

2005 AP[®] STATISTICS FREE-RESPONSE QUESTIONS (Form B)

4. A researcher believes that treating seeds with certain additives before planting can enhance the growth of plants. An experiment to investigate this is conducted in a greenhouse. From a large number of Roma tomato seeds, 24 seeds are randomly chosen and 2 are assigned to each of 12 containers. One of the 2 seeds is randomly selected and treated with the additive. The other seed serves as a control. Both seeds are then planted in the same container. The growth, in centimeters, of each of the 24 plants is measured after 30 days. These data were used to generate the partial computer output shown below. Graphical displays indicate that the assumption of normality is not unreasonable.

	N	Mean	StDev	SE Mean
Control	12	15.989	1.098	0.317
Treatment	12	18.004	1.175	0.339
Difference	12	-2.015	1.163	0.336

- (a) Construct a confidence interval for the mean difference in growth, in centimeters, of the plants from the untreated and treated seeds. Be sure to interpret this interval.
- (b) Based only on the confidence interval in part (a), is there sufficient evidence to conclude that there is a significant mean difference in growth of the plants from untreated seeds and the plants from treated seeds? Justify your conclusion.
- (c) Describe the sampling distribution of the sample mean difference (assuming the researchers got very lucky and that the sample statistics were *very* close to the parameters).
- (d) Is this an experiment or an observational study? Explain.
- (e) What ...
- is the name of the design the researcher uses?
 - are the experimental units?
 - is the factor?
 - is the response variable?

2005B #4
Super Edition
Answer Key

Note: A complete answer key with rubric for parts a-c can be found here:

https://secure-media.collegeboard.org/apc/_ap05_sg_statisticsb__46664.pdf

(c) Describe the sampling distribution of the sample mean difference (assuming the researchers got very lucky and that the sample statistics were *very* close to the parameters).

The center is at -2.015 cm, the sd (which we are estimating with a se) is 0.336 cm, and the shape may be assumed to be approximately normal. Although with a sample of only size 12, even though we are told the assumption of normality is reasonable, we are cautious about this conclusion.

(d) Is this an experiment or an observational study? Explain.

It is an experiment because the researcher applied a treatment (additives) to the seeds.

(e) What ...

i) is the name of the design the researcher uses?

It is a matched-paired experimental design. The seeds are in blocks of size two, one of each treatment in each container.

ii) are the experimental units?

The seeds

iii) is the factor?

The additive

iv) is the response variable?

The growth of the plants