

6.SP Buttons: Statistical Questions

Task

Zeke likes to collect buttons and he keeps them in a jar. Zeke can empty the buttons out of the jar, so he can see all of his buttons at once.



a. Which of the following are statistical questions that someone could ask Zeke about his buttons? (A statistical question is one that anticipates an answer based on data that vary.) For each question, explain why it is or is not a statistical question.

- i. What is a typical number of holes for the buttons in the jar?
 - ii. How many buttons are in the jar?
 - iii. How large is the largest button in the jar?
 - iv. If Zeke grabbed a handful of buttons, what are the chances that all of the buttons in his hand are round?
 - v. What is a typical size for the buttons in the jar?
 - vi. How are these buttons distributed according to color?
- b. Write another statistical question related to Zeke's button collection.

IM Commentary

A *statistical question* is a question that can be answered by collecting data and where there will be variability in the data. This is different from a question that anticipates a deterministic answer. For example, "How many minutes do 6th grade students typically spend on homework each week?" is a statistical question. We expect that not all 6th grade students spend the same amount of time on homework, and the time spent on homework may also vary from week to week. On the other hand, this is not a statistical question: "How much time did Juana spend studying last night?" This question is based on a single number and has a deterministic answer.

The question "How many buttons are in the jar?" is answered by counting the buttons. This produces a single value--it is not answered by collecting data that vary.

The question "What is a typical number of holes for the buttons in the jar?" is a statistical question. To answer this question, students might compute the mean or the median (both measures of center that are used to describe a typical value). But in either case they would need to collect data on the number of holes by recording a value for each button. Because not all buttons have the same number of holes, there would be variability in the data that would be used to answer this question. That is what makes this a statistical question.

The question "If Zeke grabbed a handful of buttons, what are the chances that all of the buttons in his hand are round?" is a statistical question because this is asking for a probability that would be estimated by having Zeke grab many handfuls of buttons. For

each handful grabbed, whether or not all of the buttons were round would be recorded. This would result in categorical data (with values of "all round" and "not all round"), but again there would be variability in this data. This data could then be used to estimate the probability of interest to provide an answer to the question posed.

Statistics is the study of variability. Students who understand statistics need to be able to identify and pose questions that can be answered by data that vary. The purpose of this task is to provide questions related to a particular context (a jar of buttons) so that students can identify which are statistical questions. The task also provides students with an opportunity to write a statistical question that pertains to the context.

Solution

- a. i. Statistical question
- ii. Not a statistical question
- iii. Statistical question
- iv. Statistical question
- v. Statistical question
- vi. Statistical question

Each of the statistical questions would be answered by collecting data and there would be variability in the data.

Questions identified as not statistical questions are not answered based on data that vary.

The question "What is a typical number of holes for the buttons in the jar?" is a statistical question. To answer this question, students might compute the mean or the median (both measures of center that are used to describe a typical value). But in either case they would need to collect data on the number of holes by recording a value for each button. Because not all buttons have the same number of holes, there would be variability in the data that would be used to answer this question. That is what makes this a statistical question.

The question "How many buttons are in the jar?" is answered by counting the buttons.

This produces a single value--it is not answered by collecting data that vary. It is not a statistical question.

The question "How large is the largest button in the jar?" is a statistical question. The size of the largest button is a population characteristic and this question would be answered by collecting data on the sizes of all the buttons in the population. In this way, the question would be answered in a way that takes variability in the population into consideration.

The question "If Zeke grabbed a handful of buttons, what are the chances that all of the buttons in his hand are round?" is a statistical question because this is asking for a probability that would be estimated by having Zeke grab many handfuls of buttons. For each handful grabbed, whether or not all of the buttons were round would be recorded. This would result in categorical data (with values of "all round" and "not all round"), but again there would be variability in this data. These data could then be used to estimate the probability of interest to provide an answer to the question posed.

Like the first question, the last two questions (v and vi) are statistical questions because they would be answered by collecting data that vary. To answer the question about the typical number of holes, data on number of holes would be collected for each button in the jar. The question about how the buttons are distributed according to color would be answered by recording the color of each button in the jar and then summarizing these data in a table or a graph.

b. Some possible statistical questions are:

- What is a typical shape for buttons in the jar?
- What is the distribution of the diameters of the round buttons in this jar?



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