
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

¹Revised by Professor Ellner in Spring 2017.

- ii) 5.5 hours
- iii) 15 hours.

5. The table below shows the result of a survey in which 2000 students were asked how they voted in the 2016 Presidential Election. (Find the probabilities to four decimal places.)

	Voted for T	Voted for C	Voted for another	Did not vote
City Tech Males	195	452	124	229
City Tech Females	84	653	87	176

- (a) Find the probability that a student in this group did not vote.
 - (b) Given that a student voted for C, find the probability the student was female.
 - (c) Find the probability that a student was male or voted for another candidate.
 - (d) Are the categories “did not vote” and “voted for C” mutually exclusive? Why?
 - (e) What is the probability that the student did not vote for T?
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.
 - (b) Two marbles are selected at random without replacement. Find the probability that the first is blue and the second is green.
 - (c) Two marbles are selected at random without replacement. Find the probability that the first is blue and the second is yellow.
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?
 - (b) Given that a student from this group is receiving TAP what is the probability that the student is going for an Associates Degree?
 - (c) What is the probability that a student is going for an Associates Degree?
 - (d) Are the categories going for an Associate’s Degree and receiving TAP independent? Why or why not?
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 1 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.
- (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?
- (c) What is the probability that none suffered from a hip fracture?
- (d) What is the probability that at least one had a hip fracture?
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?
- (d) What is the probability that a racer finished between 190 and 225 minutes?
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?
- (c) Students in the bottom 15% will fail the course. What is the cutoff grade a student can get and still pass?
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.
- (a) Find the probability that in a given year there will be less than 21 earthquakes.
- (b) Find the probability that in a given year there will be between 18 and 23 earthquakes.
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 100 tires manufactured by the ABC Tire Company is taken, what is the probability that these tires:
- (a) will last more than 41,000 miles?
- (b) will last less than 43,250 miles?

- (c) 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?
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.
- (a) What is the probability that at most 55 say they get their lunch from the salad bar in the cafeteria?
- (b) What is the probability that more than 40 say they get their lunch from the salad bar in the cafeteria?
- (c) 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?
19. For each of the following claims,
- i) state the Null Hypothesis H_0 and the Alternate Hypothesis H_1 ;
- ii) indicate which is the claim;
- iii) determine whether the reject region is left-tailed, right-tailed or two-tailed.
- (a) A consumer magazine reports that the mean life of a dot-matrix printer is at least 3.5 years.
- (b) A realtor claims that rent for studio apartments in new buildings in Brooklyn cannot be \$1500 a month.
- (c) 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) Find the sample statistic.
- (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 and 25, 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) Find the sample statistic.
 (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.

Answers:

1. (a) .

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

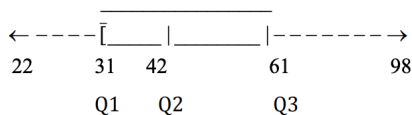
2. (a) The mean and median of these test scores are 76.2 respectfully 75.
 (b) There is no mode because all the test scores unique.

- (c) The range is 40. The standard deviation (to the nearest hundredth) is 13.55.
- (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) .

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) $IQR = Q_3 - Q_1 = 30$



- 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 $r = -0.8313$, indicating a strong negative relationship and confirming the answer to part (a).
- (c) The equation of the regression line is $y = -4.067x + 93.970$.
- (d) i) Predicted grade is 78.
ii) Predicted grade is 72.
iii) We cannot predict grade because 15 hours is outside the range of the data.

key strokes on calculator: STAT EDIT L1 and L2. STAT CALC (4) LinReg. Be sure Diagnostic is on to get the r value.

- 5. (a) The probability that a student in this group did not vote is a 0.2025.
- (b) The probability that a student who voted for C was female is 0.5910.
- (c) The probability that a student was male or voted for another candidate is 0.5435.
- (d) The categories are mutually exclusive they have no members in common.
- (e) The probability that a student did not vote for T is 0.8605.
- 6. (a) There is a 0.25 chance they are both red.
- (b) The probability the first is blue and the second is green is 0.0570.
- (c) There is a 0 probability that the first is blue and the second is yellow.
- 7. (a) The probability that a student is receiving TAP and going for a Bachelor's degree is 0.1680.
- (b) There is a 0.5667 probability that a student who is receiving TAP is going for an Associate's degree.
- (c) There is a 0.5440 probability that a student is going for an Associate's degree.

- (d) The categories going for an Associate's degree and receiving TAP are not independent.
 $P(\text{Ass. degree}) \neq P(\text{Ass. degree}|\text{TAP})$.
8. (a) There are 5040 different possible sets of officers.
 (b) There are 210 possible wining groups.
 key strokes on calculator: MATH PRB (2) nPr : : MATH PRB (3) nCr
 (c) There are 30,240 zip codes if no repeats are allowed.
 (d) There are 100,000 zip codes if repeats are allowed.
9. (a) There are 8008 different ways a group of 6 students can be selected.
 (b) There are 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 $1400/8008 = 0.1748$.
 key strokes on calculator: MATH PRB (2) nPr : : 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 1.3 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) The probability that exactly 5 had a hip fracture is 0.0591. Use the Binomial Formula in Section 5.4.2 or key strokes on calculator: 2nd VARS (10) binomial pdf (trials, p, x).
 (b) The probability that at most 3 had a hip fracture is 0.7681. key strokes on calculator: 2nd VARS (10) binomial cdf (trials, p, x)
 (c) The probability that none fractured their hip is 0.0457. key strokes on calculator: 2nd VARS (11) binomial pdf (trials,p,x)
 (d) The probability that at least one had a hip fracture is 0.9543.
12. (a) The z -score of Jose is -0.8 .
 (b) The z -score for Estella is 2.4.
 (c) The probability a racer finished in less than 180 minutes is 0.1151.
 (d) The probability a racer finished between 190 and 225 minutes is 0.5139.
 key strokes on calculator: 2nd VARS (2) normal cdf (lower, upper, μ , σ)
13. (a) Mohammed had a grade of 86.75.
 (b) The lowest grade to get an A is 85.62
 (c) The lowest grade a student can get and still pass is 52.45. key strokes on calculator 2nd VARS (3) invNorm(area, μ , σ)
14. (a) There is a 0.5177 probability there will be less than 21 earthquakes in a given year.
 (b) There is a 0.4206 probability there will be between 18 and 23 earthquakes in a given year.
15. (a) Using the calculator there is a 0.9001 probability a tire will last more than 41,000 miles. Using the z -score table, the z -score is -1.28 and there is a $1-0.10027 = 0.899723$ probability a tire will last more than 41,000 miles.
 (b) Using the calculator there is a 0.9455 probability a tire will last less than 43,250 miles. Using the z -score table, the z -score is 1.60 and there is a 0.9452 probability a tire will last more than 43,250 miles.
 (c) Using z -scores there is a 0.84493 probability a tire will last between 41,000 and 43,250 miles. Using the calculator this probability is 0.8456 key strokes on calculator: 2nd VARS normal cdf (lower, upper, μ , σ).

16. $n = 200$, $p = 0.50$, success = person buys a Fitbit
 The probability that at least 120 of these adults say they will buy a Fitbit next year is $P(x \geq 120) = 1 - P(x < 120) = 1 - \text{binomialcdf}(200, 0.50, 119) = 0.3091$.
17. (a) $P(x \leq 55) = \text{binomialcdf}(140, 0.35, 55) = 0.8748$
 (b) $P(x > 40) = 1 - P(x \leq 40) = 1 - \text{binomialcdf}(140, 0.35, 40) = 0.9356$
 (c) $\text{binomcdf}(140, 0.35, 60) - \text{binomcdf}(140, 0.35, 50) = 0.439$ is the probability that between 50 and 60, inclusive, get their lunch at the salad bar.
18. The probability the mean expenditure of this sample is greater than \$4.20 is 0.9940. 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: left-tailed
 (b) $H_0: \mu = \$1500$; $H_1: \mu \neq \$1500$; claim: two-tailed
 (c) $H_0: \mu \geq 20$ minutes; $H_1: \mu < 20$ minutes; claim: 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) Critical z , $z_0 = -2.326$
 (e) Sample statistic = -2.56
 (f) The sample statistic falls in the reject region. Therefore the claim is rejected and waiters and waitresses at a casual dining restaurant do not make an average of at least \$100 per night in tips when tested at a 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) Critical z 's are $z_0 = \pm 1.96$.
 (e) Sample statistic = 2.67
 (f) The sample statistic falls in the reject region. Therefore the claim is rejected. There is not enough evidence, at the 5% significance level, that the average annual per person spending on prescription drugs is \$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) Critical t , $t_0 = -1.771$
 (e) Sample statistic = -0.7115
 (f) The sample statistic does not fall in the reject region. Therefore we fail to reject H_0 the used car dealer's claim is not rejected at a 0.05 significance level.
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 - area of 1/2 the significance level in each.
 (d) Critical t 's are $t_0 = \pm 2.101$.
 (e) Sample statistic = -0.352

- (f) The sample statistic does not fall in the reject region. We failed to reject H_0 . Therefore there is not enough evidence to reject the claim. There is enough evidence at the 5% significance level that the mean waiting time to be connected is 6.8 minutes.
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) Chi-square test because 4 categories of qualitative data. $\chi^2 = 7.815$
- (d) Chi-square is always right tailed.
- (e) Sample statistic = 10.464
- (f) Reject the claim that the percentage of consumption of this cereal is the same for all four brands at the 5% significance level. 24 so it appears the recent percentages seem to be the same as those found in 2010 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) Chi-square test because 4 categories of qualitative data. $\chi^2 = 9.348$
- (d) Chi-square is always right tailed.
- (e) Sample statistic = 4.1888
- (f) Fail to reject the claim so it appears the recent percentages seem to be the same as those found in 2010 at the 2.5% significance level.