

King Fahd University of Petroleum and Minerals
Department of Mathematics
STAT 201
Final Exam
Term 252
May 13, 2026
Net Time Allowed: 120 Minutes

MASTER VERSION

1. (Suggested Problem 2-163) A researcher receives 20 containers of oxygen. Of those containers, 8 have oxygen that is not ionized, and the rest are ionized. Two samples are randomly selected, without replacement, from the lot. What is the probability that the second one selected is not ionized given that the first one was ionized?

- (a) 0.4211 _____(correct)
(b) 0.4000
(c) 0.3684
(d) 0.5789
(e) 0.4444

2. (Problem 3-16) $f(x) = \left(\frac{8}{7}\right) \left(\frac{1}{2}\right)^x$, $x = 1, 2, 3$. Determine $P(X \leq 1 \text{ or } X > 1)$

- (a) 1.0 _____(correct)
(b) 0.0
(c) 0.5
(d) 0.25
(e) 0.75

3. (Problem 6-6) Suppose that you add 5 to all of the observations in a sample. How does it change the sample standard deviation?

- (a) The standard deviation is not changed. _____(correct)
- (b) The standard deviation is decreased by 5.
- (c) The standard deviation is increased by 5.
- (d) The standard deviation is increased by 2.5.
- (e) The standard deviation is increased by 25.

4. (Problem 4-60) Cholesterol is a fatty substance that is an important part of the outer lining (membrane) of cells in the body of animals. The Food and Nutrition Institute of the Philippines found that the total cholesterol level for Filipino adults has a mean of 160 mg/dl and 84.13% of adults have a cholesterol level less than 180 mg/dl. Suppose that the total cholesterol level is normally distributed. An adult is at moderate risk if cholesterol level is more than one but less than two standard deviations above the mean. What proportion of the population is at moderate risk according to this criterion?

- (a) 0.1359 _____(correct)
- (b) 0.1587
- (c) 0.0228
- (d) 0.8413
- (e) 0.9772

5. (Problem 4-114) Suppose that X has an exponential distribution with a mean of 10. Which of the following statements is true?

- (a) $P(X < 15 \mid X > 10) = P(X < 5)$ _____(correct)
- (b) $P(X < 15 \mid X > 10) > P(X < 5)$
- (c) $P(X < 15 \mid X > 10) < P(X < 5)$
- (d) $P(X < 15 \mid X > 10) = P(X > 5)$
- (e) $P(X < 15 \mid X > 10) = P(X < 15)$

6. (Suggested Problem 7-12) The amount of time that a customer spends waiting at an airport check-in counter is a random variable with mean 8.3 minutes and standard deviation 1.8 minutes. Suppose that a random sample of $n = 36$ customers is observed. Approximate the probability that the average time waiting in line for these customers is between 8.0 and 8.6 minutes.

- (a) 0.68268 _____(correct)
- (b) 0.34134
- (c) 0.15866
- (d) 0.84134
- (e) 0.13236

7. (Problem 8-28) An Izod impact test was performed on 20 specimens of PVC pipe. The sample mean is 1.25 and the sample standard deviation is 0.25. Compute a 98% confidence interval on average Izod impact strength, and use it to test the hypothesis $H_0 : \mu = 1.0$. Which one of the following statements is correct?

- (a) Reject H_0 , as 1.0 falls outside the confidence interval _____(correct)
- (b) Reject H_0 , as 1.0 falls inside the confidence interval
- (c) Do not Reject H_0 , as 1.0 falls inside the confidence interval
- (d) Do not Reject H_0 , as 1.0 falls outside the confidence interval
- (e) Using the computed confidence interval, we can not reach a valid decision

8. (Problem 9-1) Which of the following hypotheses refer to a correctly stated hypothesis testing problem?

- (a) $H_0 : \mu = 50$, $H_1 : \mu \neq 50$ _____(correct)
- (b) $H_0 : \sigma > 10$, $H_1 : \sigma = 10$
- (c) $H_0 : \bar{x} = 50$, $H_1 : \bar{x} \neq 50$
- (d) $H_0 : p \neq 0.1$, $H_1 : p = 0.1$
- (e) $H_0 : s = 30$, $H_1 : s > 30$

9. (Problem 9-20) A manufacturer is interested in the output voltage of a power supply used in a PC. Output voltage is assumed to be normally distributed, with standard deviation 0.24 volt, and the manufacturer wishes to test $H_0 : \mu = 5$ volts against $H_1 : \mu \neq 5$, using $n = 16$ units. The acceptance region is $4.88 \leq \bar{X} \leq 5.12$. Find the value of α .

- (a) 0.04550 _____(correct)
- (b) 0.02275
- (c) 0.95450
- (d) 0.97725
- (e) 0.05000

10. (Problem 9-26) The proportion of residents in Phoenix favoring the building of toll roads to complete the freeway system is believed to be $p = 0.4$. If a random sample of 100 residents shows that 27 or fewer favor this proposal, we will conclude that $p < 0.4$. Find the probability of committing a type II error with this procedure if $p = 0.2$.

- (a) 0.04006 _____(correct)
- (b) 0.95994
- (c) 0.07640
- (d) 0.99598
- (e) 0.22750

11. (Problem 9-40) The mean water temperature downstream from a power plant cooling tower discharge pipe should be no more than 38.11°F. Past experience has indicated that the standard deviation of temperature is 1.55°F. The water temperature is measured on 25 randomly chosen days, and the average temperature is found to be 37.4°F. What is the p -value for testing

$$H_0 : \mu \leq 38.11 \quad \text{vs.} \quad H_1 : \mu > 38.11$$

- (a) 0.98899 _____(correct)
(b) 0.01101
(c) 0.02202
(d) 0.67724
(e) 0.32276
12. (Problem 9-56) Consider the computer output below.

One Sample t-test

```
data: X
t = 2.858, df = 15, p-value = 0.012
alternative hypothesis: true mean is not equal to 34
95 percent confidence interval:
34.324 36.224
sample estimates:
mean of X
35.274
```

At what level of significance can the null hypothesis be rejected?

- (a) We can reject the null hypothesis at significance levels greater than or equal to 0.012. (correct)
(b) We can reject the null hypothesis at significance levels less than or equal to 0.012.
(c) We can reject the null hypothesis at significance levels less than or equal to 0.988.
(d) We can reject the null hypothesis only at significance level 0.05.
(e) We can reject the null hypothesis only at significance level 0.012.

13. (Problem 11-1) An article in Concrete Research presented data on compressive strength (x) and intrinsic permeability (y) of various concrete mixes and cures. Summary quantities are $n = 11$, $\sum y_i = 404.91$, $\sum y_i^2 = 15156.6811$, $\sum x_i = 47$, $\sum x_i^2 = 225.3286$, and $\sum x_i y_i = 1653.7781$. Also,

$$S_{XX} = 24.51042, \quad S_{YY} = 251.944, \quad S_{XY} = -76.2919, \quad SSR = 237.46857, \quad SSE = 14.47543.$$

Assume that the two variables are related according to the simple linear regression model. The fitted regression line is $\hat{y} = 50.10942 - 3.11263x$. Suppose that the observed value of permeability at $x = 3.00$ is 38.62. Calculate the value of the corresponding residual.

Note: This question uses a different dataset from the other questions in the exam.

- (a) -2.15153 _____(correct)
(b) 2.15153
(c) 40.77153
(d) 38.62000
(e) -3.11263

14. (Problem 11-1) An article in Concrete Research presented data on compressive strength (x) and intrinsic permeability (y) of various concrete mixes and cures. Summary quantities are $n = 13$, $\sum y_i = 490.13$, $\sum y_i^2 = 18706.8045$, $\sum x_i = 54.86$, $\sum x_i^2 = 257.1384$, and $\sum x_i y_i = 1995.477$. Also,

$$S_{XX} = 25.6292, \quad S_{YY} = 227.77243, \quad S_{XY} = -72.8716, \quad SSR = 207.19609, \quad SSE = 20.57634.$$

Assume that the two variables are related according to the simple linear regression model. The fitted regression line is $\hat{y} = 49.70105 - 2.84330x$. What is the standard error of the slope coefficient?

Note: This question uses a different dataset from the other questions in the exam.

- (a) 0.27016 _____(correct)
(b) 0.89602
(c) 1.36769
(d) 0.07299
(e) 0.24851

15. (Problem 11-1) An article in Concrete Research presented data on compressive strength (x) and intrinsic permeability (y) of various concrete mixes and cures. Summary quantities are $n = 12$, $\sum y_i = 443.99$, $\sum y_i^2 = 16679.1943$, $\sum x_i = 50.39$, $\sum x_i^2 = 235.1413$, and $\sum x_i y_i = 1788.0105$. Also,
- $$S_{XX} = 23.54529, \quad S_{YY} = 251.93429, \quad S_{XY} = -76.37751, \quad SSR = 247.75755, \quad SSE = 4.17674.$$

Assume that the two variables are related according to the simple linear regression model. The fitted regression line is $\hat{y} = 50.62066 - 3.24386x$. What is the estimate of the error variance σ^2 ?

Note: This question uses a different dataset from the other questions in the exam.

- (a) 0.41767 _____(correct)
 (b) 0.34806
 (c) 0.37970
 (d) 0.64627
 (e) 4.17674

16. (Problem 11-1) An article in Concrete Research presented data on compressive strength (x) and intrinsic permeability (y) of various concrete mixes and cures. Summary quantities are $n = 14$, $\sum y_i = 530.24$, $\sum y_i^2 = 20338.755$, $\sum x_i = 60.16$, $\sum x_i^2 = 285.3356$, and $\sum x_i y_i = 2198.5732$. Also,
- $$S_{XX} = 26.81949, \quad S_{YY} = 256.29374, \quad S_{XY} = -79.94383, \quad SSR = 238.29748, \quad SSE = 17.99627.$$

Assume that the two variables are related according to the simple linear regression model. The fitted regression line is $\hat{y} = 50.68326 - 2.98081x$. Which of the following is the correct interpretation of the estimated slope?

Note: This question uses a different dataset from the other questions in the exam.

- (a) For each unit increase in compressive strength, mean permeability decreases by about 2.98081 units. _____(correct)
 (b) For each unit increase in compressive strength, mean permeability increases by about 2.98081 units.
 (c) A 2.98081-unit increase in permeability causes compressive strength to decrease by one unit.
 (d) Permeability is independent of compressive strength.
 (e) When compressive strength is zero, mean permeability decreases by 2.98081 units.

17. (Problem 11-1) An article in Concrete Research presented data on compressive strength (x) and intrinsic permeability (y) of various concrete mixes and cures. Summary quantities are $n = 12$, $\sum y_i = 457.24$, $\sum y_i^2 = 17561.7924$, $\sum x_i = 50.57$, $\sum x_i^2 = 236.4425$, and $\sum x_i y_i = 1879.9483$. Also,

$$S_{XX} = 23.33209, \quad S_{YY} = 139.42427, \quad S_{XY} = -46.93727, \quad SSR = 94.42390, \quad SSE = 45.00037.$$

Assume that the two variables are related according to the simple linear regression model. In the fitted simple linear regression model, approximately what percentage of the total variation in the response variable remains unexplained?

Note: This question uses a different dataset from the other questions in the exam.

- (a) 32.27585% _____(correct)
 (b) 67.72400%
 (c) 45.00037%
 (d) 22.77600%
 (e) 4.50004%
18. (Problem 12-21) Consider the R output below for a multiple linear regression model.

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	76.1272	10.6624	??	??
x1	2.6673	0.7666	3.4793	??
x2	-2.7246	0.9865	??	??

Residual standard error: ?? on 12 degrees of freedom

Multiple R-squared: ??, Adjusted R-squared: 0.9972

F-statistic: ?? on 2 and 12 DF, p-value: ??

Analysis of Variance

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Regression	2	1366.288	683.144	??	??
Residual Error	??	??	??		
Total	14	1369.613			

What is the value of the test statistic used to test whether at least one predictor is significant in the regression model?

- (a) 2465.4820 _____(correct)
 (b) 1366.2880
 (c) 683.1440
 (d) 7.1398
 (e) 3.4793

19. (Problem 12-21) Consider the R output below for a multiple linear regression model.

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	76.1272	10.6624	??	??
x1	2.6673	0.7666	3.4793	??
x2	-2.7246	0.9865	??	??

Residual standard error: ?? on 12 degrees of freedom

Multiple R-squared: ??, Adjusted R-squared: 0.9972

F-statistic: ?? on 2 and 12 DF, p-value: ??

Analysis of Variance

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Regression	2	1366.288	683.144	??	??
Residual Error	??	??	??		
Total	14	1369.613			

For the test used to test whether at least one predictor is significant in the regression model, what are the degrees of freedom for numerator and denominator respectively?

- (a) 2, 12 _____(correct)
- (b) 2, 14
- (c) 14, 12
- (d) 12, 2
- (e) 1, 12

20. (Problem 12-21) Consider the R output below for a multiple linear regression model.

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	76.1272	10.6624	??	??
x1	2.6673	0.7666	3.4793	??
x2	-2.7246	0.9865	??	??

Residual standard error: ?? on 12 degrees of freedom

Multiple R-squared: ??, Adjusted R-squared: 0.9972

F-statistic: ?? on 2 and 12 DF, p-value: ??

Analysis of Variance

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Regression	2	1366.288	683.144	??	??
Residual Error	??	??	??		
Total	14	1369.613			

What is the value of the standard deviation of the residuals (standard error of estimate)?

- (a) 0.5264 _____(correct)
- (b) 0.2771
- (c) 0.7666
- (d) 0.4709
- (e) 3.4793