"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.

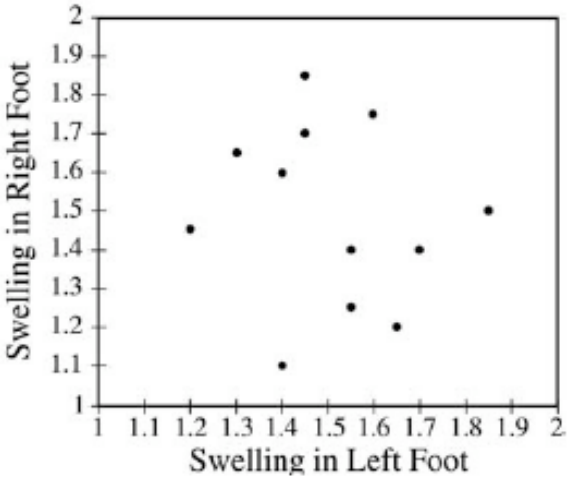
The nerves that supply sensation to the front portion of a person's foot run between the long bones of the foot. Tight-fitting shoes can squeeze these nerves between the bones, causing pain when the nerves swell. This condition is called Morton's neuroma. Because most people have a dominant foot, muscular development is not the same in both feet. People who have Morton's neuroma may have the condition in only one foot or they may have it in both feet.

Investigators selected a random sample of 12 adult female patients with Morton's neuroma to study this disease further. The data below are measurements of nerve swelling as recorded by a physician. A value of 1.0 is considered "normal", and 2.0 is considered extreme swelling. The population distribution of the swelling measurements is approximately normal for adult female who have Morton's neuroma.

Dominant Foot	Swelling in Dominant Foot	Swelling in Nondominant Foot	Foot with Neuroma
Left	1.40	1.10	Left
Left	1.55	1.25	Left
Left	1.65	1.20	Left
Left	1.55	1.40	Both
Left	1.70	1.40	Left
Left	1.85	1.50	Both
Right	1.45	1.20	Right
Right	1.65	1.30	Right
Right	1.60	1.40	Right
Right	1.70	1.45	Both
Right	1.85	1.45	Both
Right	1.75	1.60	Both

Scoring:

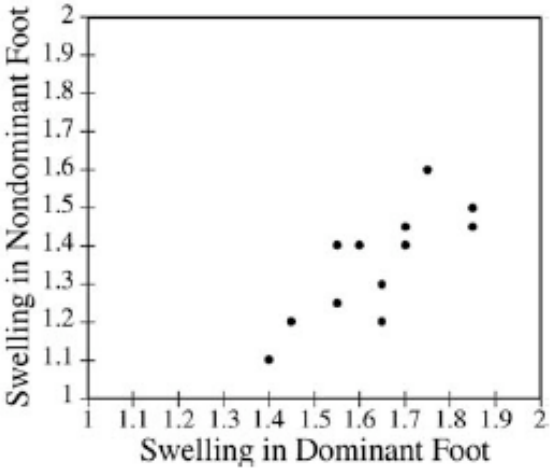
(a) A scatterplot of the ordered pairs (swelling in left foot, swelling in right foot), is shown below.



The scatterplot suggests there are two distinct groups of patients. Patients within each group share a common trait. Use the scatterplot above and the table on the previous page to determine the common trait and explain how this trait differs for the two groups.

E P I

(b) A scatterplot of the ordered pairs (swelling in dominant foot, swelling in nondominant foot), is shown below.



What conclusion can be drawn from this scatterplot that is not apparent from the scatterplot in part (a)?

E P I

(c) Can you conclude that there is a difference between the mean swelling in the dominant foot and the mean swelling in the nondominant foot for adult females who have Morton's neuroma in at least one foot? Give a statistical justification to support your answer.

(For easy reference, the table of data from the first page also appears below.)

E P I

(d) The nerve swelling measurement is used to indicate whether a foot has Morton's neuroma. Use the 24 measurements of nerve swelling to suggest a criterion for diagnosing Morton's neuroma. Justify your suggestion graphically.

(For easy reference, the table of data from the first page also appears below.)

E P I

Dominant Foot	Swelling in Dominant Foot	Swelling in Nondominant Foot	Foot with Neuroma
Left	1.40	1.10	Left
Left	1.55	1.25	Left
Left	1.65	1.20	Left
Left	1.55	1.40	Both
Left	1.70	1.40	Left
Left	1.85	1.50	Both
Right	1.45	1.20	Right
Right	1.65	1.30	Right
Right	1.60	1.40	Right
Right	1.70	1.45	Both
Right	1.85	1.45	Both
Right	1.75	1.60	Both

Total:__/4