exercise assume that the values form a normal distribution.

Questions in this document are aimed at sections 7C, 7D and 7E of the Mathematical Studies textbook, looking at using technology for `invnorm` and `normalcdf`. Use of graphics calculator technology is recommended.

1. What is the precision of the recordings if measured to the nearest minute? How many significant figures can calculations based on this original data be to? Justify
2. What is the likelihood of the commute taking between 13.5 minutes and 16.5 minutes?
3. Calculate the 0.95 Confidence Interval for the mean based on the sample given. What does this value mean in context? HINT: Assume that there are 1.96 standard deviations above and below the mean for 95% of the distribution.
4. On May 1<sup>st</sup> 2013, I took 16 minutes to get to school. Calculate the z score value by breaking one standard deviation into three parts.

5. Now repeat question 3 but use the z score formula to calculate
  
  
  
  
  
  
  
  
  
  
6. What is the importance or significance of the z score value in context to q 3, q 4 and 5? What does it tell us about this particular journey on 1<sup>st</sup> May 2013?
  
  
  
  
  
  
  
  
  
  
7. On a particular day the traffic is quite heavy on the Southern Expressway and as a result, the commute is longer than 85% of the other days recorded. Approximate the time it took for this particular commute to an appropriate number of significant figures.
  
  
  
  
  
  
  
  
  
  
8. In one week, it was found that 20% of trips were 13 minutes or less and 40% were 16 minutes or more. From this derive the mean and standard deviation using z scores and your graphics calculator.

9. How many days in that week were 13 minutes or less (assuming this is a normal 5 day school week)?
  
  
  
  
  
  
  
  
  
  
10. From this distribution for one week (q 7), what time for the journey would result in an arrival of 15 minutes?
  
  
  
  
  
  
  
  
  
  
11. Comparing this one-week to the overall sample, were the journeys from the week longer or shorter than the fifty originally recorded? Justify by comparing the distributions using z scores.
  
  
  
  
  
  
  
  
  
  
12. An accident occurs on Sturt Road near the entrance to University Drive. This results in trip to school taking 20 minutes. Calculate the z score of this value with respect to the normal distribution of the samples.
  
  
  
  
  
  
  
  
  
  
13. What are some of the limitations, generalisations and assumptions that may have been made over the course of this worksheet?