



Lesson 20: Estimating a Population Proportion

Student Outcome

- Students use data from a random sample to estimate a population proportion.

Lesson Notes

In this lesson, students continue to work with random samples and the distribution of the sample proportions. The focus in this lesson is to derive the center of the sample proportions (or the mean of the sample proportions). Students begin to see how the distribution clusters around the mean of the distribution. This center is used to estimate the population proportion.

In preparation of this lesson, provide students or small groups of students the random-number table and the table of data for all students in the middle school described in the exercises. Students will use the random-number table to select their random samples in the same way they used the random-number table in the previous lesson.

Classwork

In a previous lesson, each student in your class selected a random sample from a population and calculated the sample proportion. It was observed that there was sampling variability in the sample proportions, and as the sample size increased, the variability decreased. In this lesson, you will investigate how sample proportions can be used to estimate population proportions.

Example 1 (9 minutes): Mean of Sample Proportions

This example is similar to the data that students worked with in the previous lesson. The main idea is to have the students focus on the center of the distribution of sample proportions as an estimate for the population proportion. For some students the vocabulary can be problematic. Students are still learning the ideas behind samples and population.

Summarize the problems from the previous lesson by asking the following questions:

- How many samples are needed to calculate the sample proportion?
 - *The sample proportion is the result from one random sample.*
- How is the distribution of the sample proportions formed?
 - *The distribution of the sample proportions is a dot plot of the results from many randomly selected samples.*
- What is the population proportion?
 - *The population proportion is the actual value of the proportion of the population who would respond “yes” to the survey.*

Example 1: Mean of Sample Proportions

A class of seventh graders wanted to estimate the proportion of middle school students who were vegetarians. Each seventh grader took a random sample of middle-school students. Students were asked the question, “Are you a vegetarian?” One sample of students had three students who said that they were vegetarians. For this sample, the sample proportion is $\frac{3}{25}$ or 0.12. Following are the proportions of vegetarians the seventh graders found in 10 samples. Each sample was of size 25 students. The proportions are rounded to the nearest hundredth.

Exercises 1–9 (19 minutes)

Allow students to work in small groups on Exercises 1–9. Then discuss and confirm as a class.

Exercises 1–9

1. The first student reported a sample proportion of 0.00. Interpret this value in terms of the summary of the problem in the example.

Three of the 25 students surveyed responded that they were vegetarian.

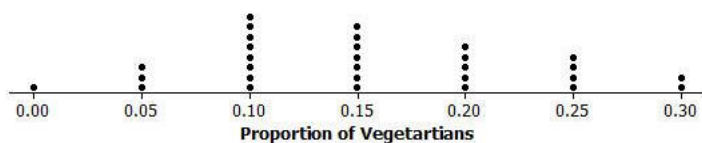
2. Another student reported a sample proportion of 0.00. Did this student do something wrong when selecting the sample of middle school students?

No, this means that none of the 25 students surveyed said that they were vegetarian.

3. Assume you were part of this seventh grade class and you got a sample proportion of 0.12 from a random sample of middle school students. Based on this sample proportion, what is your estimate for the proportion of all middle school students who are vegetarians?

My estimate is 0.12.

4. Construct a dot plot of the 10 sample proportions.



5. Describe the shape of the distribution.

Nearly symmetrical or mound shaped centering at approximately 0.12.

6. Using the class results listed above, what is your estimate for the proportion of all middle school students who are vegetarians? Explain how you made this estimate.

About 0.12. I chose this value because the sample proportions tend to cluster between 0.05 and 0.25, or 5% and 25%.

7. Calculate the mean of the sample proportions. How close is this value to the estimate you made in Exercise 6?

The mean of the samples to the nearest thousandth is . The value is close to my estimate of , and if calculated to the nearest hundredth, they would be the same. (Most likely students will say between and .)

8. The proportion of all middle school students who are vegetarians is . This is the actual proportion for the entire population of middle school students used to select the samples. How the mean of the sample proportions compares with the actual population proportion depends on the students' samples.

In this case, the mean of the sample proportions is very close to the actual population proportion.

9. Do the sample proportions in the dot plot tend to cluster around the value of the population proportion? Are any of the sample proportions far away from ? List the proportions that are far away from .

They cluster around . The value of and are far away from the .

Example 2 (4 minutes): Estimating Population Proportion

This example asks students to work with data from a middle school of students. Although the school is fictitious, the data were obtained from actual middle school students and are representative of middle school students' responses. A list of the entire students' responses is provided at the end of the lesson. The data was collected from the website, <http://www.amst at.org/censusatschool/>. Details describing the Census at School project are also available on the website of the American Statistical Association, or <http://www.amstat.org/>

In this lesson, students are directed to analyze the last question summarized in the data file of the students at Roosevelt Middle School. If students are more interested in one of the other questions listed, the exercise could be redirected or expanded to include analyzing the data from one of these questions.

Example 2: Estimating Population Proportion

Two hundred middle school students at Roosevelt Middle School responded to several survey questions. A printed copy of the responses the students gave to various questions is provided with this lesson.

The data are organized in columns and are summarized by the following table:

Column Heading	Description
ID	Numbers from to
Travel to School	Method used to get to school Walk, car, rail, bus, bike, skateboard, boat, other
Favorite Season	Summer, fall, winter, spring
Allergies	Yes or no
Favorite School Subject	Art, English, languages, social studies, history, geography, music, science, computers, math, PE, other
Favorite Music	Classical, Country, heavy metal, jazz, pop, punk rock, rap, reggae, R&B, rock and roll, techno, gospel, other
What superpower would you like?	Invisibility, super strength, telepathy, fly, freeze time

The last column in the data file is based on the question: Which of the following superpowers would you most like to have? The choices were: invisibility, super-strength, telepathy, fly, or freeze time.

The class wants to determine the proportion of Roosevelt Middle School students who answered freeze time to the last question. You will use a sample of the Roosevelt Middle School population to estimate the proportion of the students who answered freeze time to the last question.

There are several options for obtaining random samples of responses. It is anticipated that some classes can complete the exercise in the timeframe indicated; but it is also likely that other classes will require more time, which may require extending this lesson by another class period. One option is to provide each student a printed copy of the data file. A list of the data file in a table format is provided at the end of the student lesson and also at the end of the teacher notes. This option requires copying the data file for each student. A second option would be to provide small groups of students a copy of the data file, and allowing them to work in groups.

MP.

The standards for this lesson expect students will be involved in obtaining their own sample, and using the proportion derived from their sample to estimate the population proportion. By examining the distribution of sample proportions from many random samples, students see that sample proportions tend to cluster around the value of the population proportion. Students attend to precision in carefully describing how they use samples to describe the population.

The number of samples needed to illustrate this is a challenge. The more samples the class can generate, the more clearly the distribution of sample proportions will cluster around the value of the population proportion. For this lesson, a workable range would be between to samples.

Discuss how to obtain a random sample of size from the students represented in the data file. The student ID numbers should be used to select a student from the data file. The table of random digits that was used in previous lessons is provided in this lesson. Students drop their pencil on the random table and use the position of one end of the pencil (e.g., the eraser) as the starting point for generating three-digit random numbers from to . The ID numbers should be considered as three-digit numbers and used to obtain a random sample of students. Students will read three digits in order from their starting point on the table as the student ID (e.g., is the selection of the student with ID number ; is the selection of the student with ID number ; is the student with ID). Any ID number formed in this way that is greater than is simply disregarded, and students move on to form the next three-digit number from the random-number table. Indicate to students that they move to the top of the table if they reached the last digit in the table. If a number corresponding to a student that has already been selected into the sample appears again, students should ignore that number and move on to form another three-digit number.

After students obtain their ID numbers, they connect the ID numbers to the students in the data file to generate a sample of responses.

Exercises 10–17 (14 minutes)

Let students work with their groups on Exercises 10–17. Then discuss answers as a class.

Exercises 10–17

A random sample of student responses is needed. You are provided the random number table you used in a previous lesson. A printed list of the Roosevelt Middle School students is also provided. In small groups, complete the following exercise:

10. Select a random sample of student responses from the data file. Explain how you selected the random sample.

Generate random numbers between and . The random number chosen represents the ID number of the student. Go to that ID numbered row and record the outcome as a “yes” or “no” in the table regarding the freeze time response.

11. In the table below list the responses for your sample.

Answers will vary. Below is one possible result.

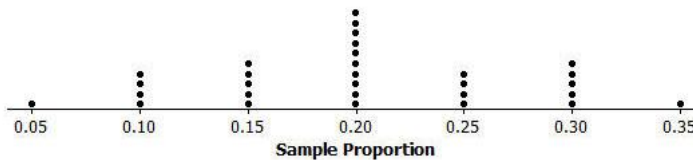
	Response
	Yes
	No
	No
	No
	Yes
	No
	No
	No
	Yes
	Yes
	No
	No
	No
	Yes
	No
	No
	No
	Yes
	No
	No
	No
	No

12. Estimate the population proportion of students who responded “freeze time” by calculating the sample proportion of the sampled students who responded “freeze time” to the question.

Student answers will vary. The sample proportion in the given example is — or .

13. Combine your sample proportion with other students’ sample proportions and create a dot plot of the distribution of the sample proportions of students who responded “freeze time” to the question.

An example is shown below. Your class dot plot may differ somewhat from the one below, but the distribution should center at approximately . (Provide students this distribution of sample proportions if they were unable to obtain a distribution.)



14. By looking at the dot plot, what is the value of the proportion of the Roosevelt Middle School students who responded “freeze time” to the question?

15. Usually you will estimate the proportion of Roosevelt Middle School students using just a single sample proportion. How different was your sample proportion from your estimate based on the dot plot of many samples?

Student answers will vary depending on their sample proportion. For this example, the sample proportion is , which is slightly greater than the .

16. Circle your sample proportion on the dot plot. How does your sample proportion compare with the mean of all the sample proportions?

The mean of class distribution will vary from this example. The class distribution should center at approximately

.

17. Calculate the mean of all of the sample proportions. Locate the mean of the sample proportions in your dot plot; mark this position with an “ ” How does the mean of the sample proportions compare with your sample proportion?

Answers will vary based on the samples generated by students.

Lesson Summary

The sample proportion from a random sample can be used to estimate a population proportion. The sample proportion will not be exactly equal to the population proportion, but values of the sample proportion from random samples tend to cluster around the actual value of the population proportion.

Exit Ticket (4 minutes)

Name _____

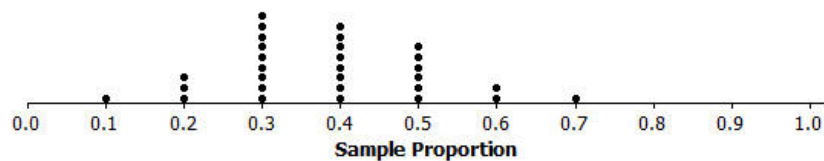
Date _____

Lesson 20: Estimating a Population Proportion

Exit Ticket

Thirty seventh graders each took a random sample of 10 middle school students and asked each student whether or not they like pop music. Then they calculated the proportion of students who like pop music for each sample. The dot plot below shows the distribution of the sample proportions.

Dot Plot of Sample Proportions for $n=10$



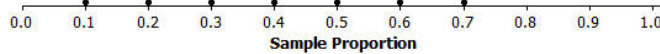
1. There are three dots above 0.2. What does each dot represent in terms of this scenario?

2. Based on the dot plot, do you think the proportion of the middle school students at this school who like pop music is 0.4? Explain why or why not.

Exit Ticket Sample Solutions

Thirty seventh graders each took a random sample of middle school students and asked each student whether or not they like pop music. Then they calculated the proportion of students who like pop music for each sample. The dot plot below shows the distribution of the sample proportions.

Dot Plot of Sample Proportions for $n=10$



1. There are three dots above . What does each dot represent in terms of this scenario?

Each dot represents the survey results from one student. means two students out of said they like pop music.

2. Based on the dot plot, do you think the proportion of the middle school students at this school who like pop music is ? Explain why or why not

No. Based on the dot plot, is not a likely proportion. The dots cluster at to , and only a few dots were located at . An estimate of the proportion of students at this school who like pop music would be within the cluster of to .

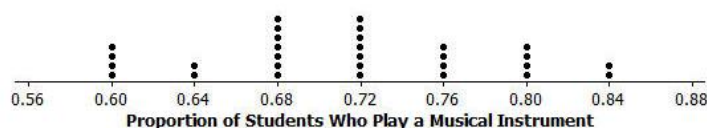
Problem Set Sample Solutions

1. A class of seventh graders wanted to estimate the proportion of middle school students who played a musical instrument. Each seventh grader took a random sample of middle school students and asked each student whether or not they played a musical instrument. Following are the sample proportions the seventh graders found in samples.

a. The first student reported a sample proportion of . What does this value mean in terms of this scenario?

A sample proportion of means out of answered "yes" to the survey.

b. Construct a dot plot of the sample proportions.



- c. Describe the shape of the distribution.

Nearly symmetrical. It centers at approximately .

- d. Describe the variability of the distribution.

The spread of the distribution is from to .

- e. Using the class sample proportions listed above, what is your estimate for the proportion of all middle school students who played a musical instrument? Explain how you made this estimate.

The mean of the sample proportions is .

2. Select another variable or column from the data file that is of interest. Take a random sample of students from the list and record the response to your variable of interest of each of the students.

- a. Based on your random sample what is your estimate for the proportion of all middle school students?

Student answers will vary depending on the column chosen.

- b. If you selected a second random sample of , would you get the same sample proportion for the second random sample that you got for the first random sample? Explain why or why not.

No, it is very unlikely that you would get exactly the same result. This is sampling variability—the value of a sample statistic will vary from one sample to another.



Table of Random Digits

Row

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ID	Travel to School	Favorite Season	Allergies	Favorite School Subject	Favorite Music	Superpower
	Car	Spring	Yes	English	Pop	Freeze time
	Car	Summer	Yes	Music	Pop	Telepathy
	Car	Summer	No	Science	Pop	Fly
	Walk	Fall	No	Computers and technology	Pop	Invisibility
	Car	Summer	No	Art	Country	Telepathy
	Car	Summer	No	Physical education	Rap/Hip hop	Freeze time
	Car	Spring	No	Physical education	Pop	Telepathy
	Car	Winter	No	Art	Other	Fly
	Car	Summer	No	Physical education	Pop	Fly
	Car	Spring	No	Mathematics and statistics	Pop	Telepathy
	Car	Summer	Yes	History	Rap/Hip hop	Invisibility
	Car	Spring	No	Art	Rap/Hip hop	Freeze time
	Bus	Winter	No	Computers and technology	Rap/Hip hop	Fly
	Car	Winter	Yes	Social studies	Rap/Hip hop	Fly
	Car	Summer	No	Art	Pop	Freeze time
	Car	Fall	No	Mathematics and statistics	Pop	Fly
	Bus	Winter	No	Science	Rap/Hip hop	Freeze time
	Car	Spring	Yes	Art	Pop	Telepathy
	Car	Fall	Yes	Science	Pop	Telepathy
	Car	Summer	Yes	Physical education	Rap/Hip hop	Invisibility
	Car	Spring	Yes	Science	Pop	Invisibility
	Car	Winter	Yes	Mathematics and statistics	Country	Invisibility
	Car	Summer	Yes	Art	Pop	Invisibility
	Bus	Winter	Yes	Other	Pop	Telepathy
	Bus	Summer	Yes	Science	Other	Fly
	Car	Summer	No	Science	Pop	Fly
	Car	Summer	Yes	Music	Pop	Telepathy
	Car	Summer	No	Physical education	Country	Super strength
	Car	Fall	Yes	Mathematics and statistics	Country	Telepathy
	Car	Summer	Yes	Physical education	Rap/Hip hop	Telepathy
	Boat	Winter	No	Computers and technology	Gospel	Invisibility
	Car	Spring	No	Physical education	Pop	Fly
	Car	Spring	No	Physical education	Pop	Fly
	Car	Summer	No	Mathematics and statistics	Classical	Fly
	Car	Fall	Yes	Science	Jazz	Telepathy
	Car	Spring	No	Science	Rap/Hip hop	Telepathy
	Car	Summer	No	Music	Country	Telepathy
	Bus	Winter	No	Mathematics and statistics	Pop	Fly
	Car	Spring	No	Art	Classical	Freeze time
	Car	Winter	Yes	Art	Pop	Fly
	Walk	Summer	Yes	Physical education	Rap/Hip hop	Fly
	Bus	Winter	Yes	Physical education	Gospel	Invisibility



	Bus	Summer	No	Art	Other	Invisibility
	Car	Summer	Yes	Computers and technology	Other	Freeze time
	Car	Fall	Yes	Science	Pop	Fly
	Car	Summer	Yes	Music	Rap/Hip hop	Fly
	Car	Spring	No	Science	Rap/Hip hop	Invisibility
	Bus	Spring	No	Music	Pop	Telepathy
	Car	Summer	Yes	Social studies	Techno/ Electronic	Telepathy
	Car	Summer	Yes	Physical education	Pop	Telepathy
	Car	Spring	Yes	Other	Other	Telepathy
	Car	Summer	No	Art	Pop	Fly
	Car	Summer	Yes	Other	Pop	Telepathy
	Car	Summer	Yes	Physical education	Rap/Hip hop	Invisibility
	Bus	Summer	Yes	Physical education	Other	Super strength
	Car	Summer	No	Science	Rap/Hip hop	Invisibility
	Car	Winter	No	Languages	Rap/Hip hop	Super strength
	Car	Fall	Yes	English	Pop	Fly
	Car	Winter	No	Science	Pop	Telepathy
	Car	Summer	No	Art	Pop	Invisibility
	Car	Summer	Yes	Other	Pop	Freeze time
	Bus	Spring	No	Science	Pop	Fly
	Car	Winter	Yes	Mathematics and statistics	Other	Freeze time
	Car	Summer	No	Social studies	Classical	Fly
	Car	Winter	Yes	Science	Pop	Telepathy
	Car	Winter	No	Science	Rock and roll	Fly
	Car	Summer	No	Mathematics and statistics	Rap/Hip hop	Super strength
	Car	Fall	No	Music	Rock and roll	Super strength
	Car	Spring	No	Other	Other	Invisibility
	Car	Summer	Yes	Mathematics and statistics	Rap/Hip hop	Telepathy
	Car	Winter	No	Art	Other	Fly
	Car	Spring	Yes	Mathematics and statistics	Pop	Telepathy
	Car	Winter	Yes	Computers and technology	Techno/ Electronic	Telepathy
	Walk	Winter	No	Physical education	Techno/ Electronic	Fly
	Walk	Summer	No	History	Rock and roll	Fly
	Skateboard /Scooter/Ro llerblade	Winter	Yes	Computers and technology	Techno/ Electronic	Freeze time
	Car	Spring	Yes	Science	Other	Telepathy
	Car	Summer	No	Music	Rap/Hip hop	Invisibility
	Car	Summer	No	Social studies	Pop	Invisibility
	Car	Summer	No	Other	Rap/Hip hop	Telepathy
		Spring	Yes	History	Rap/Hip hop	Invisibility
	Car	Summer	No	Art	Pop	Invisibility

	Walk	Spring	No	Languages	Jazz	Super strength
	Car	Fall	No	History	Jazz	Invisibility
	Car	Summer	No	Physical education	Rap/Hip hop	Freeze time
	Car	Spring	No	Mathematics and statistics	Pop	Freeze time
	Bus	Spring	Yes	Art	Pop	Telepathy
	Car	Winter	No	Mathematics and statistics	Other	Invisibility
	Car	Summer	Yes	Physical education	Country	Telepathy
	Bus	Summer	No	Computers and technology	Other	Fly
	Car	Winter	No	History	Pop	Telepathy
	Walk	Winter	No	Science	Classical	Telepathy
	Bicycle	Summer	No	Physical education	Pop	Invisibility
	Car	Summer	No	English	Pop	Telepathy
	Car	Summer	Yes	Physical education	Pop	Fly
	Car	Winter	No	Science	Other	Freeze time
	Car	Winter	No	Other	Rap/Hip hop	Super strength
	Car	Summer	Yes	Physical education	Rap/Hip hop	Freeze time
	Car	Spring	No	Music	Classical	Telepathy
	Car	Spring	Yes	Science	Gospel	Telepathy
	Car	Summer	Yes	History	Pop	Super strength
	Car	Winter	Yes	English	Country	Freeze time
	Car	Spring	No	Computers and technology	Other	Telepathy
	Car	Winter	No	History	Other	Invisibility
	Car	Fall	No	Music	Pop	Telepathy
	Car	Fall	No	Science	Pop	Telepathy
	Car	Winter	No	Art	Heavy metal	Fly
	Car	Spring	Yes	Science	Rock and roll	Fly
	Car	Fall	Yes	Music	Other	Fly
	Car	Summer	Yes	Social studies	Techno/ Electronic	Telepathy
	Car	Spring	No	Physical education	Pop	Fly
	Car	Summer	No	Physical education	Pop	Fly
	Car	Summer	Yes	Social studies	Pop	Freeze time
	Car	Summer	Yes	Computers and technology	Gospel	Freeze time
	Car	Winter	Yes	Other	Rap/Hip hop	Telepathy
	Car	Summer	Yes	Science	Country	Telepathy
	Car	Fall		Music	Country	Fly
	Walk	Summer	No	History	Pop	Telepathy
	Car	Spring	Yes	Art	Pop	Freeze time
	Car	Fall	Yes	Physical education	Rap/Hip hop	Fly
	Car	Spring	No	Music	Rock and roll	Telepathy
	Car	Fall	No	Art	Pop	Invisibility
	Car	Summer	Yes	Physical education	Rap/Hip hop	Fly
		Summer	No	Computers and technology	Pop	Telepathy
	Car	Fall	No	Art	Pop	Fly

	Bicycle	Spring	No	Science	Pop	Invisibility
	Car	Summer	No	Social studies	Gospel	Fly
	Bicycle	Winter	No	Social studies	Rap/Hip hop	Fly
	Car	Summer	Yes	Mathematics and statistics	Pop	Invisibility
	Car	Fall	Yes	Mathematics and statistics	Country	Telepathy
	Car	Winter	Yes	Music	Gospel	Super strength
	Rail (Train/Tram /Subway)	Fall	Yes	Art	Other	Fly
	Walk	Summer	No	Social studies	Pop	Invisibility
	Car	Summer	Yes	Music	Pop	Freeze time
	Car	Winter	No	Mathematics and statistics	Pop	Telepathy
	Car	Fall	Yes	Music	Pop	Telepathy
	Car	Summer	Yes	Computers and technology	Other	Freeze time
	Car	Summer	Yes	Physical education	Pop	Telepathy
	Car	Summer	Yes	Social studies	Other	Telepathy
	Car	Spring	Yes	Physical education	Other	Freeze time
	Car	Fall	Yes	Science	Country	Telepathy
	Car	Spring	Yes	Science	Pop	Invisibility
	Car	Summer	No	Other	Rap/Hip hop	Freeze time
	Car	Summer	No	Other	Other	Fly
	Car	Summer	No	Languages	Pop	Freeze time
	Car	Summer	Yes	Physical education	Pop	Telepathy
	Bus	Winter	No	History	Country	Invisibility
	Car	Spring	No	Computers and technology	Other	Telepathy
	Bus	Winter	Yes	Science	Pop	Invisibility
	Car	Summer	No	Social studies	Rap/Hip hop	Invisibility
	Car	Summer	No	Physical education	Pop	Invisibility
	Car	Summer	Yes	Physical education	Pop	Super strength
	Car	Summer	No	Mathematics and statistics	Pop	Fly
	Car	Summer	No	Art	Rap/Hip hop	Freeze time
	Car	Winter	Yes	Other	Classical	Freeze time
	Car	Summer	Yes	Computers and technology	Other	Telepathy
	Car	Spring	No	Other	Pop	Freeze time
	Car	Winter	Yes	Music	Country	Fly
	Car	Winter	No	History	Jazz	Invisibility
	Car	Spring	Yes	History	Pop	Fly
	Car	Winter	Yes	Mathematics and statistics	Other	Telepathy
	Car	Fall	No	Science	Country	Invisibility
	Car	Winter	No	Science	Other	Fly
	Car	Summer	No	Science	Pop	Fly
	Skateboard /Scooter/ Rollerblade	Spring	Yes	Social studies	Other	Freeze time
	Car	Winter	Yes	Art	Rap/Hip hop	Fly



	Car	Summer	Yes	Other	Pop	Freeze time
	Car	Summer	No	English	Pop	Telepathy
	Car	Summer	No	Other	Pop	Invisibility
	Car	Summer	Yes	Physical education	Techno/ Electronic	Freeze time
	Car	Summer	No	Art	Pop	Telepathy
	Car	Summer	No	Physical education	Rap/Hip hop	Freeze time
	Car	Winter	Yes	Mathematics and statistics	Other	Invisibility
	Bus	Summer	Yes	Music	Pop	Freeze time
	Car	Winter	No	Art	Pop	Fly
	Car	Fall	No	Science	Rap/Hip hop	Fly
	Car	Winter	Yes	Social studies	Pop	Telepathy
	Car	Fall	No	Art	Other	Fly
	Bus	Spring	No	Physical education	Country	Fly
	Car	Winter	No	Music	Other	Telepathy
	Bus	Summer	No	Computers and technology	Rap/Hip hop	Freeze time
	Car	Summer	Yes	Physical education	Rap/Hip hop	Invisibility
	Car	Summer	Yes	Music	Other	Telepathy
	Car	Spring	No	Science	Rap/Hip hop	Invisibility
	Rail (Train/Tram /Subway)	Summer	No	Physical education	Other	Freeze time
	Car	Summer	Yes	Mathematics and statistics	Rap/Hip hop	Fly
	Bus	Winter	Yes	Mathematics and statistics	Other	Super strength
	Car	Summer	No	Mathematics and statistics	Other	Freeze time
	Rail (Train/Tram /Subway)	Fall	Yes	Music	Jazz	Fly
	Car	Summer	Yes	Science	Pop	Super strength
	Car	Summer	Yes	Science	Techno/ Electronic	Freeze time
	Car	Spring	Yes	Physical education	Rap/Hip hop	Freeze time
	Car	Summer	Yes	Physical education	Rap/Hip hop	Freeze time
	Car	Winter	No	Physical education	Rap/Hip hop	Telepathy
	Car	Winter	No	Music	Jazz	Freeze time
	Walk	Summer	Yes	History	Country	Freeze time
	Car	Spring	No	History	Rap/Hip hop	Freeze time
	Car	Fall	Yes	Other	Pop	Freeze time
	Car	Spring	Yes	Science	Other	Freeze time
	Bicycle	Winter	Yes	Other	Rap/Hip hop	Freeze time