AP® Statistics
2003 Sample Student Responses

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STATISTICS
SECTION II
Part A
Questions 1-5
Spend about 65 minutes on this part of the exam.
Percent of Section II grade—75

A

Directions: Show all your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy of your results and explanation.

1. Since Hill Valley High School eliminated the use of bells between classes, teachers have noticed that more students seem to be arriving to class a few minutes late. One teacher decided to collect data to determine whether the students' and teachers' watches are displaying the correct time. At exactly 12:00 noon, the teacher asked 9 randomly selected students and 9 randomly selected teachers to record the times on their watches to the nearest half minute. The ordered data showing minutes after 12:00 as positive values and minutes before 12:00 as negative values are shown in the table below.

Students	-4.5	-3.0	-0.5	0	0	0.5	0.5	1.5	5.0
Teachers	-2.0	-1.5	-1.5	-1.0	-1.0	-0.5	0	0	0.5

(a) Construct parallel boxplots using these data.

students

teachers

minutes away from 12:00

Students
min = -4.5
Q_1 = -1.75
Med = 0
Q_3 = 1
max = 5

Teachers
min = -2
Q_1 = -1.5
Med = -1
Q_3 = 0
max = .5

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(b) Based on the boxplots in part (a), which of the two groups, students or teachers, tends to have watch times that are closer to the true time? Explain your choice.

The teachers have watch times that are closer to the true time. This is evident because the IQR for the teachers is smaller. Although the median is not 0, using the IQR, we can see that 50% of the teachers' watch times fall within the range of -1.5 to 0 minutes away from 12:00. Using the IQR of the students, we can see that 50% of the students' watch times fall within the range -1.75 to 1 minute away from 12:00. Also the full range of students' time is much larger than the range of the teachers' time. Although this does not necessarily always mean that the data set with the smaller range is more accurate, it is definitely true in this case.

(c) The teacher wants to know whether individual student's watches tend to be set correctly. She proposes to test $H_0: \mu = 0$ versus $H_a: \mu \neq 0$, where μ represents the mean amount by which all student watches differ from the correct time. Is this an appropriate pair of hypotheses to test to answer the teacher's question? Explain why or why not. <u>Do not carry out the test.</u>

This will not answer the teacher's question because the hypothesis of $H_0: \mu = 0$ versus $H_a: \mu \neq 0$ does not test individual students' watches like she wants to. This would simply test the accuracy of the mean of the students' watches.

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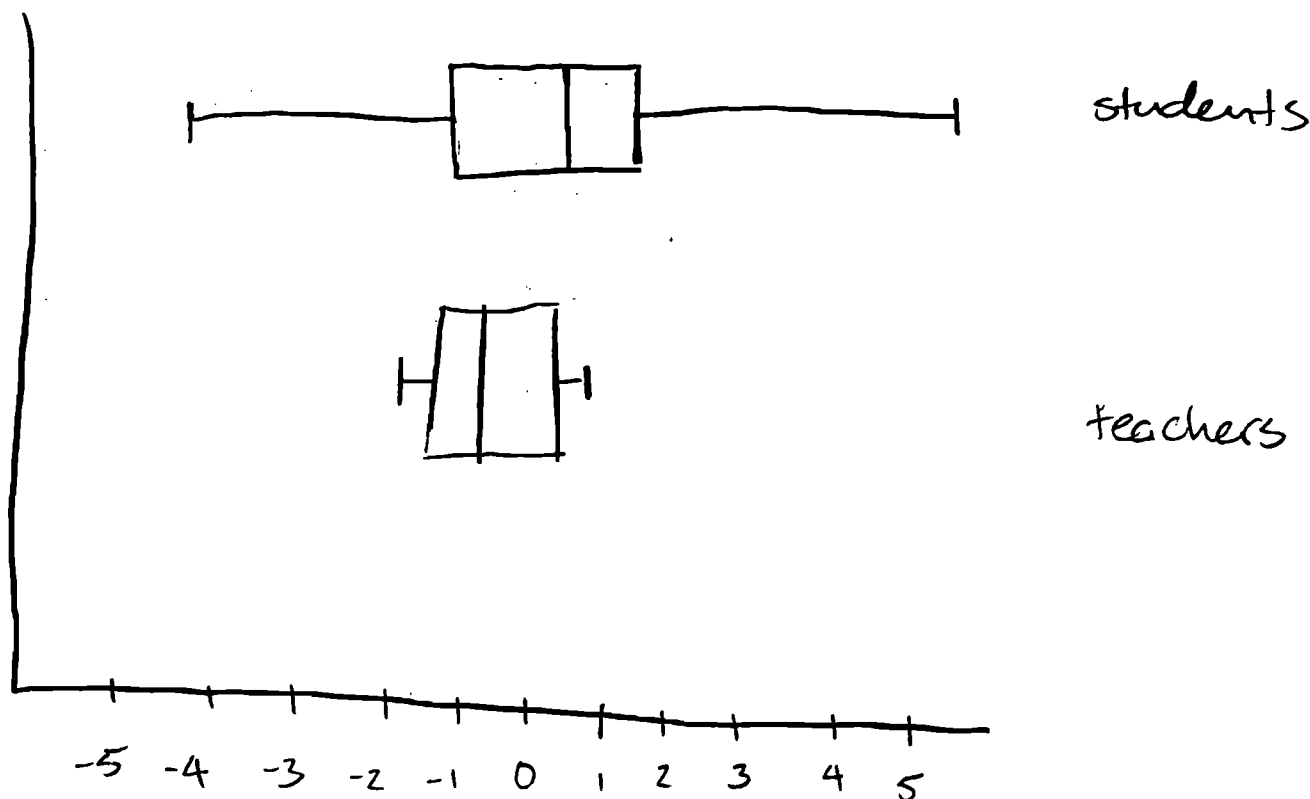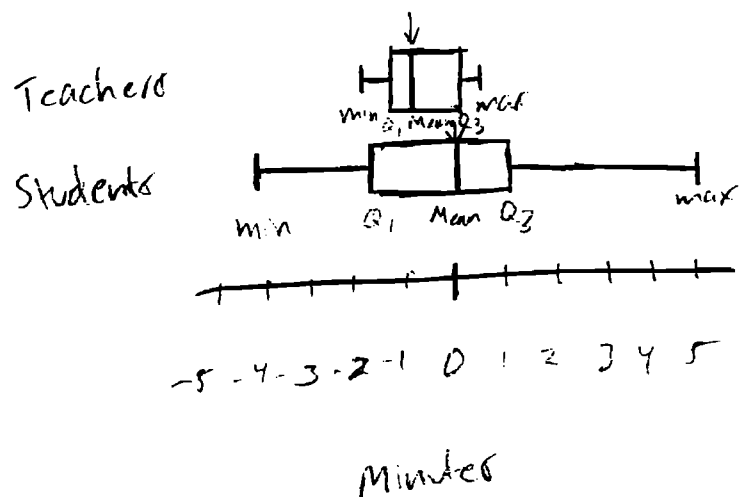**Spend about 65 minutes on this part of the exam.**
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(a) Construct parallel boxplots using these data.

(b) Based on the boxplots in part (a), which of the two groups, students or teachers, tends to have watch times that are closer to the true time? Explain your choice.

Based on the data, teachers tend to have watch times that are closer to the true time. I chose this because the teacher's boxplot was much more compact than the students. It had a smaller range of numbers within It's min/max range. Also, the inner quartile range is smaller, making the values/times closer.

(c) The teacher wants to know whether individual student's watches tend to be set correctly. She proposes to test H_0: $\mu = 0$ versus H_a: $\mu \neq 0$, where μ represents the mean amount by which all student watches differ from the correct time. Is this an appropriate pair of hypotheses to test to answer the teacher's question? Explain why or why not. <u>Do not carry out the test.</u>

No, the teacher is looking to find the students with correct time, $\mu = 0$ is the mean amount the students watches differ. Since the students times are not known, it is better to test H_0: $\mu_1 - \mu_2 = 0$ with μ_1 being real time and μ_2 being mean student time.

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