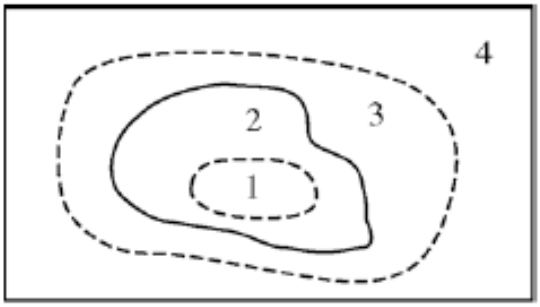
"FRAPPY"
{Free Response AP Problem...Yay!}

The following problem is taken from an actual Advanced Placement Statistics Examination. Your task is to generate a complete, concise statistical response in 15 minutes. You will be graded based on the AP rubric and will earn a score of 0-4. After grading, keep this problem in your binder for your AP Exam preparation.

A study was conducted to determine where moose are found in a region containing a large burned area. A map of the study area was partitioned into the following four habitat types.

(1) Inside the burned area, not near the edge of the burned area,
(2) Inside the burned area, near the edge,
(3) Outside the burned area, near the edge, and
(4) Outside the burned area, not near the edge.

The figure below shows these four habitat types.



Note: Figure not drawn to scale.

The proportion of total acreage in each of the habitat types was determined for the study area. Using an aerial survey, moose locations were observed and classified into one of the four habitat types. The results are given in the table below.

Habitat Type	Proportion of Total Acreage	Number of Moose Observed
1	0.340	25
2	0.101	22
3	0.104	30
4	0.455	40
Total	1.000	117

Scoring:

(a) The researchers who are conducting the study expect the number of moose observed in a habitat type to be proportional to the amount of acreage of that type of habitat. Are the data consistent with this expectation? Conduct an appropriate statistical test to support your conclusion. Assume the conditions for inference are met.

E I

E I

E I

(b) Relative to the proportion of total acreage, which habitat types did the moose seem to prefer? Explain.

E P I

Total:__/4

"FRAPPY"
{Free Response AP Problem...Yay!}

The following problem is taken from an actual Advanced Placement Statistics Examination. Your task is to generate a complete, concise statistical response in 25 minutes. You will be graded based on the AP rubric and will earn a score of 0-4. After grading, keep this problem in your binder for your AP Exam preparation.

Administrators in a large school district wanted to determine whether students who attended a new magnet school for one year achieved greater improvement in science test performance than students who did not attend the magnet school. Knowing that more parents would want to enroll their children in the magnet school than there was space available for those children, the district administrators decided to conduct a lottery of all families who expressed interest in participating. In their data analysis, the administrators would then compare the change in test scores of those children who were selected to attend the magnet school with the change in test scores of those who applied to attend the magnet school but who were not selected.

The tables below show the scores on the same science pretest and the same science posttest for 20 students. Of the 20 students, 8 were randomly selected from the magnet school and 12 were randomly selected from those who applied to attend the magnet school but who were not selected and then attended their original school.

Magnet School		
Pretest Score	Posttest Score	Posttest – Pretest
80	97	17
78	98	20
86	84	– 2
78	79	1
64	89	25
71	77	6
71	83	12
73	88	15
$\bar{x}$ = 75.125	$\bar{x}$ = 86.875	$\bar{x}$ = 11.750
s = 6.770	s = 7.699	s = 9.407

Original School		
Pretest Score	Posttest Score	Posttest − Pretest
83	80	−3
80	89	9
63	65	2
79	78	−1
83	93	10
77	79	2
66	70	4
80	84	4
73	80	7
90	90	0
77	78	1
90	91	1
$\bar{x} = 78.417$	$\bar{x} = 81.417$	$\bar{x} = 3.000$
$s = 8.207$	$s = 8.512$	$s = 3.977$

Scoring:

(a) Perform a test to determine whether students who attend the magnet school demonstrate a significantly higher mean difference in test scores (Posttest - Pretest) than students who applied to attend the magnet school but who were not selected and then attended their original school.

E P I

Administrators were also interested in using pretest scores on this test as a predictor of posttest scores on the test. The following computer output contains the results from separate regression analyses on the magnet school scores and on the original school scores. The accompanying graph displays the data and separate regression lines for the magnet and original schools.

Regression Analysis: Post_Magnet versus Pre_Magnet

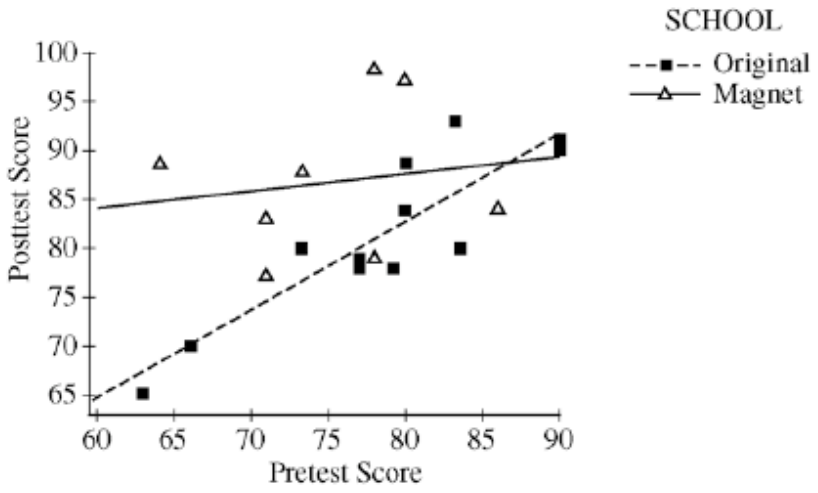
Predictor	Coef	SE Coef	T	P
Constant	73.27	34.55	2.12	0.078
Pre_Magnet	0.1811	0.4583	0.40	0.706

S = 8.20920 R-Sq = 2.5% R-Sq(adj) = 0.0%

Regression Analysis: Post_Original versus Pre_Original

Predictor	Coef	SE Coef	T	P
Constant	9.24	11.91	0.78	0.456
Pre_Original	0.9204	0.1512	6.09	0.000

S = 4.11463 R-Sq = 78.8% R-Sq(adj) = 76.6%



(b) (i) State the equation of the regression line for the magnet school and interpret its slope in the context of the question.

(ii) State the equation of the regression line for the original school and interpret its slope in the context of the the question.

(c) To determine whether there is a significant correlation between pretest score and posttest score, a test of the following hypotheses will be performed.

H_0 : There is no correlation between pretest score and posttest score
(true slope = 0)
versus
H_A : There is a correlation between pretest score and posttest score
(true slope $\neq$ 0)

(i) Using the regression output, state the *p*-value and conclusion for this test at the magnet school. Assume the conditions for inference have been met.

(ii) Using the regression output, state the *p*-value and conclusion for this test at the original school. Assume the conditions for inference have been met.

E P I

(d) What additional information do the regression analyses give you about student performance on the science test at the two schools beyond the comparison of mean differences in part (a)?

E P I

Total:__/4