

**SUBJECT: Mathematics (JC)**

<b>LEVEL</b>	JC2 H1/H2 Mathematics
<b>TOPIC</b>	Sampling Methods / Hypothesis Testing
<b>DESCRIPTION OF RESOURCES</b>	This resource package consists of two activities. The first activity will reinforce the students' understanding on sampling methods by letting the students design the sampling method that could be used to obtain the survey data on the plastic bags usage in Singapore. The second activity will reinforce the students' understanding on hypothesis testing by letting the students conduct hypothesis testing on the statistics presented in the SEC position paper.
<b>MATERIALS NEEDED</b>	Statistics extracted from the SEC Position Paper. Writing Materials for students to write their responses for sharing. Computer with Internet Connection (for teacher's use)

## Teacher's Resource Guide



In joint collaboration with NIE'S GESL Group 27, Building Blocks.

### Description:

In statistics, we are interested in gathering information about a population based on data derived from a sample of the population. To gather useful information, the sample must be a representative of the population. Various sampling methods can be used to obtain the data, they include random sampling, stratified sampling, systematic sampling and quota sampling. One of the most important use of statistics is to be able to make conclusions and test hypotheses using the data collected.

### Materials:

Statistical Data Extracted from the SEC White Paper

[http://www.sec.org.sg/publication/SEC Position Paper on Reducing Plastic Bag Wastage in Singapore.pdf](http://www.sec.org.sg/publication/SEC_Position_Paper_on_Reducing_Plastic_Bag_Wastage_in_Singapore.pdf)

- Approximately 3 billion plastic bags were used in Singapore in 2011 (Lee & Goh, 2012), resulting in an average of 1.6 plastic bags used per person on a daily basis.
- SEC and the Ministry of the Environment and Water Resources (MEWR) develop a set of survey question designed to investigate how households in Singapore obtain and reuse plastic bags. The following results were uncovered:
  - *90% of participants reuse bags obtained from supermarkets to dispose general waste.*
  - *6.3% of bags that are thrown away can certainly be considered as "wasteful use of plastic bags"*
  - *44% of respondents reported reusing 6-10 bags a week.*
  - 26% of the total sample size surveyed who store more than 20 bags at home.
  - 33% of the 2,500 respondents polled by MEWR could be said to be wasting all or some of the plastic bags given out for free at supermarkets.

- 8.5% of respondents recycling plastic bags after bringing them home from the supermarket

### **Activity (Sampling Methods):**

This activity will take approximately 50 mins.

1. Get the students to work in groups of 4 or 5.
2. Assign each group as the expert group to the one of the sampling methods: random sampling, stratified sampling, systematic sampling or quota sampling.
3. Give the students the context of conducting a survey to obtain data on the usage of plastic bags in Singapore. Get the students to discuss within their groups how they will obtain the sample to complete the survey questions using the sampling methods assigned. Get them to also discuss the advantages and disadvantages of their methods.
4. Invite the groups to share with the class what they have proposed. Correct the students if necessary. In their presentation, students should include the following:
  - a. Sampling frame and population
  - b. How the sampling is done in context
  - c. Advantages and disadvantages of their method
5. Present some of the statistics that were obtained from the SEC position paper to the students.
6. Lead the students to discuss the impact of their sampling methods on the results that would be obtained. For example, if students were to stratify their population based on income level, how will the survey results differ from that if they were to stratify based on education level or age group?

7. Lead the students to reflect on the data presented. For example: Is it appalling to them? What do they perceive as the “correct” data?
  - I. Possibility of bringing in the concept of convenience sampling that could have altered their perceptions on the plastic bags usage. (For example, the people whom they have come into contact with just use and throw away plastic bags, so the statistics on “*44% of respondents reported reusing 6-10 bags a week.*” may be “untrue” to them.)

### **Activity (Hypothesis Testing):**

This activity will take approximately 50 mins. Students are assumed to have the prior knowledge on the 4 different types sampling methods.

1. Get the students to work in groups of 4 or 5.
2. Present some of the statistics that were obtained from the SEC position paper to the students.
3. Each group will select one of the statistics about the usage of plastic bags to formulate a hypothesis they wish to test.
  - i) For example, the group chooses the statistics “*90% of participants reuse bags obtained from supermarkets to dispose general waste.*” The group can test if the proportion of the students in their class who reuse plastic bags obtained from supermarkets is 0.9.
4. Invite the groups to share with the class their hypothesis testing results. Correct the students if necessary. In their presentation, students should include the following:
  - i) Null and alternative hypothesis
  - ii) Test statistics and calculation
  - iii) Conclusion

5. Get the students to reflect on the results they have obtained (Both mathematically and environmentally).
  - i) For example, the SEC paper claims that “*90% of participants reuse bags obtained from supermarkets to dispose general waste.*” Preliminary data analysis using data obtained from their classmates shows that only 50% reuse the plastic bags.
    - (1) Environmentally: What are the implications of not recycling the plastic bags? What can they do to save the environment?
    - (2) Mathematically: Is the large difference due to sample size and sampling method used to obtain the data?