

Statistics 1040, Section 004, Quiz 1 (20 Points)

Monday, January 12, 2004

Your Name: _____

Question 1: Controlled Experiments/Observational Studies I (14 Points)

In a recent study on SIDS (Sudden Infant Death Syndrome), one hospital collected data on 128 babies who died from SIDS in the last 12 months. They took a random sample of 500 babies (of similar ages) who did not die from SIDS (the “controls”), and they compared the two groups with respect to several variables of interest (e.g. whether the child slept on his or her stomach, birthweight, time of year, whether the mother smoked, whether she breast-fed, socio-economic status, etc.).

1. (5 Points) Is this a controlled experiment or an observational study? Circle your answer and explain.
2. (5 Points) One physician noticed that 63% of the SIDS babies had mothers who smoked during pregnancy, whereas only 26% of the control babies had mothers who smoked during pregnancy. Another physician claimed that low birthweight could be a “confounding factor”. Explain what it means for low birthweight to be a “confounding factor”. Be specific.
3. (4 Points) If you had access to the data, what would you do to “control for” birthweight?

Please turn over!

Question 2: Controlled Experiments/Observational Studies II (6 Points)

In 1990, four passengers were killed by crashes on commuter airlines, compared to 39 killed on scheduled carriers (such as United, TWA, and so forth). True or false, and explain: the data show that if you have to fly, it is safer to do so on a commuter airline.

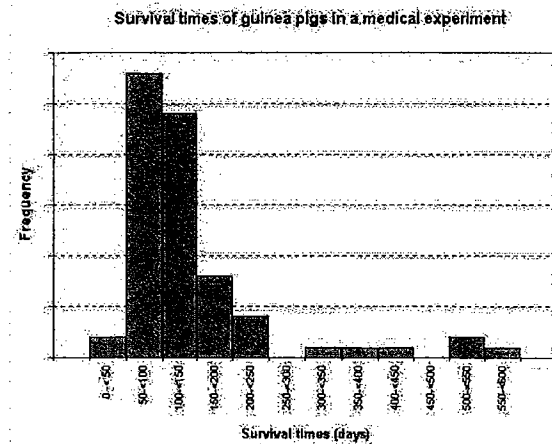
Statistics 1040, Section 004, Quiz 2 (20 Points)

Friday, January 16, 2004

Your Name: _____

Question 1: Histograms I (12 Points)

The histogram below shows the distribution of survival times in days of 72 guinea pigs after they were injected with tubercle bacilli in a medical experiment. A lab assistant is working on a report on the results of the experiment that he has to present in 15 minutes to the Company's Board of Directors. Unfortunately, the lab assistant accidentally deleted the numbers on the vertical axis! There is no way to go back to the original file in such a short time – the only thing he recalls is that 8 guinea pigs out of 72 (i.e., about 11%) survived more than 150 but less than 200 days and only one guinea pig (i.e., about 1.4%) survived at least 550 days. Try to help the lab assistant to fill in the missing percentages below so he can still give a decent presentation.

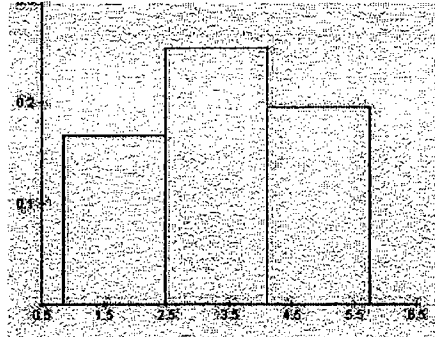


1. (4 Points) What approximate percentage of guinea pigs survived less than 100 days?
2. (4 Points) What approximate percentage of guinea pigs survived more than 100 but less than 150 days?
3. (4 Points) What approximate percentage of guinea pigs survived more than 300 days?

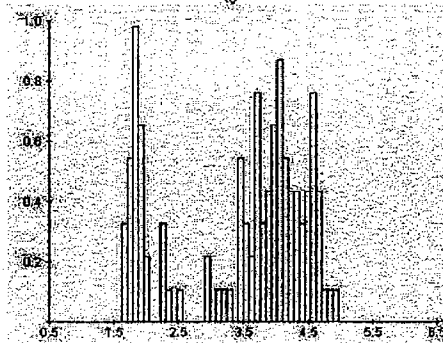
Please turn over!

Question 2: Histograms II (8 Points)

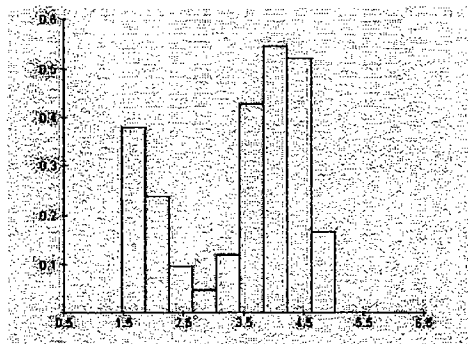
The three histograms below represent the same Old Faithful data set. The observations are the duration (in minutes) for eruptions of the Old Faithful geyser in Yellowstone National Park. Which of the three histograms you think is the best? Explain clearly why you prefer this particular histogram to represent the Old Faithful data and not the other two.



(i)



(ii)



(iii)

The best histogram is: _____

Explanation:

Statistics 1040, Section 004, Quiz 3 (20 Points)

Friday, January 23, 2004

Your Name: _____

Question 1: Measures of Center and Spread I (14 Points)

Below are the temperatures (in degrees Celsius) for five locations in Utah on Tuesday, January 20, 2004, at 9pm SMT, as found on www.wunderground.com:

City	Temperature
Bryce Canyon	-15
Logan	-14
Ogden	-12
St. George	5
Salt Lake City	-4

Show your work!

1. (5 Points) Find the **average temperature** in degrees Celsius for these locations in Utah.
2. (3 Points) Find the **median temperature** in degrees Celsius for these locations in Utah.
3. (6 Points) Find the **standard deviation** of the temperatures for these locations in Utah.

Please turn over!

Question 2: Measures of Center and Spread II (6 Points)

To answer the questions below, you need to apply your knowledge about average, median, and standard deviation. **No calculation is needed!**

1. **(3 Points)** If the St. George temperature (the only positive value) is removed from the list, what will happen to the average and median? Choose the most appropriate answer and **explain** briefly:

- (a) The average will change more than the median;
- (b) The median will change more than the average;
- (c) Both average and median will stay exactly the same.

2. **(3 Points)** If the St. George temperature (the only positive value) is removed from the list, what will happen to the standard deviation? Choose the most appropriate answer and **explain** briefly:

- (a) The SD will become bigger;
- (b) The SD will become smaller;
- (c) The SD will become negative;
- (d) The SD will not change at all.

Formulas:

$$\text{avg} = \frac{\text{sum of all numbers}}{\text{how many numbers}}$$

$$\text{SD} = \sqrt{\text{average of } [(\text{deviations from avg})^2]}$$

Statistics 1040, Section 004, Quiz 4 (20 Points)

Friday, January 30, 2004

Your Name: _____

Question 1: Normal Approximation for Data (20 Points)

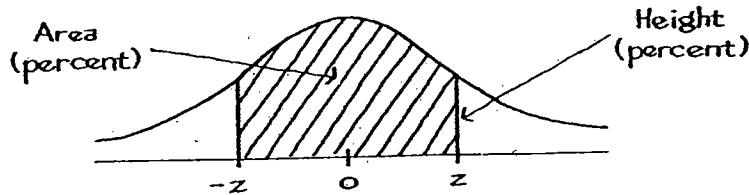
With Americans becoming more health conscious, many food companies are emphasizing the benefits of oat bran in a wide variety of products — from muffins to potato chips. One such company makes oat bran donuts that contain on average **5 grams** of oat bran. Assuming that the amount of oat bran per donut approximately follows the normal curve, with a standard deviation of **0.2 gram**, answer the questions below:

- (8 Points) The percentage of donuts that contain **more than 5.3 grams** of oat bran is roughly _____ %.

- (12 Points) The percentage of donuts that contain **between 4.5 grams and 4.9 grams** of oat bran is about _____ %.

Show your work!

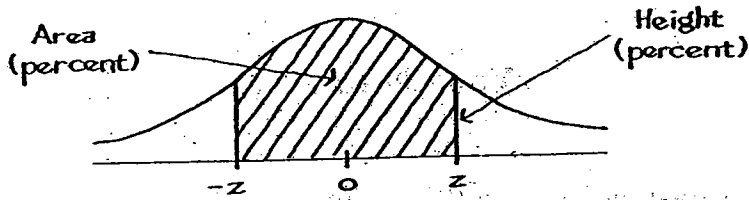
Tables



A NORMAL TABLE

<i>z</i>	<i>Area</i>	<i>z</i>	<i>Area</i>	<i>z</i>	<i>Area</i>
0.00	0	1.50	86.64	3.00	99.730
0.05	3.99	1.55	87.89	3.05	99.771
0.10	7.97	1.60	89.04	3.10	99.806
0.15	11.92	1.65	90.11	3.15	99.837
0.20	15.85	1.70	91.09	3.20	99.863
0.25	19.74	1.75	91.99	3.25	99.885
0.30	23.58	1.80	92.81	3.30	99.903
0.35	27.37	1.85	93.57	3.35	99.919
0.40	31.08	1.90	94.26	3.40	99.933
0.45	34.73	1.95	94.88	3.45	99.944
0.50	38.29	2.00	95.45	3.50	99.953
0.55	41.77	2.05	95.96	3.55	99.961
0.60	45.15	2.10	96.43	3.60	99.968
0.65	48.43	2.15	96.84	3.65	99.974
0.70	51.61	2.20	97.22	3.70	99.978
0.75	54.67	2.25	97.56	3.75	99.982
0.80	57.63	2.30	97.86	3.80	99.986
0.85	60.47	2.35	98.12	3.85	99.988
0.90	63.19	2.40	98.36	3.90	99.990
0.95	65.79	2.45	98.57	3.95	99.992
1.00	68.27	2.50	98.76	4.00	99.9937
1.05	70.63	2.55	98.92	4.05	99.9949
1.10	72.87	2.60	99.07	4.10	99.9959
1.15	74.99	2.65	99.20	4.15	99.9967
1.20	76.99	2.70	99.31	4.20	99.9973
1.25	78.87	2.75	99.40	4.25	99.9979
1.30	80.64	2.80	99.49	4.30	99.9983
1.35	82.30	2.85	99.56	4.35	99.9986
1.40	83.85	2.90	99.63	4.40	99.9989
1.45	85.29	2.95	99.68	4.45	99.9991

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0.40	31.08	1.90	94.26	3.40	99.933
0.45	34.73	1.95	94.88	3.45	99.944
0.50	38.29	2.00	95.45	3.50	99.953
0.55	41.77	2.05	95.96	3.55	99.961
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1.15	74.99	2.65	99.20	4.15	99.9967
1.20	76.99	2.70	99.31	4.20	99.9973
1.25	78.87	2.75	99.40	4.25	99.9979
1.30	80.64	2.80	99.49	4.30	99.9983
1.35	82.30	2.85	99.56	4.35	99.9986
1.40	83.85	2.90	99.63	4.40	99.9989
1.45	85.29	2.95	99.68	4.45	99.9991

Formulas:

$$\text{r.m.s. error} = \sqrt{1 - r^2} \times \text{SD}_y$$

$$\text{slope} = r \times \frac{\text{SD}_y}{\text{SD}_x}$$

$$\text{intercept} = \text{avg}_y - \text{slope} \times \text{avg}_x$$

Statistics 1040, Section 004, Quiz 7 (20 Points)

Friday, February 27, 2004

Your Name: _____

Question 1: Chance/Probability I (13 Points)

An elementary school in Logan employs 15 teachers: 11 are women and 4 are men. Two teachers are selected at random to meet the governor and attend a reception in SLC.

1. (4 Points) What is the chance that both are women?

The chance is: _____ %

2. (4 Points) What is the chance that at least one is a woman?

The chance is: _____ %

3. (5 Points) What is the chance that both are the same gender?

The chance is: _____ %

Please turn over!

Question 2: Chance/Probability II (7 Points)

A computer is programmed to compute various chances. Match the numerical answers with one of the following verbal descriptions (which can be used more than once):

Verbal description

- (i) This is as likely to happen as not.
- (ii) This is very likely to happen, but it's not certain.
- (iii) This won't happen.
- (iv) This may happen, but it's not likely.
- (v) This will happen, for sure.
- (vi) There is a bug in the program.

Numerical answer is matched by:

- (a) -50% _____
- (b) 0% _____
- (c) 10% _____
- (d) 50% _____
- (e) 90% _____
- (f) 100% _____
- (g) 200% _____

Statistics 1040, Section 004, Quiz 8 (20 Points)

Friday, March 5, 2004

Your Name: _____

Question 1: Box Models, EV, and SE (14 Points)

A quiz has 20 multiple choice questions. Each question has 5 possible answers: only one answer is completely correct, two are partially correct, and two are completely incorrect. The correct answer is worth 5 points, a partially correct answer is worth one point, and a point is taken off for a completely incorrect answer.

A student (who did not study at all) answers all the questions by guessing at random.

1. (4 Points) Find the box model.
2. (5 Points) Find the expected value, i.e., the number of points a student would get when answering all questions by guessing. $EV_{sum} = \underline{\hspace{2cm}}$
3. (5 Points) Find the standard error. $SE_{sum} = \underline{\hspace{2cm}}$

Please turn over!

Question 2: Law of Averages (6 Points)

A box contains red and green marbles; there are more green marbles than red ones. Marbles are drawn one at a time from the box, at random with replacement. You win a dollar if a red marble is drawn more often than a green one. There are two choices:

- A: 50 draws are made from the box.
- B: 500 draws are made from the box.

Choose one of the four options below. **Briefly explain your answer.**

1. A gives a better chance of winning.
2. B gives a better chance of winning.
3. A and B give the same chance of winning.
4. Can't tell without more information.

Have a good Spring Break!

Formulas:

$$\text{box average} = \frac{\text{sum of all numbers in box}}{\text{how many numbers in box}}$$

$$\text{box SD} = \sqrt{\text{average of } [(\text{deviations from box average})^2]}$$

$$EV_{sum} = \text{number of draws} \times \text{box average}$$

$$SE_{sum} = \sqrt{\text{number of draws}} \times \text{box SD}$$

Statistics 1040, Section 004, Quiz 9 (20 Points)

Friday, March 19, 2004

Your Name: _____

Question 1: EV, SE, and Normal Curve (14 Points)

According to the U.S. Census Bureau's "QuickFacts" Web site (<http://quickfacts.census.gov/qfd/states/49000.html>), about 26% of Utah residents age 25 and older have a bachelor degree or higher. Suppose that 500 Utah residents age 25 and older have been randomly chosen to participate in a survey.

1. (2 Points) Find the box model.
2. (6 Points) Find the expected number of Utah residents in this sample of 500 who have a bachelor degree or higher. What is the corresponding SE?
3. (6 Points) Using the normal curve, find the chance that **at most** 120 of the Utah residents in the sample have a bachelor degree or higher.

Please turn over!

Formulas:

$$\text{box average} = \frac{\text{sum of all numbers in box}}{\text{how many numbers in box}}$$

$$\text{box SD} = \sqrt{\text{average of } [(\text{deviations from box average})^2]}$$

$$EV_{sum} = \text{number of draws} \times \text{box average}$$

$$SE_{sum} = \sqrt{\text{number of draws}} \times \text{box SD}$$

Shortcut formulas for a box that contains only *two* different numbers:

$$\text{average} = \frac{(\text{smaller} \times \text{how many}) + (\text{bigger} \times \text{how many})}{\text{how many tickets in the box}}$$

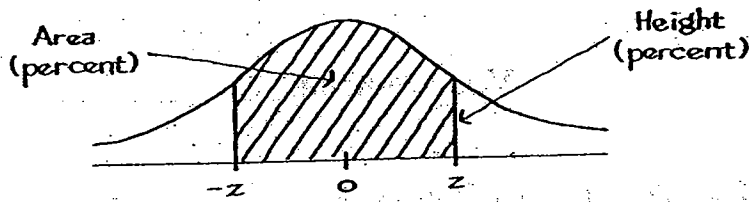
$$\text{SD} = (\text{bigger} - \text{smaller}) \times \sqrt{\frac{\text{fraction}}{\text{bigger}} \times \frac{\text{fraction}}{\text{smaller}}}$$

Shortcut formulas for a box that contains only $\boxed{0}$'s and $\boxed{1}$'s:

$$\text{average} = \frac{\text{number of } \boxed{1} \text{'s}}{\text{how many tickets in the box}}$$

$$\text{SD} = \sqrt{\frac{\text{fraction}}{\text{of } \boxed{1} \text{'s}} \times \frac{\text{fraction}}{\text{of } \boxed{0} \text{'s}}}$$

Tables



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1.10	72.87	2.60	99.07	4.10	99.9959
1.15	74.99	2.65	99.20	4.15	99.9967
1.20	76.99	2.70	99.31	4.20	99.9973
1.25	78.87	2.75	99.40	4.25	99.9979
1.30	80.64	2.80	99.49	4.30	99.9983
1.35	82.30	2.85	99.56	4.35	99.9986
1.40	83.85	2.90	99.63	4.40	99.9989
1.45	85.29	2.95	99.68	4.45	99.9991

Statistics 1040, Section 004, Quiz 10 (20 Points)

Friday, April 2, 2004

Your Name: _____

Question 1: Confidence Intervals (20 Points)

There are approximately 20,000 students at USU. For a simple random sample of 200 USU students, we learn that 140 students are satisfied with President Kermit Hall.

1. (14 Points) If possible, construct a 95% confidence interval for the percentage of all USU students who are satisfied with President Hall. If you cannot do this, explain why not.

Show your work.

2. (6 Points) (Hypothetical) Suppose that in the sample of 200 students, only 1 student is satisfied with President Hall. Would it still be possible to construct a 95% confidence interval for the percentage of all USU students who are satisfied with President Hall? **Yes or No?** And explain why or why not.

You do not have to actually construct this confidence interval, but you do have to show calculations necessary to support your answer.

Please turn over!

Formulas:

$$\text{box average} = \frac{\text{sum of all numbers in box}}{\text{how many numbers in box}}$$

$$\text{box SD} = \sqrt{\text{average of } [(\text{deviations from box average})^2]}$$

$$EV_{sum} = \text{number of draws} \times \text{box average}$$

$$SE_{sum} = \sqrt{\text{number of draws}} \times \text{box SD}$$

Shortcut formulas for a box that contains only *two* different numbers:

$$\text{average} = \frac{(\text{smaller} \times \text{how many}) + (\text{bigger} \times \text{how many})}{\text{how many tickets in the box}}$$

$$\text{SD} = (\text{bigger} - \text{smaller}) \times \sqrt{\frac{\text{fraction}}{\text{bigger}} \times \frac{\text{fraction}}{\text{smaller}}}$$

Shortcut formulas for a box that contains only $\boxed{0}$'s and $\boxed{1}$'s:

$$\text{average} = \frac{\text{number of } \boxed{1} \text{'s}}{\text{how many tickets in the box}}$$

$$\text{SD} = \sqrt{\frac{\text{fraction}}{\text{of } \boxed{1} \text{'s}} \times \frac{\text{fraction}}{\text{of } \boxed{0} \text{'s}}}$$

$$EV_{\%} = \% \text{ of } \boxed{1} \text{'s in the box}$$

$$SE_{\%} = \frac{SE_{sum}}{\# \text{draws}} \times 100\%$$

Question 2: Tests of Significance (6 Points)

Circle the correct answer.

1. (2 Points) In order to test a null hypothesis, you need
 - (a) data
 - (b) a box model for the data
 - (c) both of the above
 - (d) none of the above.

2. (2 Points) A “highly significant” result cannot possibly be due to chance.
True or False.

3. (2 Points) If the observed significance level is 5%, there are 95 chances in 100 for the alternative hypothesis to be right.
True or False.

Please turn over!

Formulas:

$$\text{box average} = \frac{\text{sum of all numbers in box}}{\text{how many numbers in box}}$$

$$\text{box SD} = \sqrt{\text{average of } [(\text{deviations from box average})^2]}$$

$$EV_{sum} = \text{number of draws} \times \text{box average}$$

$$SE_{sum} = \sqrt{\text{number of draws}} \times \text{box SD}$$

$$EV_{avg} = \text{box average} \quad SE_{avg} = \frac{SE_{sum}}{\text{number of draws}}$$

Shortcut formulas for a box that contains only *two* different numbers:

$$\text{average} = \frac{(\text{smaller} \times \text{how many}) + (\text{bigger} \times \text{how many})}{\text{how many tickets in the box}}$$

$$\text{SD} = (\text{bigger} - \text{smaller}) \times \sqrt{\frac{\text{fraction}}{\text{bigger}} \times \frac{\text{fraction}}{\text{smaller}}}$$

Shortcut formulas for a box that contains only $\boxed{0}$'s and $\boxed{1}$'s:

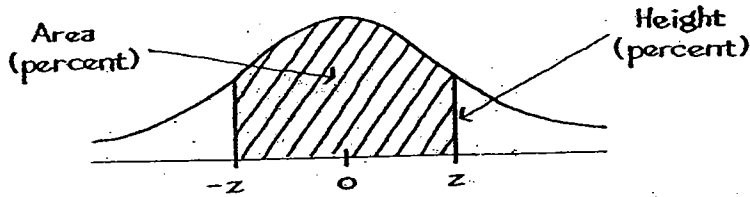
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$$\text{SD} = \sqrt{\frac{\text{fraction}}{\text{of } \boxed{1} \text{'s}} \times \frac{\text{fraction}}{\text{of } \boxed{0} \text{'s}}}$$

$$EV_{\%} = \% \text{ of } \boxed{1} \text{'s in the box}$$

$$SE_{\%} = \frac{SE_{sum}}{\text{number of draws}} \times 100\%$$

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1.30	80.64	2.80	99.49	4.30	99.9983
1.35	82.30	2.85	99.56	4.35	99.9986
1.40	83.85	2.90	99.63	4.40	99.9989
1.45	85.29	2.95	99.68	4.45	99.9991

Statistics 1040, Section 004, Quiz 12 (20+ Points)

Friday, April 16, 2004 — Due Monday, April 19, 2004 (in class!)

Your Name: _____

This is a take-home quiz. You may work on it at your own pace but you have to complete it and turn it in at the beginning of class on Monday, April 19, 2004. If you cannot attend class on Monday, please FAX your answers to (435) 797-1822 **before** class starts. Solutions will be provided in class on Monday and will also be posted to the course Web site on Monday afternoon. Late turn-ins will not be accepted.

This quiz contains three questions, formulated as they may appear in the Final Exam. The first question is worth 20 points. The second and the third questions are extra-credit questions that are optional. These questions are worth 10 extra-points each.

Please work on this quiz independently, using as little help as possible from your friends, books, and notes. To get used to the formula sheet provided in the final, you should look at this sheet only and not at any of our previously used formula sheets. A copy of the formula sheet used in previous final exams and the required tables can be found in the "Old Exams (1998-2003)" section of our workbook (you should use the formula sheet/tables from the Fall 2003 exam).

Question 1:

(20 Points) A random sample of 18 Penn State students was selected. The nose length of each student was measured in millimeters, and was recorded in the following data set:

41 57 43 42 55 35 36 40 45 55 55 36 45 44 45 47 37 48

A student thinks that the average nose length of Penn State students is fairly large. He thinks that the average nose length could be more than 44 millimeters. Does this sample of 18 students provide evidence to suggest that the average nose length is more than 44 millimeters? State the null and the alternative hypothesis, calculate the test statistic (after finding the average and SD of the sample), obtain the P-value, and clearly state your conclusions. Assume that the nose lengths follow the normal curve. (If we **cannot** conduct a test, state so and explain why not!)

Question 2:

(10 Points) Who drives older cars? Students or faculty? In a study conducted at a small university, it was found that the average age of all 5482 student cars registered with Parking Services was 7.89 years, with a standard deviation of 3.67 years. The average age of all 473 faculty cars registered with Parking Services was 5.99 years, with a standard deviation of 3.15 years. Can we conclude from those numbers that student cars are indeed older than faculty cars? Conduct an appropriate statistical test to find this out, and clearly state your conclusions. (If we **cannot** conduct a test, state so and explain why not!)

Question 3:

(10 Points) Do "A" students tend to sit in a particular part of the classroom? A researcher recorded the locations of the students who received grade A by interviewing a random sample of students from a huge class (several hundreds of students) with these results: 19 sat in the front, 9 sat in the middle, and 5 sat in the back of the classroom. Can we conclude from those numbers that the "A" students are not evenly distributed throughout the classroom? Conduct an appropriate statistical test to answer this question. (If we **cannot** conduct a test, state so and explain why not!)