

Marks

1. You are dealt 4 cards from a standard deck of 52 cards.
  - (3) (a) How many ways can the first card drawn be a king and the remaining cards are not kings.
  - (3) (b) How many ways can the first card drawn be a king and the remaining cards are not aces.
  - (3) (c) How many ways can the first card drawn be a king and the remaining cards are not hearts.
  
2. How many ways can a class of 25 students
  - (3) (a) Elect a president, vice president and treasurer?
  - (3) (b) Elect a committee of three to represent them?
  - (3) (c) Elect a president and two others?
  
3. A student council is made up of four women and six men. One of the women is president of the council. A member of the council is selected at random to report to the dean of student life.
  - (3) (a) What is the probability that a woman is selected?
  - (3) (b) What is the probability that a man is selected?
  
4. The Committee on Student Life did a survey of 417 students regarding satisfaction with student government and class standing. The results follow:

	Freshman	Sophomore	Junior	Senior	Total
Not Satisfied	17	19	23	12	71
Neutral	61	35	32	38	166
Satisfied	23	49	43	65	180
Total	101	103	98	115	417

Assume that the sample represents the entire population of students.

Find the probability that a student selected at random is

- (3) (a) Neutral and freshman
  - (3) (b) Satisfied, given that the student is a senior
  - (3) (c) Senior, given satisfied
5. The following data are based on a survey taken by a consumer research firm. In the table,  $x$  = number of televisions in household in household and % = percentages of U. S. households

$x$	0	1	2	3	4	5 or more
%	3%	11%	28%	39%	12%	7%

- (3) (a) What is the probability that a household selected at random has less than three televisions?
- (3) (b) What is the probability that a household selected at random has more than four televisions?

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6. Weights of a certain model of fully loaded gravel truck follow a normal distribution with mean  $\mu = 6.4 \text{ tons}$  and standard deviation  $\sigma = 0.3 \text{ ton}$ . What is the probability that a fully loaded truck of this model is
- (3) (a) less than 6 tons ?  
(3) (b) more than 7 tons ?  
(3) (c) between 6 and 7 tons ?
7. The weights of envelopes sent from an insurance office are normally distributed with the mean  $\mu = 12 \text{ ounces}$  and standard deviation  $\sigma = 3.7 \text{ ounces}$ . The mail room clerk would like to know the average weight of 20 envelopes. What is the probability that the mean weight  $\bar{x}$  is
- (3) (a) lighter than 10 ounces?  
(3) (b) between 10 and 13 ounces?
- (3) 8. Courts sometimes make mistakes, but which do you believe is the worst mistake convicting an innocent person or letting a guilty person go free? It turns out that 60% of all Americans believe that convicting an innocent person is the worst mistake. Suppose you are taking a sociology class with 30 students enrolled. The question discussed today is: Do you agree with the statement that convicting an innocent person is worse than letting the guilty go free? What is the probability that the proportion of the class who agrees is less than half?
- (4) 9. Computer Depot is a large store that sells and repairs computers. A random sample of 110 computer repair jobs took technicians an average of  $\bar{x} = 93.2$  minutes per computer. Assume that  $\sigma$  is known to be 16.9 minutes. Find a 99% confidence interval for the population mean time  $\mu$  for computer repairs.
- (4) 10. Mr. Crandall has assigned a term paper due at the end of the semester. He would like to know the average length of the paper. A random sample of 10 term paper has a  $\bar{x} = 14.7$  and a standard deviation of  $s = 5.31$ . Use these data to create a 95% confidence interval for the population mean length of all term papers for his class.
- (5) 11. Long term experience show that after eye surgery, the mean recovery time is 5.3 days. However, a random sample of 32 patients with this surgery had a sample mean recovery time  $\bar{x} = 4.2$  days. Does this indicate that the mean recovery time is dropping? Use a 1% level of significance. Assume  $\sigma = 1.9$  days.
- (5) 12. Is the national crime rate really going down? Some sociologists say yes! They say that the reason for the decline in crime rates in the 1980's and 1990's is demographics. It seems that the population is aging and older people commit fewer crimes. According to the FBI and the Justice Department, 70% of all arrests are of males aged 15 to 34 years. Suppose you are a sociologist and a random sample of police files showed that of 32 arrests last month, 24 were all males aged 15 to 34 years. Use a 1% level of significance to test the claim that the population proportion of such arrests is different from 70%.

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- (5) 13. Seven manufacturing companies agreed to implement a time management program in hopes of improving productivity. The average time, in minutes, it took the companies to produce the same quantity and kind of part are listed below. Does this information indicate the program decreased productivity time? Assume normal population distribution. Use  $\alpha = 0.05$

Company	1	2	3	4	5	6	7
<b>Before Program (1)</b>	75	112	89	95	80	105	110
<b>After Program (2)</b>	70	110	88	100	80	100	99

- (5) 14. The personnel manager of a large retail clothing store suspects a difference the mean amount of break time taken by workers during the weekday shifts compared to that of the weekend shift. It is suspected that the weekday workers take longer breaks on average. A random sample of 46 weekday workers had a mean  $\bar{x}_1 = 53$  minutes of break time per 8-hour shift. A random sample of 40 weekend workers had a mean  $\bar{x}_2 = 47$  minutes. Previous studies show that  $\sigma_1 = 7.3$  minutes and  $\sigma_2 = 9.1$  minutes. Test the manager's suspicion at the 5% level of significance.

- (5) 15. A lake in northern Wisconsin was stocked with fish. Seven years later samples were taken to see if the distribution had changed. Use the following results to test whether the distribution of fish has changed at the 0.01 level of significance.

Type of Fish	Percentage Stocked	Number Sampled in 7 years
Walleye	30%	150
Sunfish	25%	180
Northern	5%	30
Bass	40%	300

- (5) 16. JPC Pharmaceuticals is promoting a new test which correctly identifies drug users 95% of the time. (In other words, when a drug user is tested, it gives a positive result 95% of the time.) Unfortunately, it also gives a positive result for non users 7% of the time. Assume 12% of the population uses this drug. Given that a person tested positive for this drug, what is the probability that the person is in fact a user.
- (4) 17. There is about 75% probability that a truck will be going over the speed limit on the highway. Suppose that a random sample of five trucks on this stretch of highway is observed. Find the mean and the standard deviation of this probability distribution.