

AP[®] STATISTICS
1999 SCORING GUIDELINES

Question 1

Solution:

- Yes. Test for slope indicates that the linear model is useful (H_0 : BETA is equal to 0, H_a : BETA is not equal to 0, $t = 54.11$, p -value = .000) and the residual plot shows no pattern, indicating a linear model is appropriate.
- Slope = 233.517 aircraft/year
On average, the number of commercial aircraft flying in the U.S. increased by approximately 233.517 each year. (OK if rounded to 234 in interpretation)
- Intercept = 2939.93 aircraft
Predicted number of commercial aircraft that were flying in 1990 (since $x = 0$ corresponds to year 1990) was 2939.93. (OK if rounded to 2940 in interpretation)
- For 1992, $x = 2$, so predicted number of commercial aircraft flying is $2939.93 + 233.517(2) = 3406.964$ aircraft
- From the residual plot, the residual for 1992 is +40, so actual - predicted = 40 and Actual = $3406.964 + 40 = 3446.964$ aircraft
Since actual number flying must be an integer, actual must have been 3447.

Notes:

- Part (a) can be considered essentially correct even if it fails to mention the t test, as long as it discusses the residual plot.
- Parts (b) and (c) should draw the distinction between the model and the data. They can be considered essentially correct if the student incorporates the idea of estimation using words such as on average, predicted, approximately, about, etc.
- Parts (b) and (c) can be considered partially correct if the student (1) incorrectly identifies the values for the slope and intercept but gives an essentially correct interpretation OR (2) correctly identifies the values for the slope and intercept but gives an incomplete interpretation or an interpretation not in context for one or both.
- Parts (d) and (e) can be considered essentially correct if incorrect numbers from previous parts are correctly substituted.
- Part (e) can be considered essentially correct even if it fails to round to an integer.

AP[®] STATISTICS
1999 SCORING GUIDELINES

Question 1 (cont.)

Points:

4 Complete Response

Gives an essentially correct response to all 5 parts.

3 Substantial Response

Essentially correct on 4 of the 5 parts.

OR

Essentially correct responses on a, d, and e

AND

partially correct responses on both b and c.

2 Developing Response

Essentially correct on 3 of the 5 parts.

OR

Partially correct responses on both b and c

AND

essentially correct responses on 2 of the remaining parts

1 Minimal Response

Essentially correct on 1 or 2 of the 5 parts.

OR

Partially correct responses on both b and c