# Open Ended Task: Valentine Marbles

Task adopted from www.illustrativemathmatics.org aligned with standard 7.SP.2

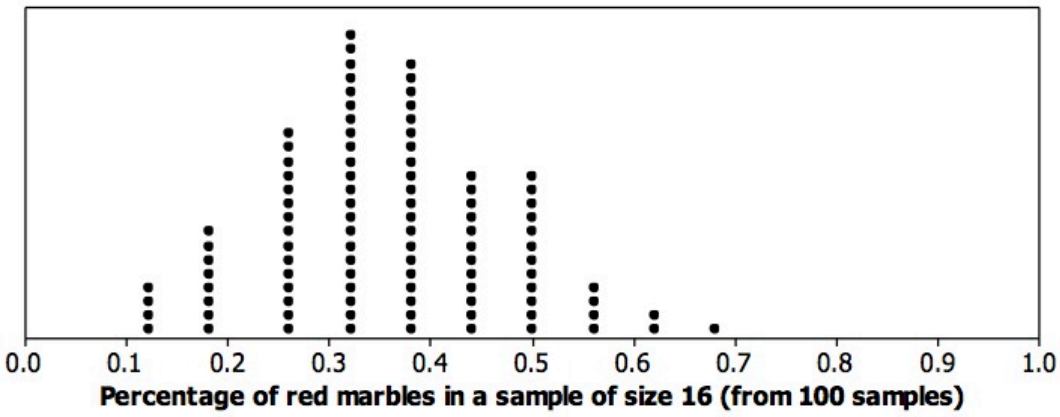
Written task aligned with SV: Loop 1

A hotel holds a Valentine's Day contest where guests are invited to estimate the percentage of red marbles in a huge opaque jar containing both red marbles and white marbles. There are 11,000 total marbles in the jar: 4,125 are red, 6,875 are white. The actual percentage of red marbles in the entire jar is 37.5%, but only some of the hotel staff know this fact.

Any guest who makes an estimate that is within 9 percentage points of the true percentage of red marbles in the jar wins a prize, so any estimate from 28.5% to 46.5% will be considered a winner. To help with the estimating, a guest is allowed to take a random sample of 16 marbles from the jar in order to come up with an estimate. (Note: when this occurs, the marbles are returned to the jar after counting.)

One of the hotel employees who does not know that the true percentage of red marbles in the jar is 37.5% is asked to record the results of the first 100 random samples. A table and dot plot of the results appears below.

| Percentage of red marbles in the sample of size 16 | Number of times the percentage was obtained |
|---|---|
| 12.50% | 4 |
| 18.75% | 8 |
| 25.00% | 15 |
| 31.25% | 22 |
| 37.50% | 20 |
| 43.75% | 12 |
| 50.00% | 12 |
| 56.25% | 4 |
| 62.50% | 2 |
| 68.75% | 1 |
| **Total:** | 100 |




1. Assuming that each of the 100 guests who took a random sample used their random sample's red marble percentage to estimate the whole jar's red marble percentage. Based on the table above, circle the winners on the dotplot.

   How many of these guests would be "winners"? Explain your answer.

2. How many of the 100 guests obtained a sample that was *more than* half red marbles? Explain your answer.

3. Explain what this table and dot plot represents. In your own words, what does the table and dot plot above illustrate? How do the table and the dot plot illustrate the sample-to-sample variation of the proportion of red marbles picked?

4. Should we be concerned that not all of the samples had a red marble percentage of exactly 37.5% (the true red marble percentage for the whole jar)? Explain your answer.

5. Recall that the hotel employee who made the table and dot plot above didn't know that the real percentage of red marbles in the entire jar was 37.5%. If another person thought that half of the marbles in the jar were red, explain briefly how the hotel employee could use the dot plot and table results to challenge this person's claim. Specifically, what aspects of the table and dot plot would encourage the employee to challenge the claim?