

Review for stat2507 Final (December 2008)

Part I: Multiple Choice questions (on 39%): Please circle only one choice.

1. [3] Which one of the following summary measures is affected most by outliers
A) The first quartile B) The Median C) The third quartile D) None of the previous.
2. [3] If $P(A) = .8$, $P(B) = .7$, and $P(A \cup B) = .9$, then $P(A \cap B)$ is
A) .6 B) .56 C) .72, D) .63.
3. [3] The time in minutes (min.) it takes Jessica to bicycle to school is normally distributed with mean 15 and variance 4. Jessica has to be at school at 8:00 am. What time should she leave her house so she will be late only 4% of the time?
A) 8:00 B) 11.5 min. before 8:00 C) 22 min. before 8:00 D) 18.5 min. before 8:00.
4. [3] Assume that X is normally distributed with unknown mean μ and standard deviation equal to .15. Given that $P(X < 2.1) = .025$, what is the value of μ ?
A) 2.394 B) 2.104 C) 2.096 D) 1.806
5. [3] Random samples of size 36 each are taken from a large population whose mean is 120 and standard deviation is 39. The mean and standard deviation of the sample mean are respectively A) 120 and 39 B) 120 and 6.5 C) 39 and 120 D) 6.5 and 120.
6. [3] Which of the following statements about confidence interval (CI) is false?
A) The width of a CI narrows when the sample size increases
B) The width of a CI narrows when the value of sample mean increases
C) The width of a CI widens when the confidence level increases
D) All of the above.
7. [3] In developing a CI for population mean, a sample size of 40 observations was used. The CI was 17.25 ± 2.42 . Had the sample size been 160 instead of 40, the

CI would have been A) 17.25 ± 9.68 , B) 17.25 ± 1.21 , C) 69.00 ± 9.68 ,
D) 34.5 ± 4.82 .


8. [3] A 95% CI for the population proportion of professional tennis players who earn more than \$2 millions a year is found to be $[\cdot82, \cdot88]$. Given this information, the sample size that was used was approximately A) 545 B) 382 C) 233 D) 378.
9. [3] A candidate wishes to estimate the proportion, among likely voters who would vote for her on election day, with 80% margin of error less than $\cdot03$. What sample size should she use? A) 250 B) 456 C) 960 D) 1028
10. [3] In testing the hypothesis $H_0 : \mu = 75$ vs $H_a : \mu \neq 75$, the following information is known: $n = 64$, $\bar{X} = 72$, and $S = 10$. The computed test statistic is equal to A) 1.96 B) 2.4 C) -2.4 D) -1.96.
11. [3] For a sample of size 20 taken from a normal population with unknown mean μ and standard deviation $\sigma = 5$, a 90% CI for μ would require the use of
A) $t=1.328$ B) $t=1.729$ C) 1.96 D) 1.64
12. [3] A random sample of size 15 taken from normal population revealed a sample mean of 75 and sample variance of 25. The upper limit of a two-sided 95% CI for the true mean would be A) 77.769 B) 72.231 C) 72.727 D) 77.273
13. [3] Based on sample data, the 90% CI limits for μ were 170.86 and 195.42. If the 10% level of confidence were used in testing the hypothesis $H_0 : \mu = 201$ vs $H_a : \mu \neq 201$, the null hypothesis would be A) rejected B) accepted C) correct D) none of the previous.

part II Long-answer questions (on 61%). Show all your work.

1. Whether a grant proposal is funded often depends on the reviewers. Suppose a group of research proposals was evaluated by a group of experts as to whether the proposals were worthy of funding. When these same proposals were submitted to a second independent group of experts, the decision to fund was reversed in 30% of cases. If the probability that a proposal is judged worthy of funding by the first peer review group is $\cdot2$, what are the probabilities of the following events:

[2] a. A proposal is approved by both groups.

[2] b. A proposal is disapproved by both groups.

- [2] **c.** A proposal is approved by exactly one group.
2. A DVD player chain store sells three different brands of DVD players. Of its sales, 50% are of brand 1 (the least expensive one), 30% are of brand 2, and 20% of brand 3. Each manufacture offers a 2-year warranty on parts and labor. It is known that 25% of brand 1's DVD players require warranty repair work, whereas the corresponding percentages for brand 2 and 3 are 20% and 10% respectively.
- [2] **a.** What is the probability that a randomly selected purchaser has brought a brand 1 DVD player that will need repair while under warranty? 
- [2] **b.** What is the probability that a randomly selected purchaser has a DVD player that will need repair while under warranty?
- [2] **c.** If a customer returns to the store with a DVD player that needs repair while under warranty, what is the probability that this DVD player is brand 1?
2. The manufacturer of the disk drives used in one of the well-known brands of microcomputers knows from past experience that 10% of the disk drives malfunction during the warranty period.
- [3] **a.** In a random sample of 15 disk drives, what is the probability that at least 2 will malfunction during the warranty period?
- [6] **b.** If it costs the manufacturer \$2000 to fix each malfunctioning disk drive, what is the expected cost to the manufacturer if he sells 15 randomly selected disk drives? What is the standard deviation of the cost?
- [5] **c.** In a random sample of 150 disk drives, use a suitable approximating distribution to find the probability that at most 20 will malfunction during the warranty period. Justify your approximation.
3. Suppose men's heights are normally distributed with mean of 176 cm and a standard deviation of 5 cm.
- [6] **a.** What proportion of men are between 172 cm and 178 cm tall?
- [3] **b.** Find the minimum ceiling of an airplane such that at most 2% of the men walking down the aisle will have to duck their heads.

- [3] c. Would it be correct to state that the average height of a random sample of 6 men is normally distributed with mean 176 cm and standard deviation $\frac{5}{\sqrt{6}}$? Why or why not?
- [3] d. Find the probability that the average height of a random sample of 64 men is greater than 178 cm.
- [3] e. If the heights were **NOT** normally distributed, which of your answers in (a), (b), (c), (d) above still hold? Why?
4. [5] A well-designed and safe workplace can contribute greatly to increased productivity. It is especially important that workers not be asked to perform tasks, such as lifting, that exceed their capabilities. The following data on maximum weight of lift (MAWL, in kg) are recorded for 5 randomly selected healthy male workers. 25.8 36.6 26.6 21.8 27.2. Do this data suggest that the average MAWL exceeds 25kg? Use $\alpha = .05$, and assume that MAWL is normally distributed.
5. A stylist at the Hair Care Palace gathered data on the number of hair colorings given on Saturdays and weekdays. Her results are listed below. Assume the two samples were taken independently:
- | | | |
|-------------|------------|------------|
| Saturdays : | $n_1 = 50$ | $x_1 = 14$ |
| weekdays : | $n_2 = 65$ | $x_2 = 13$ |
- [3] a. Find a point estimate and its 95% margin of error for $p_1 - p_2$, the difference in the true proportions between hair colorings given on Saturdays and weekdays.
- [3] b. Estimate the difference in the true proportions with a 95% confidence interval. Interpret this interval.
6. [6] Do government employees take longer coffee breaks than private sector workers? That is a question that interested a management consultant. To examine the issue, she took a random sample of ten government employees and another random sample of ten private sector workers and measured the amounts of time (in minutes) they

spent in coffee breaks during the day. The results are listed below

	Government employees	Private sector workers
	23	25
	18	19
	34	18
	31	22
	28	28
	33	25
	25	21
	27	21
	32	20
	21	16
$\sum x_i$	272	215
$\sum x_i^2$	7662	4741

Do these data provide sufficient evidence to support the claim that government employees take longer breaks than private sector workers? (Use $\alpha = 0.05$). Under what assumptions does your method work?