Will You Have a Seat?
ID: 12650

Time required
45 minutes

Activity Overview

This activity allows students to use a simulation to understand why airline companies routinely overbook flights.

Topic: Simulations

- *Understand and apply basic concepts of probability*

- *Use proportionality and a basic understanding of probability to make and test conjectures about the results of experiments and simulations*

Teacher Preparation and Notes

- *TI-Navigator is not required for this activity, but an extension is given for those teachers that would like to use it.*

- ***To download the student worksheet, go to education.ti.com/exchange and enter "12650" in the quick search box.***

Associated Materials

- *MGAct31_Seats_worksheet_TI73.doc*

Suggested Related Activities

To download the activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *Empty Seats (TI-73 Explorer & TI-Navigator) ⎯ 6699*

- *You're Probably Right, It's Wrong (TI-73 Explorer) ⎯ 4562*

- *Tack Toss (TI-73 Explorer & TI-Navigator) ⎯ 11499*

Problem 1 – Empty or Full Seat

Discuss with students how airlines routinely overbook flights to help ensure that the flight is full. There is a typical "no show" factor for flights. In this situation, you will work with a flight that holds 25 people and historically 20% of the people do not show for the flight.

Questions 1-3

To begin, each student should store a different number to the random seed. This can be the last four digits of their home phone number, a portion of their student ID number, or another unique number. To do this, enter the number on the home screen, then press [STO▸] [MATH] [▸] [▸] [ENTER] [ENTER].

```
3158→rand      3158
```

Next, students will enter the function shown at the right and store the generated list to L1. To enter the function, press the following. [2nd] [LIST] [▸] [▸] [2] (to find **randInt**) [1] [,] [1] [0] [,] [2] [5] [)] [STO▸] [2nd] [LIST] [1] [ENTER].

```
randInt(1,10,25)
→L1
{1 4 4 3 2 3 8 …
```

Questions 4-6

After this first list is generated, have students look at the list to get a sense for how many people did not show. In this case, since 20% of people historically have not shown, let the numbers 1 and 2 represent someone that purchased a ticket and did not show up for the flight. Since each student entered a unique seed for the random number generator, most lists should be different.

Now students will sort the list so 1 is at the top. Use the **sortA(** command under [2nd] [LIST] OPS to sort the list. This will make it easier to identify the people that did not show for the flight. (1s and 2s).

Questions 7-10

In the next set of questions, students should start gathering more data from the class results. Through this additional data, they should see that few, if any, flights were actually full if only 25 tickets were sold.

This will lead them to the next problem, determining how many tickets they should sell to help ensure the flight is full.

Problem 2 – Oversold Seats

<u>Questions 11-13</u>

In this set of problems, students will modify the original random number function to increase the number of "tickets" sold. Students will then look through the list (in order) and count the number of tickets that were sold before the flight is full.

In this case, students should NOT sort the list but use it in its original order.

```
randInt(1,10,50)
→L₁
{6 3 1 5 3 10 6…
```

<u>Questions 14-15</u>

The last two questions allow students to draw conclusions and wrap up the ideas presented in the lesson. If desired, you can have students repeat the simulation for the 30% scenario. In that case, students would consider the numbers 1, 2, and 3 as a no-show for the flight.

Solutions – student worksheet

Problem 1

1. Students will set up the random number generator.

2. Lists will vary based on the random number seed entered in Question 1.

3. The function generates 25 random numbers between 1 and 10.

4. Lists will vary based on the random number seed entered in Question 1.

5. This list is the list from Question 4 in increasing order.

6-7. Answers will vary.

8. Answers will vary but most flights should not have been full.

9. Answers will vary.

10. Answers will vary. Students' explanation should be supported by information gathered in the activity.

Problem 2

11-12. Answers will vary.

13. Answers will vary but the number should be similar among students.

14. Answers will vary based on data gathered by students. Answers should be close to 30 seats.

15. Answers will vary based on data gathered by students but should be close to 35.

Extension – TI-Navigator^{TM}

1. After Question 6, use **Quick Poll** to see how many people did not show up for the flight.

2. After Question 10, use **Quick Poll** to gather the classes' guesses of how many seats need to be sold. This will allow students to see what other students think before moving on to Problem 2.

3. For each flight in Questions 11 and 12, use **Quick Poll** to gather each student's number of tickets sold to have a full flight. The bar graph that appears will let students see what the classes' results are. They will easily see that the airline needs to sell several more tickets than seats to ensure the flight is full.