

MEMO

SAMPLE FINAL EXAM

MAT225

- 1) The amount of pyridoxine (in grams) in a multiple vitamin is normally distributed with $\mu = 110$ grams and $\sigma = 25$ grams. What is the probability that a randomly selected vitamin will contain between 82 and 100 grams of pyridoxine?
- 2) Suppose Z has a standard normal distribution with a mean of 0 and a standard deviation of 1. The probability that Z is less than 1.15 is _____.
- 3) Suppose Z has a standard normal distribution with a mean of 0 and a standard deviation of 1. The probability that Z is between -2.33 and 2.33 is _____.
- 4) Suppose Z has a standard normal distribution with a mean of 0 and a standard deviation of 1. The probability that Z values are larger than _____ is 0.3483.
- 5) Suppose Z has a standard normal distribution with a mean of 0 and a standard deviation of 1. So 85% of the possible Z values are smaller than _____.
- 6) The amount of time necessary for assembly line workers to complete a product is a normal random variable with a mean of 15 minutes and a standard deviation of 2 minutes. The probability is _____ that a product is assembled in between 15 and 21 minutes.
- 7) The amount of time necessary for assembly line workers to complete a product is a normal random variable with a mean of 15 minutes and a standard deviation of 2 minutes. The probability is _____ that a product is assembled in more than 11 minutes.
- 8) Suppose A and B are independent events where $P(A) = 0.4$ and $P(B) = 0.5$. Then $P(A \text{ and } B) =$ _____.
- 9) Suppose A and B are mutually exclusive events where $P(A) = 0.4$ and $P(B) = 0.5$. Then $P(A \text{ or } B) =$ _____.

TABLE 4-5

In a meat packaging plant, Machine A accounts for 60% of the plant's output, while Machine B accounts for 40% of the plant's output. In total, 4% of the packages are improperly sealed. Also, 3% of the packages are from Machine A and are improperly sealed.

- 10) Referring to Table 4-5, if a package is selected at random, the probability that it will be properly sealed is _____.
- 11) Referring to Table 4-5, if a package selected at random came from Machine B, the probability that it is properly sealed is _____.

TABLE 4-8

According to the record of the registrar's office at a state university, 35% of the students are freshman, 25% are sophomore, 16% are junior and the rest are senior. Among the freshmen,

sophomores, juniors and seniors, the portion of students who live in the dormitory are, respectively, 80%, 60%, 30% and 20%.

12) Referring to Table 4-8, what is the probability that a randomly selected student is a freshman who lives in a dormitory?

13) Referring to Table 4-8, determine whether the class status of a student and whether the student lives in a dormitory are statistically independent.

14) The amount of bleach a machine pours into bottles has a mean of 36 oz. with a standard deviation of 0.15 oz. Suppose we take a random sample of 36 bottles filled by this machine. The probability that the mean of the sample is between 35.94 and 36.06 oz. is _____.

15) A manufacturer of power tools claims that the average amount of time required to assemble their top-of-the-line table saw is 80 minutes with a standard deviation of 40 minutes. Suppose a random sample of 64 purchasers of this table saw is taken. The probability that the sample mean will be greater than 88 minutes is _____.

16) As an aid to the establishment of personnel requirements, the director of a hospital wishes to estimate the mean number of people who are admitted to the emergency room during a 24-hour period. The director randomly selects 64 different 24-hour periods and determines the number of admissions for each. For this sample, $\bar{X} = 19.8$ and $S^2 = 25$. Estimate the mean number of admissions per 24-hour period with a 95% confidence interval.

TABLE 8-4

To become an actuary, it is necessary to pass a series of 10 exams, including the most important one, an exam in probability and statistics. An insurance company wants to estimate the mean score on this exam for actuarial students who have enrolled in a special study program. They take a sample of 8 actuarial students in this program and determine that their scores are: 2, 5, 8, 8, 7, 6, 5, and 7. This sample will be used to calculate a 90% confidence interval for the mean score for actuarial students in the special study program.

17) Referring to Table 8-4, the mean of the sample is _____, while the standard deviation of the sample is _____.

18) Referring to Table 8-4, a 90% confidence interval for the mean score of actuarial students in the special program is from _____ to _____.

19) A prison official wants to estimate the proportion of cases of recidivism. Examining the records of 250 convicts, the official determines that there are 65 cases of recidivism. A 99% confidence interval for the proportion of cases of recidivism would go from _____ to _____.

20) How many Kleenex should the Kimberly Clark Corporation package of tissues contain? Researchers determined that 60 tissues is the average number of tissues used during a cold. Suppose a random sample of 100 Kleenex users yielded the following data on the number of tissues used during a cold: $\bar{x} = 52$, $s = 22$. Give the null and alternative hypotheses to determine if the number of tissues used during a cold is less than 60.

21) Suppose that a student's math score X from next year's Graduate Record Exam can be considered as an observation from a normal population having mean 467 and standard deviation 110. Find the probability that the student scores are between 290 and 500. Show all your work and use the appropriate notation.

22) A sample of 36 measurements provide the sample mean $\bar{x} = 11.38$ and the sample standard deviation $s = 5.43$. For the population mean, construct a 95% percent confidence interval. Show all your work and use the appropriate notation.

23) The following data come from a normal distribution: 3, 4, 2, 8, 4, 7. Test the hypothesis $H_0 : \mu \leq 6$ against $H_1 : \mu > 6$ at $\alpha = .01$ (make sure to do all the six steps) $\bar{x}(\text{avg}) = 4.67$
 $s = 2.3329$

24) Suppose that measurements of the size of butterfly wings (cm) for two related species yielded the data:

Species 1	8	3	7	4	3	$s = 2.3452$	$\bar{x} = 5$
Species 2	6	9	5	4		$s = 2.1602$	$\bar{x} = 6$

1) Calculate S_{pooled}^2 , and give an estimate of the common standard deviation for the wing size for the two species.

2) Test the equality of two population mean wing sizes (versus a two-sided alternative). Assume that the data for each species come from a normal distribution.

25) A manager at a power company monitored the employee time required to process high-efficiency lamp bulb rebates. A random sample of 42 applicants gave a sample mean time of 3.7 minutes and a standard deviation of $\sigma = 1.3$ minutes. Is the claim that $\mu > 3.7$ minutes substantiated by these data? Test with $\alpha = .01$. (Give all the six steps)

26) If X has a normal distribution with $\mu = 120$ and $\sigma = 5$, find b such that $P(X > b) = .025$

MOM

SOLUTION FOR THE SAMPLE FINAL EXAM

- 1) 0.2132
 - 2) 0.8749
 - 3) 0.9802
 - 4) 0.39
 - 5) 1.04
 - 6) 0.49865
 - 7) 0.97725
 - 8) 0.2
 - 9) 0.9
 - 10) 0.96
 - 11) 0.975
 - 12) 0.28
 - 13) Not
 - 14) 0.9836
 - 15) 0.0548
 - 16) 19.8 ± 1.249 (18.55, 21.05)
 - 17) 6.0; 2.0
 - 18) 4.66 to 7.34
 - 19) (0.189, 0.331)
 - 20) $H_0: \mu \leq 60$ vs $H_1: \mu > 60$
- And all the 5 remaining steps

	DoV	Not	Total
80 Freshman	.28	.07	.35
60 Sophomore	.15	.10	.25
30 Junior	.048	.112	.16
20 Senior	.048	0.192	.24
Total	.526	.474	1.00

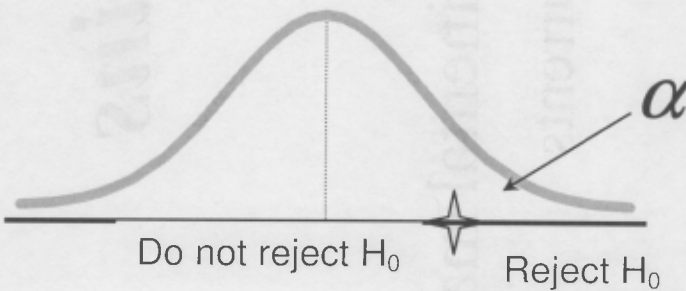
$$\frac{.28/1.00}{.35/1.00} = .8$$

$$\frac{.526}{1.00}$$

$$P(A|B) = P(A)$$

$$P(\text{status}/\text{denom}) = P(\text{status})$$

- 21) .5642
- 22) (9.275, 13.485) (9.5428, 13.217)
- 23) 1- $H_0: \mu \leq 6$ Vs $H_1: \mu > 6$
- 2- $n=6$ $\alpha = .01$
- 3- $T = \frac{\bar{x} - 6}{\frac{s}{\sqrt{n}}}$ d.f=5
- 4-



24) a) $S^2_{pooled} = 5.14$

The common standard deviation for the wing size is 2.26

b) 1) $H_0: \mu_1 = \mu_2$ VS $H_1: \mu_1 \neq \mu_2$

2) $n_1 = 5; n_2 = 4, \alpha = .05$

$$t = \frac{\bar{x}_1 - \bar{x}_2 - 0}{\sqrt{\frac{1}{5} + \frac{1}{4}}}$$

3) 2.26^*

4)

25. $H_0: \mu \leq 3.7$ $H_1: \mu > 3.7$
 $z = -2.33$ $\alpha = 0$
 $0 > -2.33$ so reject null hypo.

26. 129.8