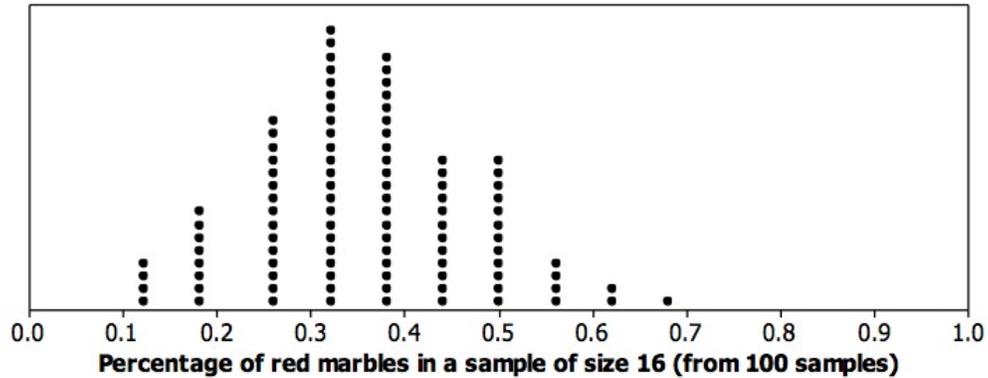


A hotel holds a Valentine's Day contest where guests are invited to estimate the percentage of red marbles in a huge clear jar containing both red marbles and white marbles. There are 11,000 total marbles in the jar: 3696 are red, 7304 are white. The actual percentage of red marbles in the entire jar ($33.6\% = \frac{3696}{11000}$) is known to some members of the hotel staff.

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 24.6% to 42.6% 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 then 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 33.6% is asked to record the results of the first 100 random samples. A table and dotplot 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



For example, 15 of the random samples had exactly 25.00% red marbles; only 2 of the random samples had exactly 62.50% red marbles, and so on.

- 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, how many of these guests would be "winners"?
- How many of the 100 guests obtained a sample that was *more than* half red marbles?
- Should we be concerned that none of the samples had a red marble percentage of exactly 33.6% even though that value is the true red marble percentage for the whole jar? Explain briefly why a guest can't obtain a sample red marble percentage of 33.6% for a random sample of size 16.
- Recall that the hotel employee who made the table and dotplot above didn't know that the real percentage of red marbles in the entire jar was 33.6%. If another person thought that half of the marbles in the jar were red, explain briefly how the hotel employee could use the dotplot and table results to challenge this person's claim. Specifically, what aspects of the table and dotplot would encourage the employee to challenge the claim?
- Design a simulation that takes a large number of samples of size 16 from a population in which 65% of the members of the population have a particular characteristic. For each sample of size 16, compute the percentage of red items in the sample. Record these percentages, and then summarize all of your sample percentages using a table and dotplot similar to those shown above. In what ways is your dotplot similar to the dotplot used in this task? In what ways does it differ?