

NAME: \_\_\_\_\_

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## Statistics Exam

You may use a calculator and the attached tables and formula sheets.

### Part 1: Multiple Choice. 6 points each.

1. The heights of American males aged 18 to 24 years are normally distributed with a mean of 68 inches and a standard deviation of 2.5 inches. Half of all young American men have heights less than or equal to
  - (a) 65.5 inches
  - (b) 68 inches
  - (c) 67.5 inches
  - (d) The first quartile of heights
  - (e) Can't tell because the median is not given.
2. Wilt Chamberlain was a basketball player. Which of the following is an example of a binomial random variable?
  - (a) The number of independent attempts required for Wilt Chamberlain to make a free throw.
  - (b) The number of free throws attempted by Wilt Chamberlain in a game.
  - (c) The number of free throws made by Wilt Chamberlain in 5 independent attempts.
  - (d) The number of home games in a random sample without replacement of 20 games from the 1966 season of the Philadelphia 76ers.
  - (e) The total number of points scored by Wilt Chamberlain in 5 games.

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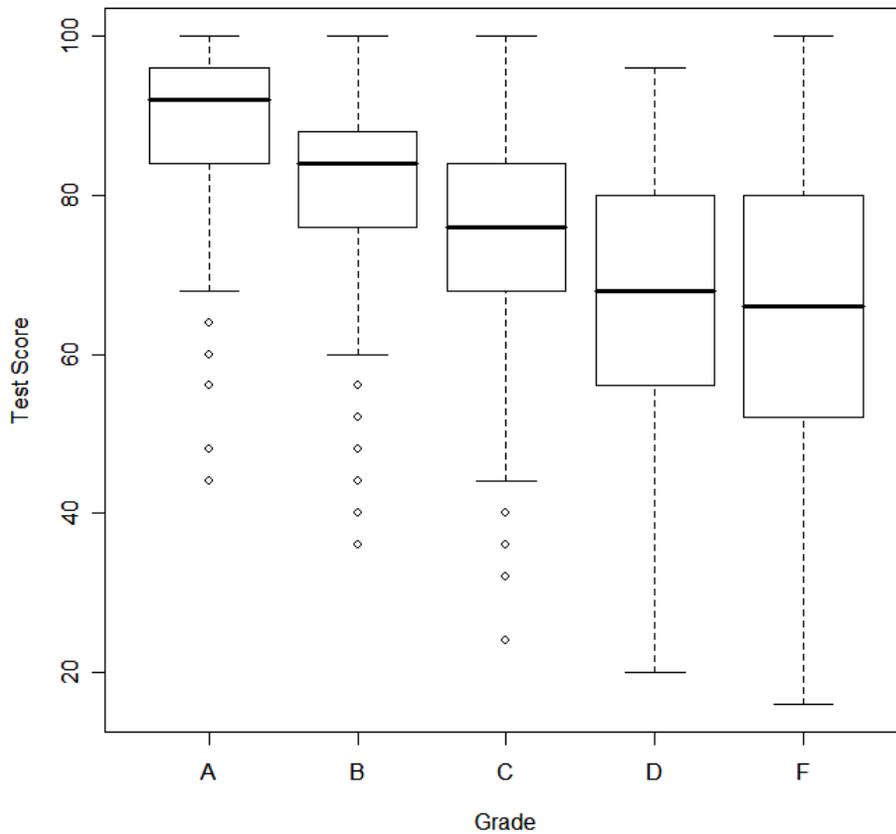
3. A high school has 40% freshmen, 30% sophomores, 20% juniors, and 10% seniors. A sample of 100 students consisting of the same proportions of the classes is planned. This is an example of
- (a) An observational study
  - (b) Cluster sampling
  - (c) A randomized complete block design
  - (d) Stratified sampling with proportional allocation
  - (e) Ordinal data

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4. Students in a math course took a prerequisite test at the beginning of the semester. At the end of the semester the distributions of test scores for students earning each letter grade were obtained. Boxplots (box and whisker diagrams) of prerequisite test scores for each letter grade are given below. Which of the following statements is true?

- (a) There are extreme outliers in test scores for F students.
- (b) The distribution of test scores for A students is symmetric.
- (c) 75% of the B students did as well or better than half of the C students.
- (d) Half or more of all C students scored below 70.
- (e) The interquartile range for A students is the same as the interquartile range for C students.

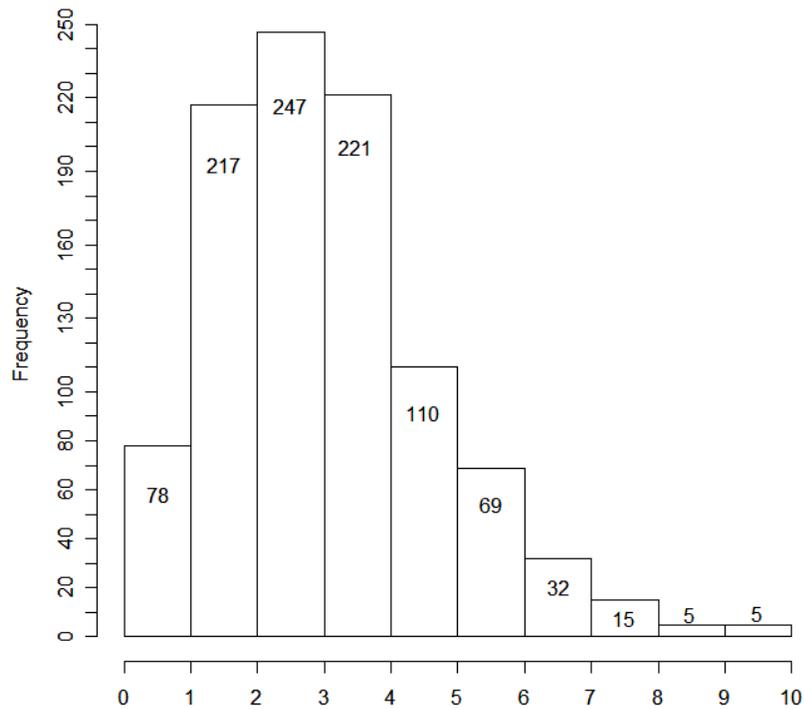


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5. The figure below is a histogram of 1000 measurements. The mean of the data is closest to:

- (a) 4.5
- (b) 3.0
- (c) 247
- (d) 2.5
- (e) Since the data is not given, there is no way to estimate the mean.



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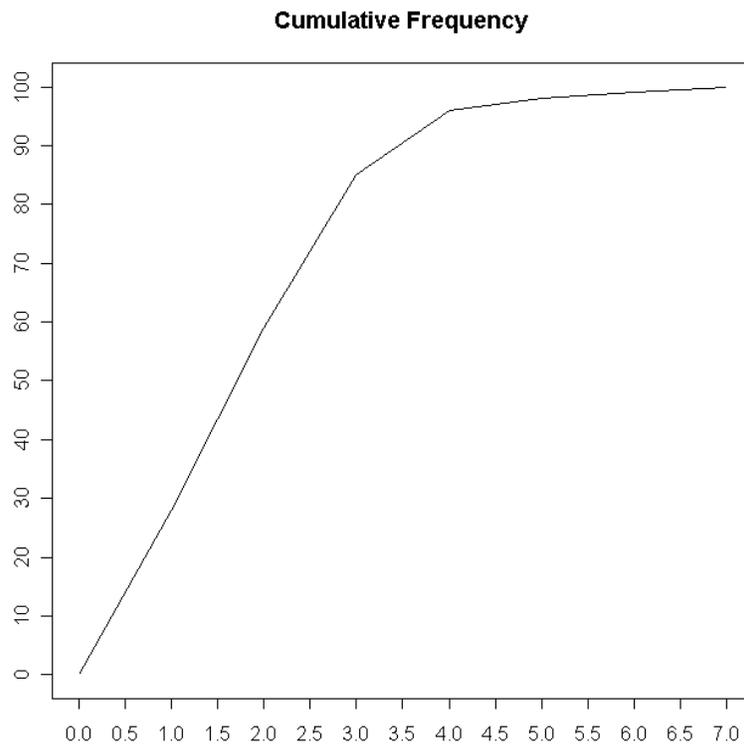
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6. An interplanetary space probe is designed to set down at a certain point on Mars. Because of random perturbations it will miss its planned impact point. The square of the distance from the target point has a chi-squared distribution with two degrees of freedom. Which of the following is closest to the probability that it will land more than 2.15 units of distance from its target?
- (a) 0.10
  - (b) 0.05
  - (c) 0.90
  - (d) 0.50
  - (e) 0.99
7. Scores on a nationwide professional qualifying exam are normally distributed and have a population mean of 800 and a population standard deviation of 50. An examinee scored at the 20<sup>th</sup> percentile nationally. To the nearest whole number, what was the examinee's numerical score?
- (a) 745
  - (b) 700
  - (c) 688
  - (d) 758
  - (e) 840
8. Concerned officials know that the number of hours students spend daily on YouTube is normally distributed with a standard deviation of 1.5 hours. They would like to monitor a sample of students to estimate the mean amount of time spent with an error no greater than 15 minutes and 95% confidence. The minimum number of students needed for their sample is
- (a) 30
  - (b) 1425
  - (c) 38
  - (d) 266
  - (e) 139



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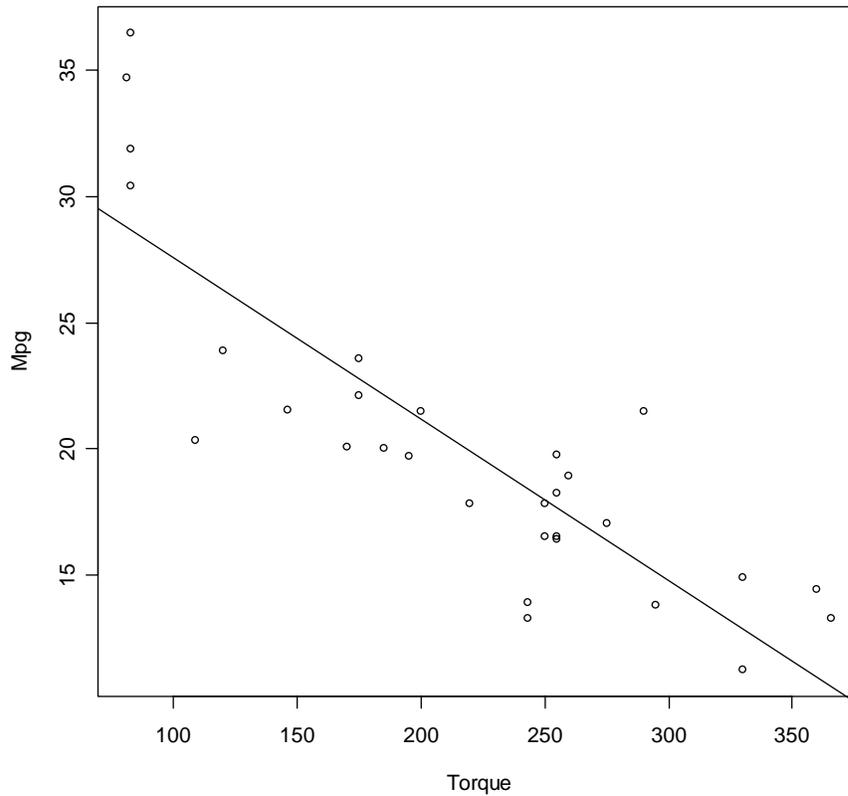


11. Inspection of 50 randomly selected houses in Houston revealed that 12 of them had termite damage. Find a 95% confidence interval for the proportion of all houses in Houston that have termite damage.

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12. The two sets of software output on the next page are from R and Excel and both apply to the data in the scatter diagram. Use either one to answer the following questions.



- What is the equation of the fitted least squares line? Let  $x$  stand for Torque and  $y$  for Mpg.
- What is the predicted value of Mpg for Torque = 275?
- What is the coefficient of determination?
- What is the correlation between Mpg and Torque?

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**R output**

> summary(autos.lm)

Call:

lm(formula = Mpg ~ Torque, data = autos, subset = -c(23, 25))

Residuals:

Min 1Q Median 3Q Max  
-6.7187 -2.0293 -0.4245 1.9565 7.8147

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	34.00548	1.75000	19.432	< 2e-16	***
Torque	-0.06410	0.00752	-8.523	2.89e-09	***

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Residual standard error: 3.364 on 28 degrees of freedom

Multiple R-Squared: 0.7218, Adjusted R-squared: 0.7119

F-statistic: 72.65 on 1 and 28 DF, p-value: 2.889e-09

**Excel output**

SUMMARY OUTPUT

<u>Regression Statistics</u>	
R Square	0.72180579
Adjusted R Square	0.71187028
Standard Error	3.36416209
Observations	30

<u>ANOVA</u>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	822.2125931	822.2126	72.64911	2.88885E-09
Residual	28	316.8924235	11.31759		
Total	29	1139.105017			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	34.0054778	1.750001226	19.43169	8.628E-18	30.42076287	37.590193
Torque	-0.0640989	0.007520301	-8.52344	2.889E-09	0.079503512	-0.048694