Miss Amico's Birthday Bash

My friend Mrs. McKegney and I are having a disagreement and need your help! On December 6th I will be celebrating my 30th birthday! Since this is such a big day, I want to celebrate in a big way by having a gigantic birthday bash. I am thinking about having a huge sledding party, but Mrs. McKegney is having doubts about the weather. She thinks there will not be enough snow to have a sledding party and that I should plan something different.

To begin to solve this disagreement, I contacted the Northeast Regional Climate Center and asked them to send me information about past weather conditions on the date of my birthday. On the next page is the information they sent. Using that information, determine how much snow you think there will be on my birthday. Be sure to support your solution mathematically.

Write me a letter (including a mathematical representation) explaining your conclusion and how you arrived at it.

Grade Levels 3 - 5

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Context

When creating this task, we decided to invent a task, which would directly measure students' knowledge of probability and statistics. We considered when in "real life" most students would come in contact with statistics and probability and weather seemed like the most prominent occurrence. It is also a unit many students study as part of a science or social studies curriculum. Students often hear that there will be a 50% chance of snow, but do not know how this information is procured. This task provides students with the opportunity to be real-life meteorologists!

As mentioned in the task, I contacted my local weather service to obtain information about past weather conditions on my birthday (December 6). I chose this date because it was something coming up soon that students could look forward to. You can request information on any date, whether it is a birthday, holiday or other special event.

This information can be obtained by calling your local weather service. The information can be sent to you and will arrive in three to five working days. When you get the information, the weather service also provides the statistical summaries, which should be deleted before giving it to students. It does provide you, however, with a handy "answer key"!

What This Task Accomplishes

This task was given to students as a pre-assessment activity prior to a unit on probability and statistics. This enabled us to get an idea of students' command of knowledge and skill in these content areas. It was obvious from the results that few students had a solid understanding of the mathematics needed to thoroughly solve this task. However, this information provided us

with assistance in deciding what content, concepts and skills need to be taught in this upcoming unit.

What the Student Will Do

Students with only a basic understanding of the task will create some type of tally (enough snow, not enough snow) and determine which is more. Other students may create line plots, average information or analyze the data in a more complex manner to come up with an actual prediction of the number of inches of snow. Students with a solid understanding of probability will give the theoretical probabilities of the different amounts of snowfalls and base their predictions on this information. Those students might also comment about how this is only theoretical and how we need to wait until December 6th to be certain.

Time Required for Task

Two, 45-minute class periods

Interdisciplinary Links

This task obviously lends itself well to a unit on weather. It could also be introduced during units on careers, newspapers or while planning for an upcoming activity such as a winter carnival or sporting event.

Teaching Tips

When the statistics were sent, they also included information on temperature and rainfall. We choose to delete this in order to keep the students focused. Also, the information was provided in decimal amounts, so we provided information to students in decimals and in whole numbers, allowing them to make the choice of which format they would feel most comfortable using. We also adapted the task for our students with special needs in the following manner:

On December 6th Miss Amico will be celebrating her birthday! She wants to have a sledding party, but is not sure there will be enough snow. Using the snowfall information, decide if you think there will be enough snow for a sledding party on Miss. Amico's birthday.

Along with this version of the task, students were given only 10 years worth of information as whole numbers and in larger print.

Suggested Materials

- Database of snowfall amounts
- Northeast Regional Climate Center datasheet (see page 5)
- Rulers (Some students used rulers to determine how much snow was enough to sled on.)
- Calculators
- Graph paper
- Special stationary (to motivate students to write up solutions)

Possible Solutions

For December 6th, the mean/average amount of snow on the ground is 2.5 inches, the median amount of snow on the ground is 1 inch and the mode amount of snow on the ground is 0 inches.

The probability of there being three inches of snow or more on the ground is 42%

Students then need to decide and justify which central measure of tendency would provide the most accurate prediction. Some students also included "snowfall that day" in their predictions which is okay, but they should take into consideration that it might not snow until just before midnight - not leaving a lot of time for sledding. However, there is no "right" answer. We are all waiting until December 6th to see whose prediction was the closest!

Benchmark Descriptors

Novice
This student had no concept of finding a measure of central tendency, nor frequency of snowfall. The student merely adds the snowfall from the years given and makes no mathematical argument except to say that it only snowed 41 inches in 40 years. The student had poor and incomplete reasoning, used little or no math language and makes no attempt to create a mathematical representation. It is unclear what the student was thinking and on what basis a mathematical conclusion was made.

Apprentice
This student has a strategy that would work, but fails to summarize his/her results. The student did not explain his/her reasoning and has only a basic understanding of the task. The student does not make a prediction of the amount of snow, just states his/her conclusion about whether or not there would be enough snow on which to sled. The student creates a tally for record keeping, but uses no math language to communicate.

Practitioner
This student uses a measure of central tendency (mean/average) to obtain a prediction of the amount of snow on December 6th. The student uses a variety of terms, symbols and notation to communicate. The student creates an accurate and appropriate mathematical representation and clearly explains his/her process and reasoning. This student, however, does not equate the task with the mathematics of probability.

Expert
The student uses his/her knowledge of probability to determine whether or not there will be enough snow ("You would at most have a 50 - 50 chance."). The student uses a variety of terms and symbols to communicate his/her thinking. S/he creates a chart which shows the years s/he considers there to be enough snow and s/he makes a reasonable conclusion based on his/her mathematical results.

Climate Data for the Burlington Area December 6, 1955-1994

Year	Snowfall that day (inches)	Depth of snow on the ground that day from previous snowfalls (inches)
1955	Trace	1
1956	0	2
1957	0.00	0
1958	Trace	5
1959	0.00	0
1960	0.00	0
1961	Trace	0
1962	0.00	0
1963	0.00	3
1964	2.80	8
1965	1.20	1
1966	0.30	3
1967	0.00	Trace
1968	0.20	Trace
1969	0.00	6
1970	2.90	8
1971	1.90	11
1972	0.00	3
1973	Trace	0
1974	0.00	0
1975	0.70	3
1976	Trace	8
1977	4.10	Trace
1978	0.00	0
1979	0.00	Trace
1980	0.00	1
1981	9.00	0
1982	0.00	2
1983	0.00	2
1984	13.40	8
1985	1.00	Trace
1986	0.90	0
1987	0.10	1
1988	Trace	0
1989	0.60	3
1990	Trace	0
1991	1.80	4
1992	Trace	1
1993	Trace	0
1994	0.00	0

Note: A trace of precipitation is less than .01 inches