Elementary Statistics Final Examination Preparation

1 Consider the following data.

1.5	2.0	1.1	2.8	3.1	2.2	3.3
2.0	2.8	3.0	2.0	1.1	1.5	2.5

(a) Construct a stem-and-leaf display.
(b) Find the mean.
(c) Find the mode.

2 Consider the following data.

18.4	30.6	24.5	26.4	27.5	28.7	22.2
32.9	45.8	34.8	37.5	42.1	45.5	34.0

(a) Find the five number summary.
(b) Draw a box plot.

3 As part of Berkeley Guidance study, the heights (in cm) and weights (in kg) of 13 girls were measured at age two. The average height was 86.6 cm with a standard deviation of 2.9 cm and the average weight was 12.6 kg with a standard deviation of 1.4 kg. Which measure has more variability?

4 Find (a) the range, (b) the variance and (c) the standard deviation of the following data.

7	8	14	1	2	4

5 Among the 16 candidates for four positions on a city council, 10 are Democrats, 6 are Republicans. In how many ways can the 4 councilmen be chosen so that 3 are Democrats and 1 is a Republican?

6 Which is relatively better: a score of 75 on a history test or a score of 25 on a psychology test? Scores on history test have a mean of 80 and a standard deviation of 12. Scores on psychology test have a mean of 30 and a standard deviation of 8.

7 Consider the experiment of rolling a balanced six-sided die. Sample space $S = \{1, 2, 3, 4, 5, 6\}$. Let $A = \{1, 3\}$, $B = \{2, 3, 6\}$ and $C = \{4, 6\}$.

Find the following:

(a) $A \cup B$
(b) $A \cap C'$
(c) $(A \cup C)'$

(d) $P(A \cup B)$

(e) $P(A \cap C')$

8 Let $P(A) = 0.5$, $P(B) = 0.6$, and $P(A \cap B) = 0.3$. Find the following probabilities.

(a) $P(A \cup B)$.

(b) $P(A \cap B')$.

(c) $P(A' \cap B')$.

(d) $P\left[(A \cap B)'\right]$.

(e) $P\left[(A \cup B)'\right]$.

9 Let the random variable X have a Binomial distribution with n = 10 and p = 0.4. Find the following:

(a) $P(X < 3)$.

(b) $P(X \leq 3)$.

(c) $P(X \geq 4)$.

(d) $P(X > 5)$.

(e) $P(3 \leq X < 6)$.

10 The American Almanac of Jobs and Salaries, reported that 30% of accountants are employed in public accounting. Assume that this percentage applies to a group of 10 college graduates just entering the accounting profession. Find the following:

(a) Find the probability that at least 3 graduates will be employed in public accounting.

(b) Find the probability that at most 3 graduates will be employed in public accounting.

(c) Find the probability that less than 3 graduates will be employed in public accounting.

(d) Find the probability that more than 3 graduates will be employed in public accounting.

11 Find the mean, variance and the standard deviation the following probability distribution.

X	1	2	3
$f(x)$	0.20	0.60	0.20

12 Drivers who are members of a union earn an average of \$20.00 per hour. Assume that available data indicate wages are normally distributed with a standard deviation of \$2.25.

(a) What is the probability that wages are between \$15.50 and \$24.50 per hour?
(b) What is the probability that the wages are less than \$15.00 per hour?

13 Weights of men between the ages of 20 and 30 have a mean of 170 pounds with a standard deviation of 28 pounds. Assume that a simple random sample of 40 men in this age group is to be selected and the sample mean weight $\bar{x}$ is computed. (a) What is the mean of the sampling distribution of $\bar{x}$? (b) What is the standard error of the mean? (c) Find $P\left(\bar{X} > 178.85\right)$.

14 A zoologist measured tail length in 86 individuals, all in the one-year age group, of the deermouse Peromyscus. The mean length was 60.43 mm and the standard deviation was 3.06 mm. Construct a 95% confidence interval for the population mean length.

15 Six healthy three-year-old female Suffolk sheep were injected with the antibiotic Gentamicin, at a dosage of 10mg/kg body weight. Their blood serum concentrations (μ g/ml) of Gentamicin 1.5 hours after injection were as follows:

33 26 34 31 23 25

For these data, the sample mean is 28.7 and the sample standard deviation is 4.6. Construct a 95% confidence interval for the population mean.

16 BRCA1 is a gene that has been linked to breast cancer. Researchers used DNA analysis to search for BRCA1 mutations in 169 women with family histories of breast cancer. Of the 169 women tested, 27 had BRCA1 mutations. Let p denote the probability that a woman with a family history of breast cancer will have a BRCA1 mutation. Construct a 90% confidence interval for p.

17 A park ranger wants to know the average size of trout taken from a certain lake. How large a sample of trout must be taken to be able to assert with a probability 0.90 that a sample mean will not be off by more than 0.6 inch? Assume that it is known from previous studied that σ = 3.6 inches.

18 If you want to be 99% confident of estimating the population proportion to within an error of ± 0.04, what sample size is needed?

19 If you want to be 95% confident of estimating the population proportion to within an error of ± 0.02 and there is historical evidence that the population proportion is approximately 0.40, what sample size is needed?

20 As part of a study of the development of the thymus gland, researchers weighed the glands of thirty-six chick embryos after 14 days of incubation. The mean weight was 31.7 mg with a standard deviation of 8.7 mg. What can we assert with 99% confidence about the maximum error if we use 31.7 mg as an estimate of the true average weight of the thymus gland?

21 Is the average healthy adult body temperature equal to 98.6^0F? A sample of 106 healthy adults recorded an average of 98.4^0 F and a standard deviation of 0.72^0F. Assume that the body temperature is normally distributed. Conduct an appropriate test to answer the question at 0.01 level of significance. Also find the p-value.

22 A manufacturer of flashlight batteries took a sample of 13 batteries from a day's production and used them continuously until they failed to work. The life as measured by the number of hours until failure was 342, 426, 317, 545, 264, 451, 1049, 631, 512, 266, 492, 562, 298
At the 0.05 level of significance, is there evidence that the mean life of the batteries is more than 400 hours? Assume the battery life is approximately normal. Is the p-value greater than 0.05? Sample mean was 437.46 and the sample standard deviation was 210.76.

23 An article in Wall Street Journal implies that more than **half** of all Americans would rather be given $100 than a day off from work. This statement is based on a survey conducted by a private public polling firm, in which 593 of 1060 respondents indicated that they would rather have the $100. At the 0.05 level of significance, is there evidence on the survey data that more than half of all Americans would rather have $100? Find the p-value.

24 A carpet manufacturer is studying differences between two of its major outlet stores. The company is particularly interested in the time it takes before customers receive carpeting that has been ordered from the plant. Data concerning a sample of delivery times for the most popular type of carpet is summarized as follows:

	Store 1	Store 2
Sample size	41	31
Sample mean	34.3 days	37.1 days
Sample S.D.	2.4 days	5.1 days

Is there evidence of a difference in the average delivery time between the two outlet stores? Assume that the delivery time is approximately normal. Use 0.05 level of significance. Find the p-value.

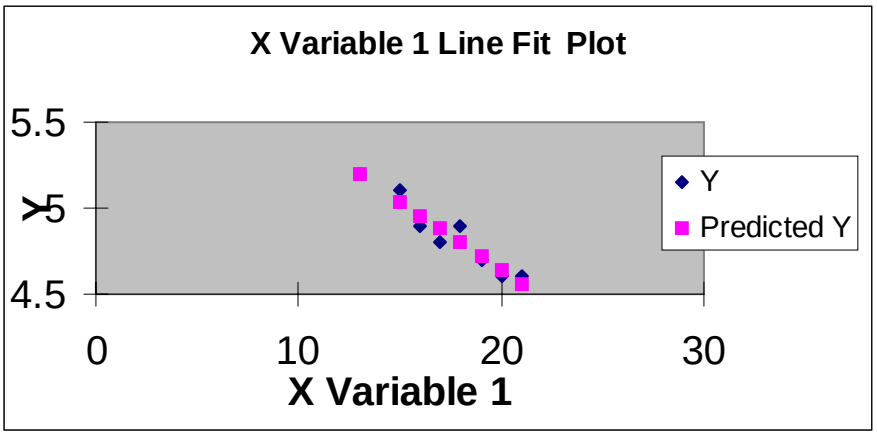
25 Shipments of meat, meat by-products, and other ingredients are mixed together in several filling lines at a pet food-canning factory. After the ingredients are thoroughly mixed, the pet food is placed into eight-ounce cans. Descriptive statistics concerning fill weights, from two production lines obtained from two independent samples are given in the following table:

	Line 1	Line 2
Sample size	11	16
Sample mean	8.005	7.997
Sample S.D.	0.012	0.005

Assume the populations are approximately normal and the variances are equal. Is there evidence of a difference between the average weight of cans filled on the two lines at 0.05 level of significance? Find the p-value.

26 In initial tests of the Salk vaccine, 33 of 200,000 vaccinated children later developed polio. Of 200,000 children vaccinated with a placebo, 115 later developed polio. Does it appear that the vaccine is effective? Use 0.005 level of significance. Use the p-value to argue your conclusion.
(Use 3 decimal places after leading zeros for all the calculations)

27 In a sample survey 150 of 500 persons interviewed in a large city said that they shop in the downtown area at least once a week. What can we say with 90% confidence about the maximum error if we use the s ample proportion to estimate the true proportion?



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.959215
R Square	0.920094
Adjusted R Square	0.906777
Standard Error	0.06729
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.312832	0.312832	69.08856	0.000164
Residual	6	0.027168	0.004528		
Total	7	0.34			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	6.226065	0.167253	37.22537	2.51E-08	5.816811	6.635319	5.816811	6.635319
X Variable 1	-0.0792	0.009528	-8.31195	0.000164	-0.10251	-0.05588	-0.10251	-0.05588

(a) Write down equation of the regression line.

(b) What is the correlation coefficient?

(c) Test $H_0 : a = 0$ verses $H_a : a \neq 0$ at 0.01 level of significance.

(d) Test $H_0 : b = 0$ verses $H_a : b \neq 0$ at 0.01 level of significance.

(e) Find a 95% confidence interval for a.