
New York City College of Technology
Department of Mathematics

MAT 1272 Final Exam Review Problems¹

Directions: Show all work. When using the calculator write down the function buttons used. Do not just write a numerical solution – write a sentence indicating what answer represents. The answers have solutions this format.

1. Use the following 20 values:

222 233 254 241 251 268 276 220 238 253
249 236 247 256 261 227 257 244 239 242

to perform the following tasks.

- (a) Construct a frequency distribution table using 6 classes.
 - (b) Draw a histogram for the frequency distribution in part (a).
 - (c) Draw a frequency polygon for the frequency distribution in part (a).
2. The data set below is a sample of the Mathematics test scores of 10 students.

56 96 78 67 60 69 85 90 89 72

- (a) Find the mean and median of the given test scores.
 - (b) Is there a mode value for these scores? Why or why not?
 - (c) Find the range and standard deviation (nearest hundredth) of these scores.
 - (d) Find the percentile rank of 78.
 - (e) What percent of these scores are within 1 standard deviation from the mean?
3. (a) Draw a stem and leaf graph using the following data.

22 31 42 49 35 24 58 61 73 24 32 42 98 61 58

- (b) Prepare a box-and-whisker plot for these values – indicate an outlier.
4. The chart below records the number of hours 12 students spent online during the weekend and the math test scores they achieved the following Monday.

Hours on-line (x)	0	7	5	2	3	5	1	3	5	10	7	6
Test scores (y)	96	75	84	82	74	76	85	95	68	50	65	58

- (a) Is there a positive, negative or no relationship between the number of hours spent online and the exam grade? Give reasons for your answer.
- (b) Find the value of r , the linear regression constant, and discuss whether this value confirms your answer to part (a).
- (c) Find the equation of the regression line.
- (d) Using the regression line, predict, if possible, the math exam grade if a student was online for:
 - i) 4 hours
 - ii) 5.5 hours
 - iii) 20 hours.

¹Revised by Professor Taraporevala, Spring 2024

5. The table below shows the result of a survey in which 2000 students were asked how they voted in the 2016 Presidential Election.

	Voted for X	Voted for Y	Voted for another	Did not vote
City Tech Males	195	452	124	221
City Tech Females	84	653	87	184

- (a) Find the probability that a student in this group did not vote. Express your answer as a fraction that is not reduced.
- (b) Find the probability the student was female, given that a student voted for Y. Express your answer as a fraction that is not reduced.
- (c) Find the probability that a student was male or voted for another candidate. Express your answer as a fraction that is not reduced.
- (d) What is the probability that the student did not vote for X? Express your answer as a fraction that is not reduced.
- (e) Are the categories “student is male” and “voted for X” mutually exclusive? Give reasons for your answer.
6. A box contains 15 red, 10 blue, and 5 green marbles.
- (a) Two marbles are selected at random with replacement. Find the probability they are both red. Express your answer as a fraction that is not reduced.
- (b) Two marbles are selected at random without replacement. Find the probability that the first is blue and the second is green. Express your answer as a fraction that is not reduced.
- (c) Two marbles are selected at random without replacement. Find the probability that both are blue. Express your answer as a fraction that is not reduced.
- (d) Two marbles are selected at random without replacement. Find the probability that the first is blue and the second is yellow. Give reasons for your answer.
7. The table shows the result of a survey given to 250 randomly selected students who were waiting for advisement in the Fall 2016.

	Going for an Associate’s degree	Going for a Bachelor’s degree	Neither
Receiving TAP	85	42	23
Not receiving TAP	51	34	15

- (a) Find the probability that a student from this group is receiving TAP and is going for a Bachelor’s Degree? Express your answer as a fraction that is not reduced.
- (b) Given that a student from this group is receiving TAP what is the probability that the student is going for an Associate’s Degree? Express your answer as a fraction that is not reduced.
- (c) What is the probability that a student is going for an Associate’s Degree? Express your answer as a fraction that is not reduced.
- (d) Are the categories “is going for an Associate’s Degree” and “is receiving TAP” independent? Give reasons for your answer.
8. (a) A club elects a president, vice-president, secretary and treasurer. How many different sets of officers are possible if there are 10 members to choose from?
- (b) In a group of 10 people, 4 will each win \$500. How many wining groups are possible? Arrangement does not matter.
- (c) How many five-digit zip codes can be made, where the possible digits are the numbers from 0 through 9, and no repeats are allowed?

- (d) How many five-digit zip codes can be made, where the possible digits are the numbers from 0 through 9, and repeats are allowed?
9. A study group is to be selected from a group of 16 students. The group consists of 5 freshmen, 7 sophomores, and 4 juniors.
- (a) In how many ways can a group of 6 students be selected from this group?
- (b) If the study group is to consist of 2 freshmen, 3 sophomores, and 1 junior, how many different groups are possible?
- (c) What is the probability that a group of 6 students will consist of 2 freshmen, 3 sophomores and junior?
10. Let x be the number of PC computers repaired at the Best Buy in Green Acres Mall on a randomly selected day. This data is represented in the discrete probability distribution table below.

x	1	2	3	4	5
$P(x)$	0.16	0.22	?	0.20	0.14

- (a) Find the probability that 3 computers were repaired that day.
- (b) Find the mean of this probability distribution.
- (c) Find the standard deviation of this probability distribution.
- (d) Find the probability that at most 4 computers were repaired.
11. According to the National Institute of Health 32% of all women fracture a hip by the age of 90. Suppose 8 women aged 90 are selected at random. Write the calculator commands used. Do not forget to describe a success and give the values of n , p and q . You are required to draw a picture.
- (a) What is the probability that exactly 5 suffered from a hip fracture?
- (b) What is the probability that at most 3 suffered from a hip fracture? Express a success in words. Find n , p , and q .
- (c) What is the probability that none suffered from a hip fracture? Express a success in words. Find n , p , and q .
- (d) What is the probability that at least six have not had a hip fracture? Express a success in words. Find n , p , and q .
12. In a recent race, the finish times formed a normal distribution with a mean of 210 minutes and a standard deviation of 25 minutes.
- (a) Find the z -score of Jose who finished in 190 minutes.
- (b) Find the z -score of Estella who finished in 270 minutes
- (c) What is the probability that a racer finished in less than 180 minutes? Write the calculator commands used. Do not forget to draw the picture.
- (d) What is the probability that a racer finished between 190 and 225 minutes? Write the calculator commands used. Do not forget to draw the picture.
13. A professor determined that the grades on the statistics final exam are normally distributed with a mean grade of 68 and a standard deviation of 15.
- (a) If Mohammed had a z score of 1.25, what was his grade?
- (b) Students in the top 12% receive an A the student what is the lowest grade a student can get and still get an A? Write the calculator commands used. Do not forget to draw the picture.
- (c) Students in the bottom 15% will fail the course. What is the cutoff grade a student can get and still pass? Write the calculator commands used. Do not forget to draw the picture.

14. The number of major earthquakes in a year forms an approximately normal distribution with a mean of 20.8 and a standard deviation of 4.5.
- Find the probability that in a given year there will be more than 21 earthquakes. Write the calculator commands used. Do not forget to draw the picture.
 - Find the probability that in a given year there will be between 18 and 23 earthquakes. Write the calculator commands used. Do not forget to draw the picture.
15. The tires manufactured by the ABC Tire Company last an average of 42,000 miles with a standard deviation of 7,800 miles. If a random sample of 75 tires manufactured by the ABC Tire Company is taken, what is the probability that these tires:
- will last more than 41,000 miles? (Write the calculator commands used. Do not forget to draw the picture.)
 - will last less than 43,250 miles? (Write the calculator commands used. Do not forget to draw the picture.)
 - will last between 41,000 and 43,250 miles?
16. Fifty-eight percent of all adults plan to purchase a Fitbit next year. You randomly select 200 adults and ask them if they plan to buy a Fitbit next year. What is the probability that at least 120 of these adults will say they will buy a Fitbit next year? Write the calculator commands used. Do not forget to describe a success and give the values of n , p and q . You are required to draw a picture.
17. A survey of all City Tech students found that 35% say they get their lunch from the salad bar in the cafeteria. A random sample of 140 students is selected and asked if they get their lunch from the salad bar in the cafeteria. Write the calculator commands used. You are required to draw a picture.
- What is the probability that at most 55 say they get their lunch from the salad bar in the cafeteria?
 - What is the probability that more than 40 say they get their lunch from the salad bar in the cafeteria?
 - What is the probability that between 50 and 60, inclusive, say they get their lunch from the salad bar in the cafeteria?
18. In the past, all patrons of a cinema complex have spent an average of \$5.00 for popcorn and other snacks, with a standard deviation of \$1.80. If a random sample of 32 patrons is taken, what is the probability that the mean expenditure of this sample is greater than \$4.20? Write the calculator commands used. Do not forget to describe a success and give the values of n , p and q . You are required to draw a picture.
19. For each of the following claims,
- state the Null Hypothesis H_0 and the Alternate Hypothesis H_1 ;
 - indicate which is the claim;
 - determine whether the reject region is left-tailed, right-tailed or two-tailed.
- A consumer magazine reports that the mean life of a dot-matrix printer is at least 3.5 years.
 - A realtor claims that rent for studio apartments in new buildings in Brooklyn cannot be \$1500 a month.
 - A car dealer announces that the mean time for an oil change in its service department is less than 20 minutes.

For questions 20–23, answer the following questions.

- (a) State the Null and Alternate Hypotheses.
 - (b) Which is the claim?
 - (c) Describe the reject region as left-tailed, right-tailed or two-tailed.
 - (d) Will you use a z -test or a t -test? What is the critical value?
 - (e) What is the p-value?
 - (f) Do you reject or fail to reject the claim? Write out your decision in at least one sentence.
20. A report by a restaurant reviewer claims that serving staff at all casual dining restaurants in New Jersey receive at least \$100 in tips with a standard deviation of \$15. Colleen who works as a server in a casual dining restaurant in New Jersey believes this claim is wrong. She records her tips over a 30-day period and finds that they average \$93. Using a 1% significance level, test the claim.
21. It is claimed that the average annual per person spending on all prescription drugs is \$410 with a standard deviation of \$45. A survey of 64 randomly selected individuals found that average annual per person spending was \$425. Using a 5% significance level test this claim.
22. A used car dealer says that the mean price of all 2009 Toyota Camry in Atlanta is at least \$16,200. To test this claim you search the Internet and get the prices of a random sample of 14 of these cars available in Atlanta. The mean price of these cars is \$15,999 with a standard deviation of \$1,057. Is there enough evidence to reject the dealer's claim at the 5% significance level? Assume the population is normal.
23. The help line at Wiley Publishers claims that the mean wait time to be connected is 6.8 minutes. You randomly select a sample of 19 callers and calculate their mean wait times to be 6.7 minutes with a standard deviation of 1.24 minutes. Is there enough evidence to reject the claim at a 5% significance level? Assume the population is normally distributed.

For questions 24 -26, answer the following questions.

- (a) State the Null and Alternate Hypotheses.
 - (b) Which is the claim?
 - (c) Will you use a z -test, t -test or chi-square test? What is the critical value?
 - (d) Describe the reject region as left-tailed, right-tailed or two-tailed.
 - (e) What is the p-value?
 - (f) Do you reject the claim? Write out your decision in at least one sentence.
24. The Healthy Food Company makes an oatmeal and almond cereal. It has three competitors who make a similar product. The company wants to investigate if the percentage of people who consume oatmeal and almond cereal is the same for each of the four brands. Let A represent the Healthy Food Company's and B, C and D represent the 3 competitors. A sample of 1000 person who consume oatmeal and almond cereal were asked which brand they consume. The results are provided in the table below.

Cereal Brand	A	B	C	D
Consumption	212	284	254	250

Is there enough evidence to reject the null hypothesis that the percentage of people who consume oatmeal and almond cereal is the same for all four brands? Use a significance level of 5%.

25. The Smokey Bear Rangers station came out with a report in 2010 that said 61% of forest fires are started by accident, 24% by lighting, 13% by arson and 2% of causes are unknown. A 2017 study of 1000 randomly selected forest fire fighting companies was taken and the results of this sampling is recorded below.

Cause of Forest Fire	Accident	Lighting	Arson	Unknown
Number recorded	581	256	138	25

Assuming the Smokey Bear Rangers percentages are correct for the year 2010 test at the 2.5% significance level whether the current distribution of the causes of forest fires is different from the 2010 report.

26. Adults from two different boroughs in a certain city were asked which borough had a better understanding of global warming. Test, using a 1% level of significance, if the two attributes, borough and opinion on congestion pricing, are independent. The following table gives a two-way classification of their responses.

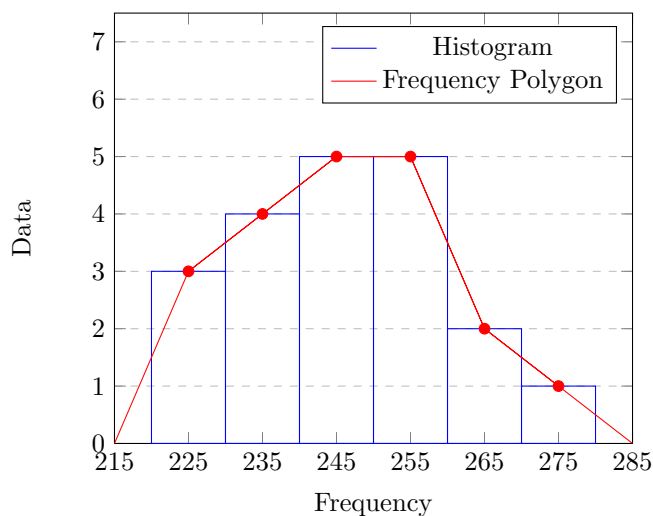
	Yes	No	No Opinion
Borough B	463	86	31
Borough M	295	189	36

Answers:

1. (a) .

Class	Frequencies
220-229	3
230-239	4
240-249	5
250-259	5
260-269	2
270-279	1

(b) & (c) .



2. (a) The mean and median of these test scores are 76.2 and 75 respectively.

(b) There is no mode because all the test scores unique.

(c) The range is 40. The standard deviation is 13.5466273.

(d) A score of 78 is in the 50th percentile.

(e) 60% of these test scores are within 1 standard deviation of the mean.

key strokes on calculator: STAT EDIT L1; STAT CALC (1) 1-Var.

3. (a) The following stem and leaf plot:

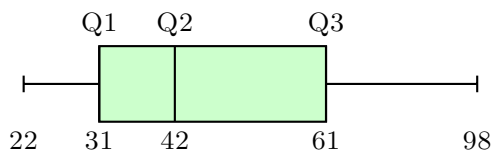
Stem	Leaf
2	2 4 4
3	1 2 5
4	2 2 9
5	8 8
6	1 1
7	3
8	
9	8

(b) The five number summary is: 22, 31, 42, 61, 98

$$\text{IQR} = Q_3 - Q_1 = 30$$

The lower Inner fence = -14 and the upper inner fence = 106. Since all the data points are

between the lower inner fence and the upper inner fence, there are no outliers.



4. (a) Since the test scores decrease as the number of hours spent online increase, there is a negative relationship between the number of hours spent online over the weekend and the student's exam grade on the following Monday.
- (b) The linear regression constant $r = -0.8312962309$, indicating a strong negative relationship and confirming the answer to part (a).
- (c) The equation of the regression line is $y = -4.06741573x + 93.97003745$.
- (d) i) Predicted grade is 78.
 ii) Predicted grade is 72.
 iii) In the event we were to use this model the predicted grade would be 13. However, this is not a good predicted grade because 20 hours is outside the range of the possible scores (x).
 key strokes on calculator: STAT EDIT L1 and L2. STAT CALC (4) LinReg. Make sure Diagnostic is on to get the r value.
5. (a) The probability that a student in this group did not vote is a $\frac{405}{2000}$.
- (b) The probability that a student who voted for Y given the student was female is $\frac{653}{1105}$.
- (c) The probability that a student was male or voted for another candidate is $\frac{1079}{2000}$.
- (d) The probability that a student did not vote for X is $\frac{1721}{2000}$.
- (e) The categories "student is male" and "voted for X " are not mutually exclusive there are 195 male students who voted for X .
- (f) Let A denote the event that the student is female and B be the event that the student voted for Y . Then $P(A) = \frac{1008}{2000} = 0.504$ and $P(A | B) = \frac{653}{1105} = 0.5909502262$. Since $P(A) \neq P(A | B)$, the events A and B are not independent.
6. (a) The probability that both are red $= \frac{15}{30} \times \frac{15}{30} = \frac{225}{900}$
- (b) The probability the first is blue and the second is green is $= \frac{10}{30} \times \frac{5}{29} = \frac{50}{870}$
- (c) The probability that both are blue $= \frac{10}{30} \times \frac{9}{29} = \frac{90}{870}$
- (d) Since there are no yellow balls, probability that the first is blue and the second is yellow is 0.
7. (a) The probability that a student is receiving TAP and going for a Bachelor's degree is $\frac{42}{250}$
- (b) The probability that a student is going for an Associate's degree given that the student is receiving TAP $= \frac{85}{150}$
- (c) The probability that a student is going for an Associate's degree $= \frac{136}{250}$
- (d) Let A denote the event that the student is going for an Associate's degree and B be the event that the student is receiving TAP. Then $P(A) = \frac{136}{250} = 0.544$ and $P(A | B) = \frac{85}{150} = 0.5666666667$. Since $P(A) \neq P(A | B)$, the events A and B are not independent.
8. (a) There are $10 \times 9 \times 8 \times 7 = 5040$ different possible sets of officers.
- (b) There are ${}_{10}C_4 = 210$ possible winning groups.
 key strokes on calculator: MATH PRB (2) nPr : : MATH PRB (3) nCr
- (c) There are $10 \times 9 \times 8 \times 7 \times 6 = 30240$ zip codes if no numbers can be repeated.
- (d) There are $10 \times 10 \times 10 \times 10 \times 10 = 100000$ zip codes if numbers can be repeated.

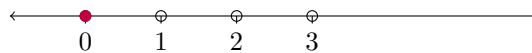
9. (a) There are ${}_{16}\mathbf{C}_6 = 8008$ different ways a group of 6 students can be selected.
- (b) There are ${}_5\mathbf{C}_2 \cdot {}_7\mathbf{C}_3 \cdot {}_4\mathbf{C}_1 = 1400$ different ways the group will consist of 2 freshman, 3 sophomores and one junior.
- (c) The probability that the group described above will be formed out of these 16 individuals is $\frac{1400}{8008} = 0.1748251748$.
Keystrokes on calculator: MATH PRB (3) nCr
10. (a) The probability of repairing 3 computers is 0.28.
- (b) The mean is 2.94 computers.
- (c) The standard deviation is approximately 1.271377206 computers.
key strokes on calculator: STAT CALC 1-Var Stat L1, L2
- (d) The probability that at most 4 computers were repaired is 0.86.
11. (a) Success = a woman aged 90 had a hip fracture, $n = 8$, $p = 0.32$, $q = 0.68$.
P(exactly 5 women aged 90 had a hip fracture) = $P(X = 5) = \text{binompdf}(8, 0.32, 5) = 0.0590832881$
Keystrokes on calculator: 2nd VARS (10) binomial pdf (trials, p, x).



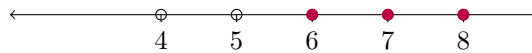
- (b) Success = a woman aged 90 had a hip fracture, $n = 8$, $p = 0.32$, $q = 0.68$.
P(at most 3 women aged 90 suffered from a hip fracture) = $P(X \leq 3) = \text{binomcdf}(8, 0.32, 3) = 0.7680956568$
Keystrokes on calculator: 2nd VARS (10) binomial cdf (trials, p, x)



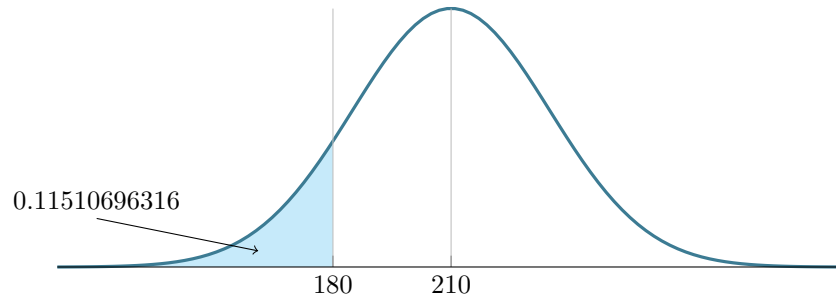
- (c) Success = a woman aged 90 has not had a hip fracture, $n = 8$, $p = 0.32$, $q = 0.68$.
P(none of the women aged 90 suffered from a hip fracture) = $P(X = 0) = \text{binompdf}(8, 0.32, 0) = 0.045716324$
Keystrokes on calculator: 2nd VARS (10) binomial pdf (trials, p, x)



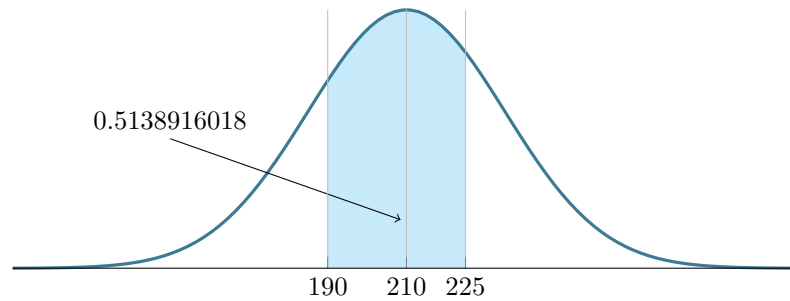
- (d) Success = a woman aged 90 has not had a hip fracture, $n = 8$, $p = 0.68$, $q = 0.32$.
P(at least 6 women aged 90 suffered from a hip fracture) = $P(X \geq 6) = 1 - \text{binomcdf}(8, 0.68, 5) = 0.5012976839$
Keystrokes on calculator: 1 - 2nd VARS (10) binomial cdf (trials, p, x)



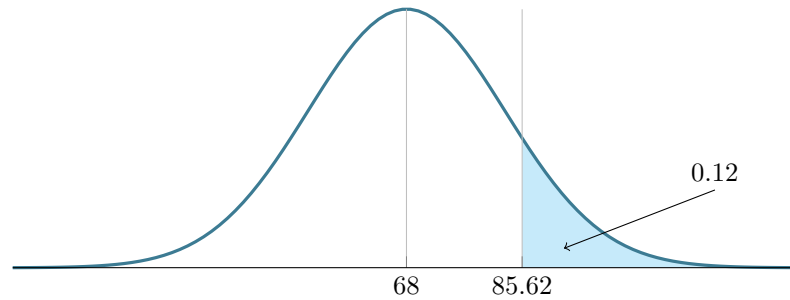
12. (a) The z-score of Jose = $\frac{190-210}{25} = -0.8$.
- (b) The z-score for Estella = $\frac{270-210}{25} = 2.4$.
- (c) The probability a racer finished in less than 180 minutes = $\text{normalcdf}(-1E99, 180, 210, 25) = 0.11510696316$



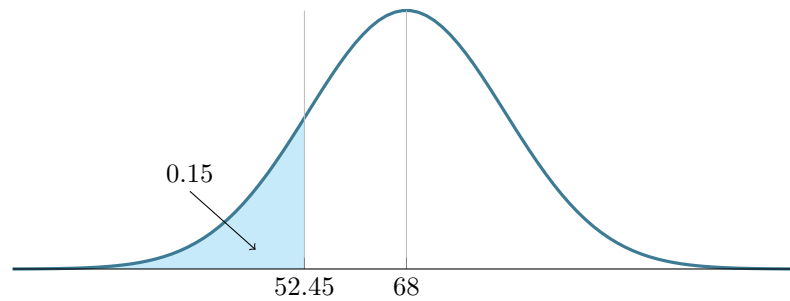
- (d) The probability a racer finished between 190 and 225 minutes = $\text{normalcdf}(190, 225, 210, 25)$
 $= 0.5138916018$.
 key strokes on calculator: 2nd VARS (2) normal cdf (lower, upper, μ , σ)



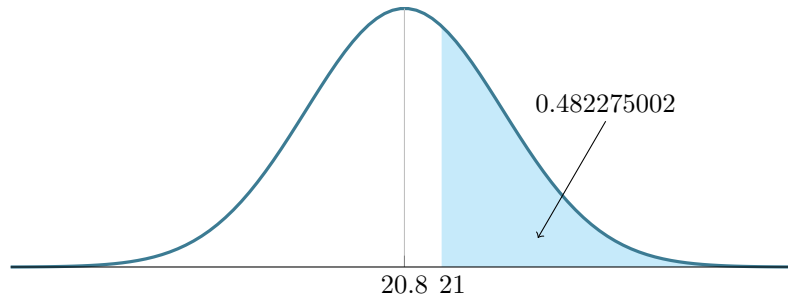
13. (a) Mohammed's grade = $68 + 15 \cdot 1.25 = 86.75$
 (b) The lowest grade to get an A = $\text{invNorm}(1 - 0.12, 68, 15) = 85.62480187$



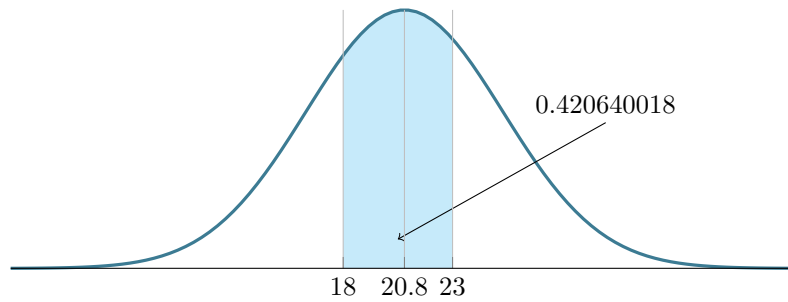
- (c) The lowest grade a student can get and still pass = $\text{invNorm}(0.15, 68, 15) = 52.4534993$
 key strokes on calculator 2nd VARS (3) invNorm(area, μ , σ)



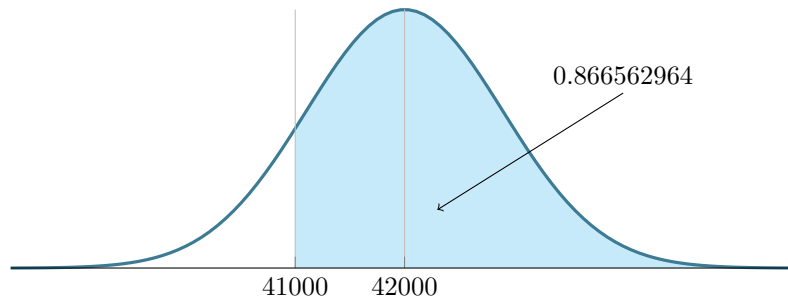
14. (a) The probability that there will be more than 21 earthquakes in a given year = $\text{normalcdf}(21, 1E99, 20.8, 4.5) = 0.482275002$



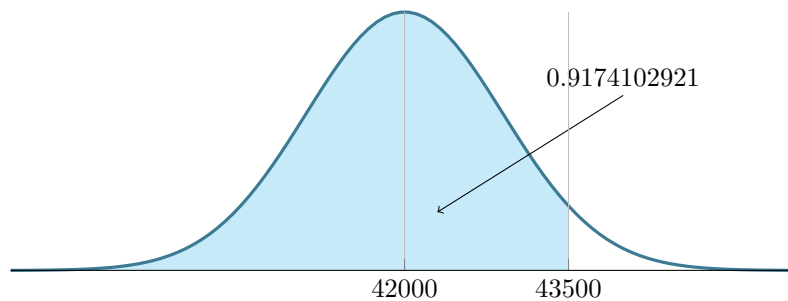
- (b) The probability there will be between 18 and 23 earthquakes in a given year = $\text{normalcdf}(18, 23, 20.8, 4.5) = 0.4206420018$



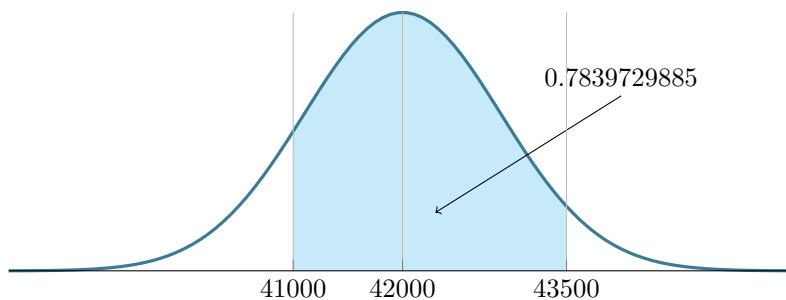
15. (a) The probability that the mean of these tires will last more than 41000 miles = $\text{normalcdf}(41000, 1E99, 42000, \frac{7800}{\sqrt{75}}) = 0.8665626964$



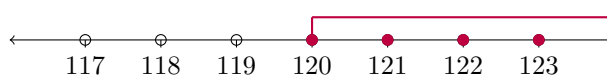
- (b) The probability that the mean of these tires will last less than 43500 miles = $\text{normalcdf}(-1E99, 43500, 42000, \frac{7800}{\sqrt{75}}) = 0.9174102921$



- (c) The probability that the mean of these tires will last between 41000 miles and 43500 miles = $\text{normalcdf}(41000, 43500, 42000, \frac{7800}{\sqrt{75}}) = 0.7839729885$
 key strokes on calculator: 2nd VARS normal cdf (lower, upper, μ , σ).

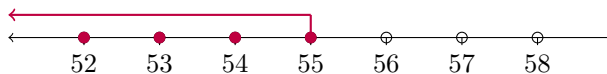


16. Success = person buys a Fitbit , $n = 200$, $p = 0.58$, $q = 0.42$
 The probability that at least 120 of these adults say they will buy a Fitbit next year is $P(x \geq 120) = 1 - P(x < 120) = 1 - \text{binomialcdf}(200, 0.58, 119) = 0.30909945485$

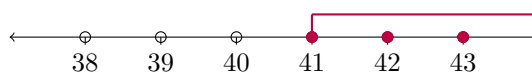


17. Success = CityTech student buys lunch from the salad bar, $n = 140$, $p = 0.35$, $q = 0.65$

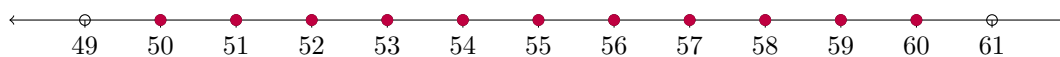
- (a) The probability that at most 55 get their lunch from the salad bar
 $= P(x \leq 55) = \text{binomialcdf}(140, 0.35, 55) = 0.874778583$



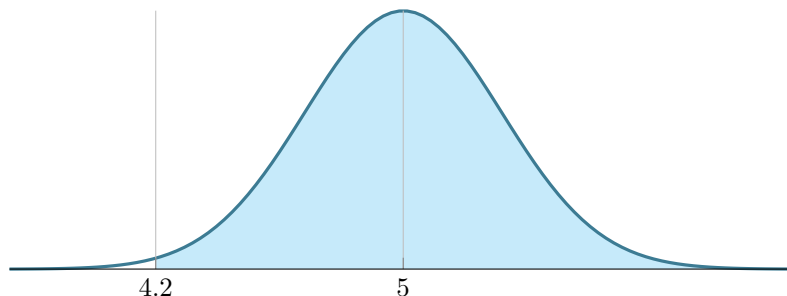
- (b) The probability that more than 40 get their lunch from the salad bar
 $= P(x > 40) = 1 - P(x \leq 40) = 1 - \text{binomialcdf}(140, 0.35, 40) = 0.935643245$



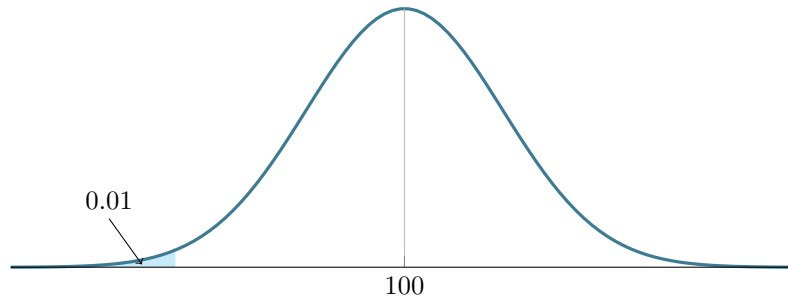
- (c) The probability that between 50 and 60, inclusive, get their lunch from the salad bar
 $= P(50 \leq x \leq 60) = \text{binomcdf}(140, 0.35, 60) - \text{binomcdf}(140, 0.35, 50) = 0.4392493592$



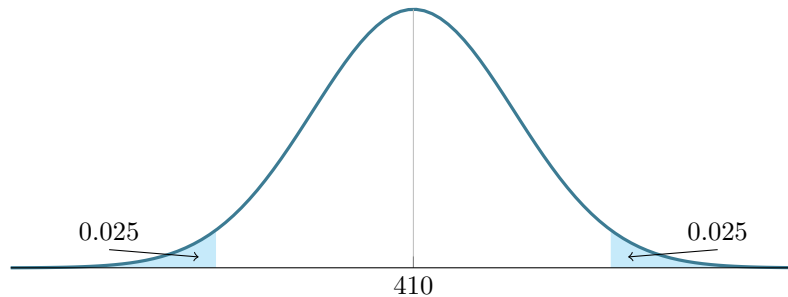
18. The probability the mean expenditure of this sample is greater than 4.20 $= \text{normalcdf}(4.20, 1E99, 5.00, \frac{1.80}{\sqrt{32}}) = 0.9940341249$
 Key strokes on calculator: 2nd VARS (2) normal cdf (lower, upper, μ , σ)



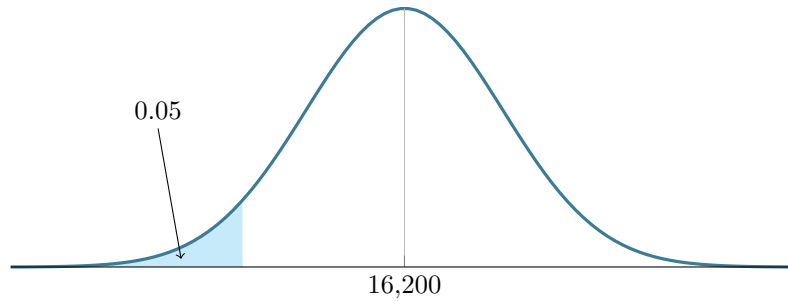
19. (a) $H_0: \mu \geq 3.5$ years; $H_1: \mu < 3.5$ years; claim is H_0 ; left-tailed
 (b) $H_0: \mu = \$1500$; $H_1: \mu \neq \$1500$; claim is H_1 ; two-tailed
 (c) $H_0: \mu \geq 20$ minutes; $H_1: \mu < 20$ minutes; claim is H_1 ; left-tailed
20. (a) $H_0: \mu \geq \$100$; $H_1: \mu < \$100$
 (b) The null hypothesis is the claim.
 (c) The reject region is in the left tail.



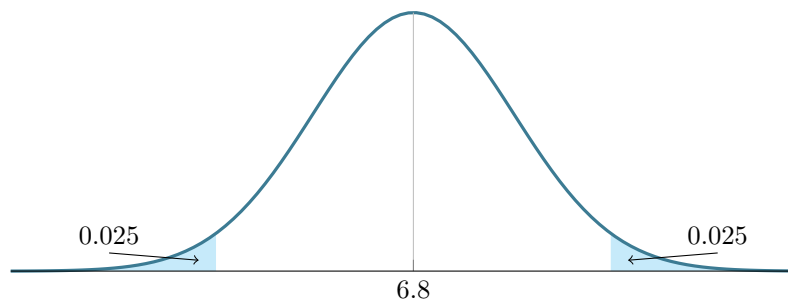
- (d) Since $\bar{x} = \$93$, $n = 30$, $\sigma = \$15$, we would use a z -test
 (e) p -value = 0.0052935944
 (f) The level of significance is 0.01, and as the p -value < 0.01 , we reject the null hypothesis. Therefore, the serving staff at the casual dining restaurant do not make an average of at least \$100 per night in tips when tested at 0.01 significance level.
21. (a) $H_0: \mu = 410$; $H_1: \mu \neq 410$
 (b) The null hypothesis is the claim.
 (c) The two tail reject region - area of 1/2 the significance level in each.



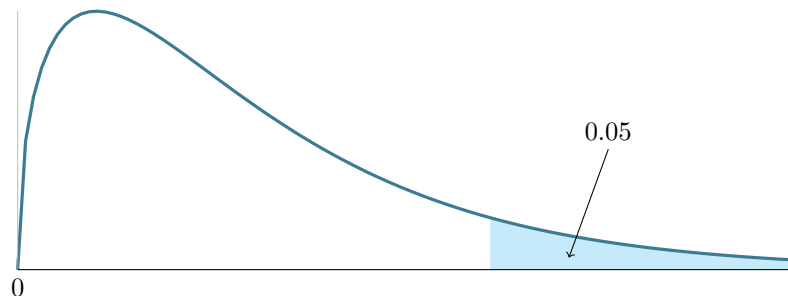
- (d) Since $\bar{x} = \$425$, $n = 64$, $\sigma = 45$, we would use a z -test.
 (e) p -value = 0.0076608502
 (f) The level of significance is 0.05, and as the p -value < 0.05 , we reject the null hypothesis. Hence, at a 5% significance level, that the average annual per person spending on prescription drugs is not \$410
22. (a) $H_0: \mu \geq \$16200$; $H_1: \mu < \$16200$.
 (b) The null hypothesis is the claim.
 (c) The reject region is in the left tail.



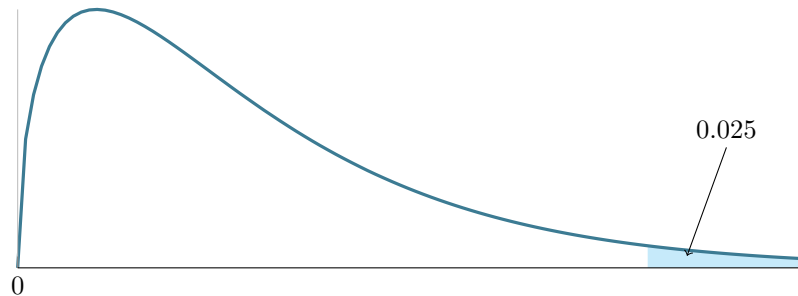
- (d) Since $\bar{x} = \$15999$, $n = 14$, $s = 1057$, we would use a t-test
 - (e) p -value = 0.2446678484
 - (f) The level of significance is 0.05, and as the p -value ≥ 0.05 , we fail to reject the null hypothesis. Therefore, at a 5% significance level, there is not enough evidence to reject the used car dealer's claim.
23. (a) $H_0: \mu = 6.8$ minutes; $H_1: \mu \neq 6.8$
- (b) The null hypothesis is the claim.
 - (c) The two tails make up the reject region.



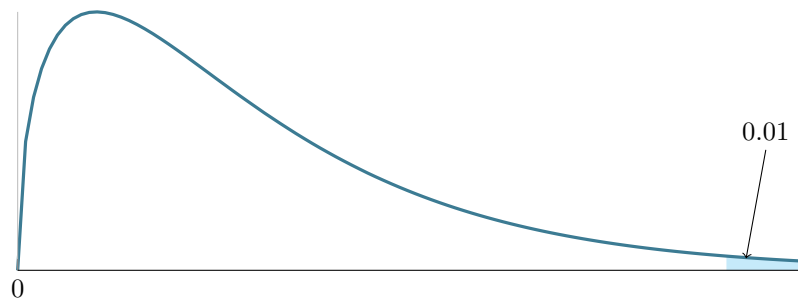
- (d) Since $\bar{x} = 6.7$ minutes, $n = 19$, $s = 1.24$ minutes, we would use a t-test
 - (e) p -value = 0.7292765224
 - (f) The level of significance is 0.05, and as the p -value ≥ 0.05 , we fail to reject the null hypothesis. Therefore, at a 5% significance level, there is not enough evidence to reject the used company's claim.
24. (a) H_0 : The percent of people who consume oatmeal and almond cereal is the same for all four brands.
 H_1 : The percent of people who consume oatmeal and almond cereal is not the same for all four brands.
- (b) H_0 is the claim
 - (c) Degrees of freedom = $4 - 1 = 3$
 - (d) Chi-square is always right tailed.



- (e) p -value = 0.015007105
- (f) The level of significance is 0.05, and as the p -value < 0.05 , we reject the null hypothesis. Hence, we reject the claim that the percentage of consumption of this cereal is the same for all four brands at the 5% significance level.
25. (a) H_0 : The current percentages are the same as those recorded in 2010.
 H_1 : The current percentages are different from those recorded in 2010.
- (b) H_0 is the claim.
- (c) Degrees of freedom = $4 - 1 = 3$
- (d) Chi-square is always right tailed.



- (e) p -value = 0.2418999716
- (f) The level of significance is 0.025, and as the p -value ≥ 0.025 , we fail to reject the null hypothesis. Hence, we fail to reject the claim. Therefore, the recent percentages seem to be the same as those found in 2010 at the 2.5% significance level.
26. (a) H_0 : The two attributes, borough and opinion on congestion pricing are independent.
 H_1 : The two attributes, borough and opinion on congestion pricing are dependent.
- (b) H_0 is the claim.
- (c) Degrees of freedom = $(2 - 1) \cdot (3 - 1) = 2$
- (d) Chi-square is always right tailed.



- (e) P -value = $1.317667186 \times 10^{-16}$
- (f) Since the level of significance is 0.01, and as the p -value < 0.01 , we reject the null hypothesis. Therefore, two attributes, borough and opinion on congestion pricing are dependent at the 1% Significance level.