The Normal Distribution and Standard Deviation– an elicitation activity

This elicitation activity looks at section 7C of the Haese and Harris Publications, which involves looking at ideas of spread, standard deviation and the empirical rule. Assume (UNLESS OTHERWISE STATED), that the first deviation below and above the mean holds 68%, two standard deviations above and below the mean hold 95% of the population and that 99.7% of the population is housed within three standard deviations above and below the mean)

The Curriculum Director of Statistics Island Core Education (SICE) has found that the mean of the 2012 classes' Statistics Island Tertiary Admission Ranking (SITAR) is 65 with a standard deviation of 11. Approximately 9800 students sat the SICE end of year examinations in 2012.

1. What is the population? Is the data Quantative or categorical?

2. Explain why a mean may be an appropriate measure given the context

3. Suggest why it can be assumed that the SITAR scores may suit a normal distribution

4. What percentage of students got a SITAR of 54 or less?

5. What percentage of students could do the Advanced Statistics Course at Statistics University if the cut off entrance rank is a SITAR of 87?

6. What is the probability of a student achieving a SITAR of 98?

Mr. Statistic is the director at a Statistics University. He has decided to offer free tuition for life for people who achieve a SITAR that is greater than 98.

7. Calculate the percentage of 2012 students who are eligible for free tuition

8. Given the population of 2012 students who sat the SICE exams, how many people are eligible for free tuition?

Calculus Island has its own Calculus Island Certificate of Education (CICE). It was found that the average ranking for university entrance was 77 with a standard deviation of 6. Approximately 6500 students sat the examination at the end of 2012.

1. Does Calculus Island's tertiary ranking distribution or Statistics Island's tertiary ranking distribution have a greater spread?

2. What is the probability that someone on Calculus Island who was part of the 2012 class achieved a ranking numerically higher than the mean of the Statistics Island tertiary admission ranking?

3. Based on the confidence interval formula below and the assumption that two standard deviations above/below the mean equate to 95.4% of the population (hence there is 1.96 standard deviations above/below to represent 95%), compute the range of tertiary admission rankings for students in the 2012 SICE and CICE.

$$1.96 * \frac{\sigma}{\sqrt{n}} < u < 1.96 * \frac{\sigma}{\sqrt{n}}$$

4. The two different education ranking systems are not scaled exactly the same. It was found that someone who has a SITAR ranking of 76, would have the equivalent of a Calculus Island Tertiary Admission Ranking of 83. Explain whether Calculus Island or Statistics Island has smarter students and why. Would you be more likely to find a smarter student on Calculus Island or Statistics Island if randomly selected?

As part as the Statistics Island Core Education, 80% of tasks done are internal assessment pieces and 20% of grades are part of the external assessment. Sam is currently doing his final year at Stats High and has achieved the following results from his internal assessment pieces for his four subjects.

Subject	Internal Assessment (80%)
High Level Mathematics	A
Standard Level Mathematics	A+
Physics	A+
Chemistry	A

Assuming that his mean predicted SITAR is 96 with a standard deviation of 2, what is the likelihood that Sam will be able to get free tuition at Statistics University? (See previous questions)