



PROJECT-SET

Statistics Education for Teachers

Open-Ended Task: Mira Beach #2

Grading Rubric with Answers

Task adopted from www.illustrativemathematics.org aligned with standard S-IC

Written task aligned with SV: Loop 3

Grade each question below using the following three grades: Essentially Correct (E), Partially Correct (P), and Incorrect (I).

Example answers for each category are given below each question.

Once each of the questions is graded in this manner, the results will then be tallied to give an overall score for the task. For each E, a person will receive 1 point. For each P, a person will receive $\frac{1}{2}$ point. For each I, a person will receive 0 points. The overall grade will be one of the following:

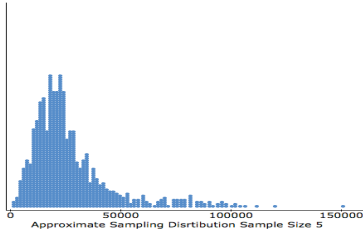
- 3 Complete Response (EEE)**
- 2/2.5 Substantial Response (EEP, EPP, EEL)**
- 1/1.5 Developing Response (EPI, PPP, EII or PPI)**
- 0/.5 Minimal Response (PII or III)**

When grading, write the amount of points earned, the word to describe the points earned (complete, substantial, developing, or minimal) on the front page of each person's paper with a note that states "Final."

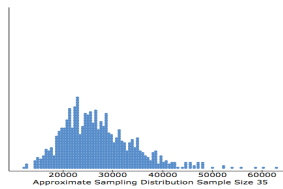
Mira Beach Continued

Recall that the Town Census collects data about all 1400 people who live in the town of Mira Beach, Florida. The data about this population include age, gender, race, marital status, school attendance, public or private school, and income.

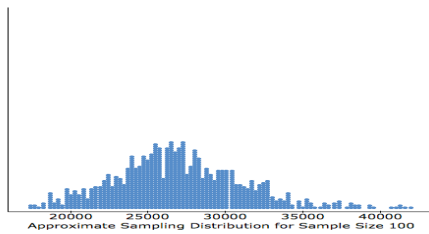
- 1 a. From this population, take 1000 random samples, each of 10 people. For each sample compute the mean income of the 5 people. Construct an approximation to the sampling distribution for the average income in the town.



- b. From this population, take 1000 random samples, each of 35 people. For each sample compute the mean income of the 25 people. Construct an approximation to the sampling distribution for the average income in the town.



- c. From this population, take 1000 random samples, each of 100 people. For each sample compute the mean income of the 100 people. Construct an approximation to the sampling distribution for the average income in the town.



Grading Category	Solutions, Explanations, and Sample Answers
Essentially Correct (E)	An essentially correct answer presents a correct graphical display such as a dot plot for each of the three distributions.
Partially Correct (P)	A partially correct answer presents a correct graphical display for two of the distributions OR three graphical displays that do not show the values or don't show their frequencies.
Incorrect (I)	An incorrect answer fails to meet the criteria of E and P.

2. Compute the mean and standard deviation for the distributions in 1a, b, and c.

Theoretical answers based on the distributions found in 1 are:

Column	Mean	Std. dev.
Sample Means Sample Size 5	27878.099	18987.68
Sample Mean Sample Size 35	27204.837	7157.7384
Sample Mean Sample Size 100	27071.337	4151.0175

Grading Category	Solutions, Explanations, and Sample Answers
Essentially Correct (E)	Answers will vary for this questions depending on the samples selected in 1. An essentially correct answer provides the correct mean and correct standard deviation for each of the three distributions in 1.
Partially Correct (P)	A partially correct answer provides some of the correct means and correct standard deviations but not all.
Incorrect (I)	An incorrect answer fails to meet the criteria of E and P.

3. Compare the three distributions that you constructed.
- What can you say about the shape of the distribution as the sample size, n , increases?
 - What can you say about the mean?
 - What can you say about the standard deviation?

Shape: For samples of size 5, the distribution is strongly skewed to the right, like the population. The distribution for samples of size 15 is still skewed right, but less so. With sample sizes of 30, the distribution has become almost mound shaped. Summarizing, as the sample size increases, the distribution of the sample mean becomes less skewed right and more mound-shaped.

Mean: The means of the three distributions are approximately the same, roughly equal to the population mean of 27,394.

Standard Deviation: As the sample size increases, the distribution of the sample mean is less spread out. That is, the standard deviation decreases as the sample size increases.

Grading Category	Solutions, Explanations, and Sample Answers
Essentially Correct (E)	An essentially correct answer references the distributions drawn in question 1 noting that as the sample size increases the sampling

	distribution starts looking more and more normal, that each distribution has a mean close to the population mean, and that the standard deviation decreases as the sample size increases.
Partially Correct (P)	A partially correct answer would either make the three correct statements about what happens to the approximate sampling distribution as the sample size increases but not reference those found in question 1 OR it may correctly describe what is happening to the shape or mean or standard deviation but not all three.
Incorrect (I)	An incorrect answer fails to meet the criteria of E and P.

4. Can the shape of the sampling distribution be predicted?

Yes, the shape of the sampling distribution will be normal for large samples.