

1998 AP STATISTICS

Section II

Part A

Questions 1-5

Spend about 65 minutes on this part of the exam.

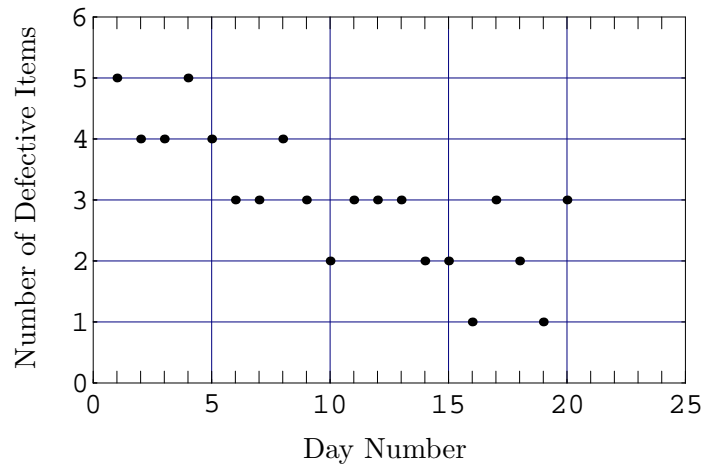
Percent of Section II grade—75

To obtain full credit for a free-response question, you must analyze the situation completely and communicate your analyses and results clearly. Your answers should show enough work so that your reasoning process can be tracked through the analysis. It is also important to do this if you expect to earn partial credit when warranted.

1. Consider the sampling distribution of a sample mean obtained by random sampling from an infinite population. This population has a distribution that is highly skewed toward the larger values.
    - (a) How is the mean of the sampling distribution related to the mean of the population?
    - (b) How is the standard deviation of the sampling distribution related to the standard deviation of the population?
    - (c) How is the shape of the sampling distribution affected by the sample size?
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2. A plot of the number of defective items produced during 20 consecutive days at a factory is shown below.



- (a) Draw a histogram that shows the frequencies of the number of defective items.  
(b) Give one fact that is obvious from the histogram but is not obvious from the scatterplot.  
(c) Give one fact that is obvious from the scatterplot but is not obvious from the histogram.
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**Free-Response Scoring Guidelines: Question 1****4 Complete Response**

Standard symbols are acceptable without explanation, but non-standard symbols must be defined. The question asks for exact results, but a student can receive full credit for CAREFULLY explaining what might happen in a simulation.

- (a) The mean of the sampling distribution is equal to the mean of the population.
- (b) The standard deviation of the sampling distribution is equal to the standard deviation of the population divided by the square root of the sample size.

OR

Clearly states that the standard deviation of the sampling distribution decreases as  $n$  increases.

- (c) The equivalent of the following two statements must be included:
  - 1. The sampling distribution is skewed for small sample sizes. (A statement that does not use the term skewed but says the distribution will be non-normal is OK.)
  - 2. The shape of the sampling distribution gets more and more normal-like (bell shaped) as the sample size increases.

**3 Substantial Response**

States both (a) and (b) correctly; has a weak, but correct, response on part (c). A weak response for (c) would include correctly one of the two statements in (c) above, but not both.

OR

States either (a) or (b) correctly and gives a complete and correct response to (c).

**2 Developing Response**

States both of (a) and (b) correctly but gives an incorrect response to (c).

OR

Gives a correct response to either (a) or (b), but gives a weak response to (c).

OR

Gives an incorrect response to both (a) and (b), but gives a complete and correct response to (c).

**1 Minimal Response**

States one of (a) or (b) correctly.

OR

Has substantive errors in (a) and (b), but gives a weak response to (c).

**Notes:**

Some students appear to have confused the *sampling distribution* with the histogram for a particular sample. There were a number of papers that had responses containing “the sample mean is close to” or “gets close to the population mean as  $n$  increases,” or other rewordings of the law of large numbers. These statements, while true, do not answer the questions posed. These incorrectly worded responses may surround the correct formula in parts (a) and (b). If the written response is irrelevant but does not contradict the formula, credit can be awarded; if the written response directly contradicts the formula, credit should not be given.