

SUBJECT: Mathematics

LEVEL	Secondary 2 Express / Normal Academic / Normal Technical
TOPIC	Rate and Proportion / Percentage / Data Analysis
DESCRIPTION OF RESOURCES	Students will be given information from the position paper and answer questions relevant to recycling. During the activity, they will need to make use of mathematical concepts to solve questions related to the source. Also, they will be able to understand the need of reducing, reusing and recycling of plastic bags in order to save the Earth from the negative impacts of the plastic wastes produced. Lastly, they will reflect on their current effort in reducing, reusing and recycling of plastic bags.
MATERIALS NEEDED	Computer with internet access Position paper (Online) Activity Worksheet (Provided) A4 size paper (For reflection drawing)
OTHERS	Group Activity Suggested Duration: 1 hour 30 minutes

Teachers' Guide (Suggested Flow of Lesson)

Introduction

1. This activity can be conducted in groups of 5.
2. Teachers can start the lesson showing videos regarding negative impacts of plastic waste to the environment.

(Source:<http://www.youtube.com/watch?v=73sGgmZoMBQ>)

Question 1

1. Students will be given about 20 minutes to discuss and attempt Question 1.
2. Teacher is to ask a few students to share with the class on how plastic bags can be reused.
3. Prompt students to discuss whether the method proposed by the students are feasible.

Question 2

1. Students will be given about 20 minutes to discuss and attempt Question 2.
2. Students have to read up on Section 2.2 of the Position Paper before answering part (a) and (b).
3. Teacher is to ask a few students to share with the class on their main concerns of plastic waste on the environment.
4. Teacher may also ask students to think about what will happen to Earth if there is no effort in practicing reduce, reuse and recycling of plastic bags.

Question 3

1. Students will be given about 20 minutes to discuss and attempt Question 3.
2. Teacher is to ask students to share their reasons for using/not using reusable bags.



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

Reflection

1. Students will be given about 20 minutes to complete the reflection section.
2. Students may pin up their reflection drawings to allow other classmates to look at it.
3. Teachers may ask a few students to share with the class their drawings.

End of Lesson

Teacher is to collect the activity sheet to give comments on their mathematical solutions and other answers.



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Mathematics Activity Worksheet on Recycling of Plastic Bags

Name: _____

Date: _____

Class: Secondary _____

Objective of Activity

In this worksheet, you will be able to use mathematical concepts learnt to solve some problems related to recycling and compare results with resources found in the internet. Also, you will be exposed to some facts of current recycling efforts of plastic bags in Singapore and understand the importance of recycling in order to save the Earth and our future generations.

Question 1: Total Number of Plastic Bags Used in Singapore Annually.

Approximately 3 billion plastic bags were used in Singapore in 2011, resulting in an average of 1.6 plastic bags used per person on a daily basis. This high annual usage of plastic bags has been of much concern from environmentalists and concerned members of the public alike. Concerns about the environmental harm done by plastic bags is expressed primarily through letters sent to the forum sections of national newspapers, complaints sent to the National Environment Agency's public feedback channels, and bottom-up initiatives by environmental groups, such as the Singapore Environmental Council's 'Bring Your Own Bag Day' campaign that ran from 2007 to 2010.

Extract from: Identifying and Mitigating the Wastage and Inefficient use of plastic bags in Singapore

With reference to the above source,

- a) What is the approximate size of Singapore's population in 2011? Correct your answer to the nearest whole number.

- b) How many family members are staying in your house? Based on the figures shown in the source, calculate the number of plastic bags used in your house, correcting your answer to the nearest 1 decimal place.

Reflecting on your past encounter,

- c) When did you have to use plastic bags? Give 3 examples.
- d) What did you do to those plastic bags after using them?
- e) Give at least 3 suggestions on how plastic bags can be reused. Share with your group mates on your ideas.

Question 2: Current Percentage of Plastic Waste Recycled

In 2012, a total of 721,300 tonnes of plastic waste were generated, out of which only 82,100 tonnes were recycled. While there is no available data on the proportion of this plastic waste accounted for by plastic carrier bags, the 2.5 billion plastic bags used annually are certainly likely to account for a significant proportion of plastic waste that is incinerated and then sent to landfills.

Extract from: Identifying and Mitigating the Wastage and Inefficient use of plastic bags in Singapore

With reference to the above source,

- a) What is the percentage of plastic waste being recycled in 2012? Correct your answer to 3 significant figures.

By referring to Section 2.2 of the Position Paper,

- b) What are the environmental impacts caused by plastic waste? Share with your group mates on an impact that you are most concerned with.
- c) Having found the percentage of plastic waste recycled and the impacts on the environment, do you think there is a need for everyone to start recycling plastic waste?

Question 3: Reasons Provided for Not Using Reusable Bags

Respondents who did not use reusable bags all the time were asked about their reasons for not doing so. The top-most cited reason for not using reusable bags was that plastic bags were provided (39.3%). 33.5% of respondents mentioned that they did not have reusable bags with them when they made unplanned purchases, and 27% forgot to bring their reusable bags with them when they went shopping. 23.2% also consciously took plastic bags from supermarkets so that they would have bags in which to dispose of their household waste, or for other types of reuse.

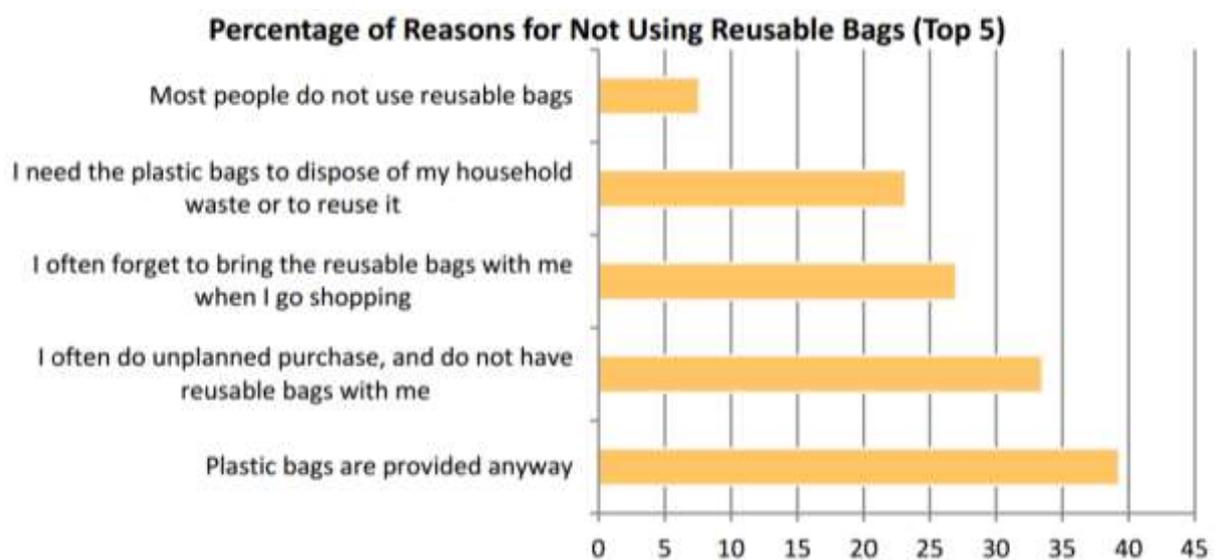


Chart 6: Percentage of Reasons for Not Using Reusable Bags (Top 5)

Extract from: Identifying and Mitigating the Wastage and Inefficient use of plastic bags in Singapore

With reference to the above source,

- a) Obtain the percentages for all the five reasons for not using reusable bags.

Does the sum of all percentages add up to 100%? If not, why is this so?

Assuming the total number of respondents of this data is 1000,

- b) Find the number of respondents who indicated "Yes" for each category.
- c) Using results of part (b), construct a bar chart with number of respondents as the vertical axis and reasons for not using reusable bags as the horizontal axis.

- d) What are the three measures of central tendency? Which of them is most appropriate in describing the bar chart in part (c) and why? State the most appropriate measure of central tendency.
- e) Did you use reusable bags? If not, what are your reason(s) for not using it?

Reflection time

- i) Please reflect on what you have learnt from this activity and tick on the appropriate boxes.

Item No.	Questions	Yes	No
1	I am aware of the high amount of plastics used in Singapore.		
2	I have understood the negative impacts of plastic waste on the environment.		
3	I am aware of the reasons that people give for not using reusable bags.		
4	I am going to put in effort to reduce, reuse and recycle plastic bags starting from today.		
5	I will disseminate the importance of reducing, reusing and recycling of plastic bags to people around me.		

- ii) Think through these questions and share with the class about it.
- a) What will happen to the world if no one sees the need to reduce the amount of plastic waste?
- b) As an individual, what can I do to help reduce the amount of plastic waste?
- c) How can I help to reduce the amount of plastic waste generated in my house and in school?
- d) Draw a picture to illustrate your determination in reducing, reusing and recycling of plastic bags. Share with your group.

Please read the Position Paper published by Singapore Environmental Council for more facts and information on recycling of Plastic Bags in Singapore.

Link:

Identifying and Mitigating the Wastage and Inefficient use of plastic bags in Singapore

[http://www.sec.org.sg/publication/SEC Position Paper on Reducing Plastic Bag Wastage in Singapore.pdf](http://www.sec.org.sg/publication/SEC%20Position%20Paper%20on%20Reducing%20Plastic%20Bag%20Wastage%20in%20Singapore.pdf)

Congratulations!

You have taken the first step to save our beloved Earth!

Keep it up ☺

Suggested Solution for Worksheet

1(a) Number of bags used per person for a year

$$= 1.6 \times 365 \text{ days}$$

$$= 584 \text{ plastic bags}$$

Total population size of Singapore approximated in year 2012

$$= \frac{3 \times 10^9}{584}$$

$$\approx 5136986 \text{ people (correct to nearest whole number)}$$

- (b) Depending on the number of family members of students.
- (c) Groceries, shopping, packing of stores, etc.
- (d) Throw them away after use, keep them for covering of rubbish bins, etc.
- (e) Bring them out and reuse them for groceries, use to collect rubbish at home, used for storage purposes.

2(a) Percentage of plastic waste recycled

$$= \frac{82100}{721300} \times 100\%$$

$$= 11.4\% \text{ (correct to 3 significant figures)}$$

(b) Consumption of natural resources, energy, air quality and waste management considerations, lack of space for landfilling of ask residue and impact on marine life.

(c) ---

3(a)

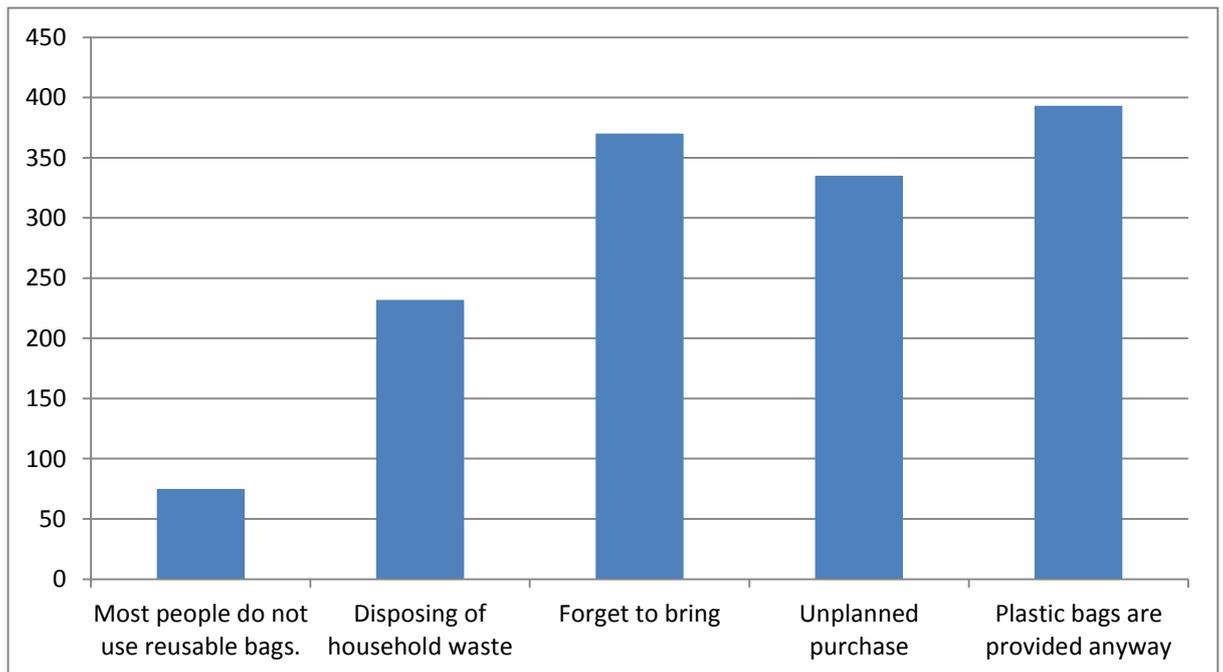
Reasons	Percentage
Most people do not use reusable bags.	7.5%
I need the plastic bags to dispose of my household waste or to reuse it.	23.2%
I often forget to bring the reusable bags with me when I go shopping.	27%
I often do unplanned purchase, and do not have reusable bags with me.	33.5%
Plastic bags are provided anyway.	39.3%

The sum of all percentages does not add up to 100%. This is because each respondent may have more than 1 reason for not using reusable bags.

(b)

Reasons	Number of Respondents
Most people do not use reusable bags.	75
I need the plastic bags to dispose of my household waste or to reuse it.	232
I often forget to bring the reusable bags with me when I go shopping.	270
I often do unplanned purchase, and do not have reusable bags with me.	335
Plastic bags are provided anyway.	393

(c)



(d) Mean, median and mode. Mode is the most appropriate measure as the data has nominal variables (categorical data). The mode of this data is "Plastic bags are provided anyway".

(e) ---