Final Policies

You should have the following items on your desk (and nothing else) during the final:

- Pen and/or pencil and/or eraser - make sure you have enough writing utensils and they are functional. You should not try to open your bag to get another pen. Have everything ready prior to the midterm.
- Scientific calculator.
- UCI Student ID card - we will come around to check your ID during the midterm.

The following items are **not** permitted during the midterm

- Scrap paper
- Watches - remaining time will be displayed on the screen.
- Cell phones - turn your cell phone off completely and put it in your bag not in your pocket.
- Laptops / Ipads/Tablets
- Graphing calculator
- Notes of any kind, books etc.
- Any note taking device or any device with internet connectivity

Note that if you use an eraser (for pen or pencil) and do not erase well, you may not receive any points if previous answer and the latest answer are visible simultaneously.

Multiple choice questions have one correct answer. Only choose one of the choices. Write your answers in the boxes provided. You should only write a single letter in each of these boxes.

For questions that are **not** multiple choice, show your work. Write your final answers in the boxes provided. You should only write numbers in these boxes. For instance if your answer is $P(A) = 0.12$ only write 0.12 inside the box.

You will have 115 minutes. You may leave the classroom if you finish early. Make sure to review your answers before leaving.

You may not start the final until you are prompted to start. Just write your name and student ID number and wait for the prompt to start. Once you begin make sure to write your name and Student ID on top of every page.

Row:	Seat:

1. For a normally distributed random variable, 80% of the observations are contained within _____ standard deviations of the mean. Make sure to write the final numeric answer in the box. Round to two decimal places.

   (A) `qnorm(0.10)`

   (B) `qnorm(0.20)`

   (C) `qnorm(0.80)`

   (D) `qnorm(0.90)`

2. Jared brings his Macbook into the Apple store because he feels it has not been working properly. The diagnostics test found that there is a problem with graphics chip and it gets sent to get repaired. Once it starts being repaired, it turns out that it was never actually broken. What type of error did the diagnostics test produce and why?

   (A) A Type I error because we rejected the null hypothesis and it turned out the null was true.
   (B) A Type I error because we failed to reject the null hypothesis and it turned out the null was true.
   (C) A Type II error because we failed to reject the null hypothesis and it turned out the null was false.
   (D) A Type II error because we rejected the null hypothesis and it turned out the null was true.
   (E) No error was committed.

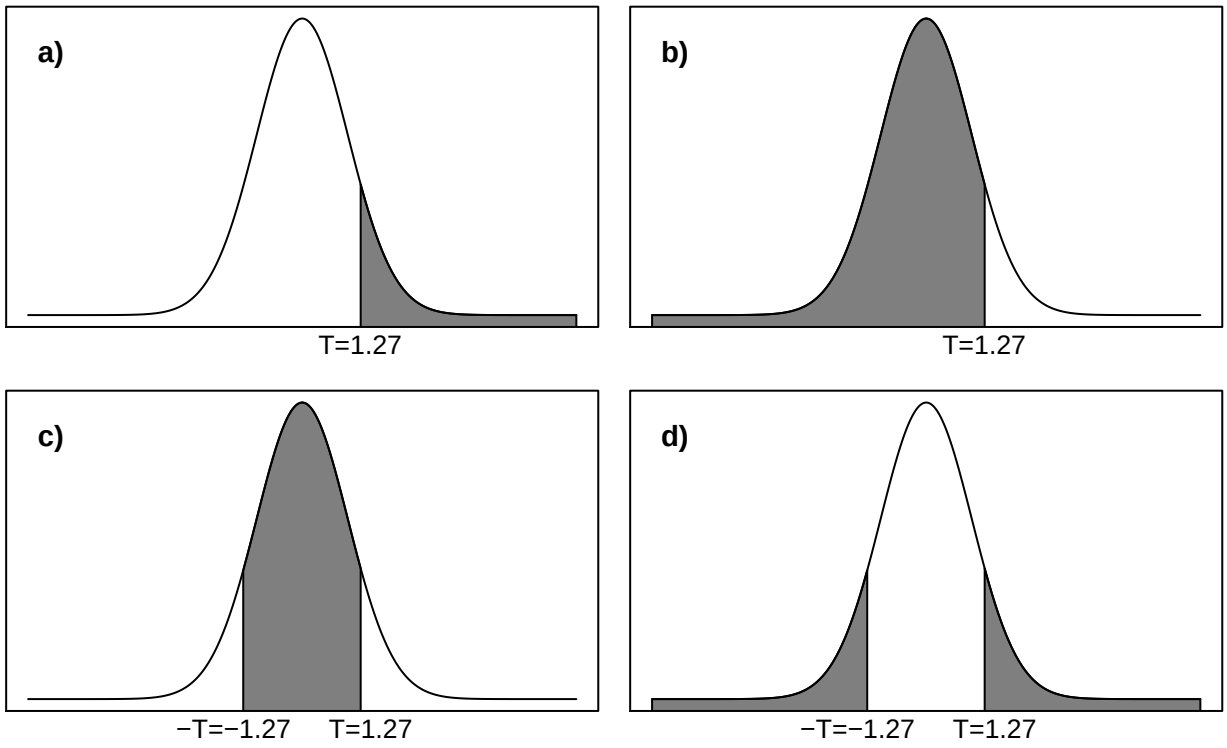
You test the following hypotheses:

$H_0 : \mu = 5$

$H_A : \mu > 5$

with a sample of n = 397, and obtain a T-statistic of 1.27. Answer the next three questions based on this information. Take $\alpha = 0.05$

3. The shaded region in which of the following plots describes the p-value for this T-statistic?



4. How many degrees of freedom does the test-statistic T = 1.27 have?

5. Assuming you had already assigned your degrees of freedom to a variable named `degFree`, which line of code would find the appropriate T-critical value for this test?

   (A) `qt(0.05, df = degFree)`

   (B) `qt(0.025, df = degFree)`

   (C) `qt(0.975, df = degFree)`

   (D) `qt(0.95, df = degFree)`

6. Which of the following is false?

   (a) The sample mean is an unbiased estimator of the population mean.

   (b) As n increases the t-distribution approaches a normal distribution.

   (c) As number of samples increases for large samples, the sampling distribution approaches a normal distribution.

   (d) The standard deviation can be negative.

7. In 2018, Irvine held City Council elections. The two candidates who won election to council were Anthoy Kuo and Farrah Khan. We are interested in whether Kuo and Khan's campaign contribution amounts (in US dollars) are significantly different. Which of the following hypotheses would represent the question we are interested in?

   (A) $H_0 : \mu_{Kuo} = \mu_{Khan}$, $H_A : \mu_{Kuo} \neq \mu_{Khan}$
   (B) $H_0 : p_{Kuo} = p_{Khan}$, $H_A : p_{Kuo} \neq p_{Khan}$
   (C) $H_0 : \mu_{diff} = 0$, $H_0 : \mu_{diff} \neq 0$
   (D) $H_0 : p_{diff} = 0$, $H_A : p_{diff} \neq 0$

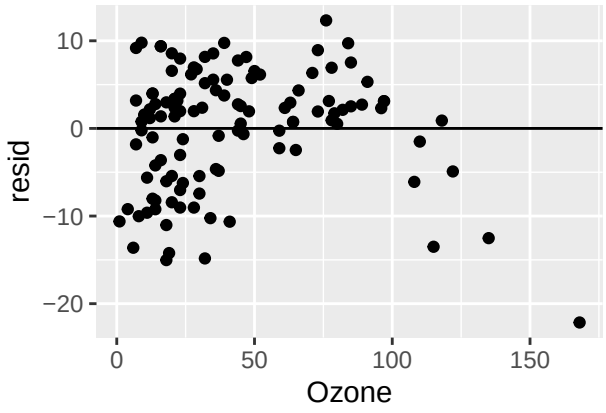
We have information on daily air quality measurements for New York between May and September 1973. We would like to know if there is a relationship between temperature ($^\circ F$) and ozone (ppb). Below is a summary of the linear model regression temperature (variable is called `Temp`) on ozone (variable is called `Ozone`). Answer the next four questions based on this information.

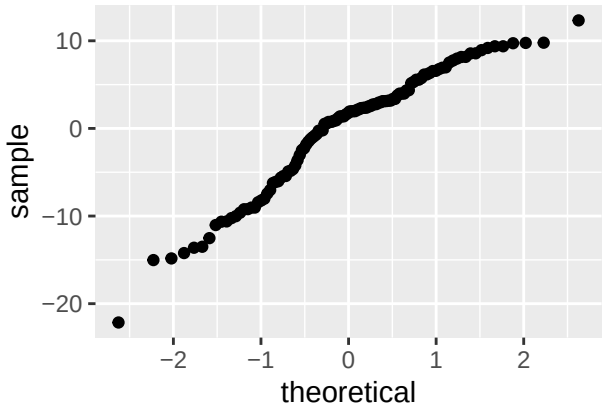
```
##
## Call:
## "lm(formula = _____________, data = airquality)"
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -22.147  -4.858   1.828   4.342  12.328
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 69.41072    1.02971   67.41   <2e-16 ***
## Ozone        0.20081    0.01928   10.42   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.819 on 114 degrees of freedom
##   (37 observations deleted due to missingness)
## Multiple R-squared:  0.4877, Adjusted R-squared:  0.4832
## F-statistic: 108.5 on 1 and 114 DF,  p-value: < 2.2e-16
```

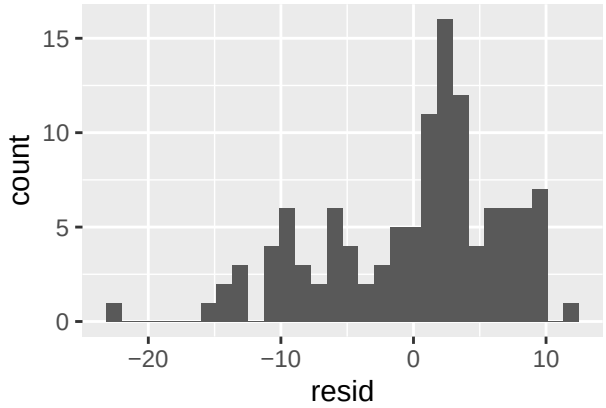
8. The model summary has a blank. Fill in the blank with appropriate code.

9. Interpret the coefficients (slope and intercept) in the context of air quality. Make sure to use the units of the variables.

10. Below are a residual plot, a QQ-plot, and a histogram of residuals for the model. Check whether the conditions for a linear regression are met.







11. Regardless of what you determine in Question 10, construct a 95% confidence interval for the slope. Interpret it in the context of the problem.

The UCI Transportation website is now selling parking permits for the Winter quarter. Approximately every three minutes, someone logs on and purchases a permit. Answer the next two questions based on this information.

12. How many permits can we expect to be sold in a typical 2 hour period?

(A) 32
(B) 20
(C) 25
(D) 55
(E) 40

13. A permit has just been purchased. Which of the following can be used to calculate the probability that we will need to wait at least 5 minutes until the next permit is purchased?

(A) $\frac{1}{5-3}$
(B) $\int_5^\infty (\frac{1}{3}) e^{-\frac{1}{3}x}$
(C) $\frac{3^5}{5!} e^{-3}$
(D) $\int_5^\infty (\frac{1}{5}) e^{-(\frac{1}{5})x}$
(E) $5e^{-(5)3}$

14. Assume that there is a student that has a 37% chance of getting an A on any assignment for any class. Which of the following would be used to calculate the probability that this student gets an A on 3 of 10 assignments?

(A) $\binom{10}{3}(0.37)^3(1-0.37)^7$
(B) $(0.37)(1-0.37)^9$
(C) $10e^{-10(3)}$
(D) $\frac{1}{10-3}$
(E) $\frac{10^3e^{-10}}{3!}$

15. Assume that there is a student that has a 37% chance of getting an A on any assignment for any class. Which of the following would be used to calculate the probability that this student gets their first A on the 5th assignment?

(A) $\binom{10}{5}(0.37)^5(1-0.37)^5$
(B) $(0.37)(1-0.37)^4$
(C) $5e^{-5(5)}$
(D) $\frac{1}{5}$
(E) $\frac{10^5e^{-10}}{5!}$

16. Assume that the student is expected to get 7 A's in one quarter of class. Which of the following can be used to calculate the probability that this student will get exactly 9 A's in a quarter?

(A) $\binom{9}{7}(0.37)^7(1-0.37)^2$
(B) $(0.37)(1-0.37)^9$
(C) $7e^{-7(9)}$
(D) $\frac{7}{9}$
(E) $\frac{7^9e^{-7}}{9!}$

17. Let X be the time before your phone runs out of battery after it has been completely charged. What distribution is X likely to follow?

    (A) Bernoulli Distribution
    (B) Normal Distribution
    (C) Exponential Distribution
    (D) Poisson Distribution
    (E) Geometric Distribution

18. Let X be a continuous random variable with a uniform distribution, in other words $X \sim U(a, b)$. Plot the cumulative distribution function $F(x)$. Make sure to label a and b clearly on your plot.

19. We want to compare the proportion of flights that are on time under two airline carriers: Southwest Airlines and Frontier Airlines. Taking a random sample of 50 Frontier flights from 2013, we find that 1 flight (2%) was on time; in a random sample of 49 Southwest flights from the same time period, we also find that 1 flight (2.04%) was on time. What is the standard error?

(A) $\sqrt{\frac{0.02(1-0.02)}{50} + \frac{0.0204(1-0.0204)}{49}}$

(B) $\frac{0.02(1-0.02)}{50} + \frac{0.0204(1-0.0204)}{49}$

(C) $\frac{0.02(1-0.02)}{\sqrt{50}} + \frac{0.0204(1-0.0204)}{\sqrt{49}}$

(D) $\sqrt{\frac{0.02(1-0.02)}{50} + \frac{0.02(1-0.02)}{49}}$

20. Let X be a random variable with the following probability mass function:

X	0	1	2	3
$P(X)$	$\frac{\theta}{5}$	$\frac{3\theta}{5}$	$\frac{3(1-\theta)}{5}$	$\frac{2-\theta}{5}$

where $0 < \theta < 1$ and $\{3, 2, 2, 1, 0, 0\}$ represents a set of six observations taken from this distribution. Estimate θ using maximum likelihood.