Name:

Show all your work!

Use your calculator to compute each expression to 6 significant digits accuracy. Write down the sequence of keys you entered in order to compute each expression. Do not round numbers in mid-computation.

1. (5pts) $\sqrt[9]{46} =$

2. (9pts) $3700\left(1 + \dfrac{0.05}{4}\right)^{16} =$

3. (7pts) $12(\sqrt[24]{7} - 1) =$

4. (6pts) $\dfrac{\log 3.71}{\log 0.125} =$

5. (9pts) $\dfrac{\log 7.32}{14 \log 4.33} =$

6. (12pts) $\dfrac{\left(1 + \dfrac{0.0375}{12}\right)^{48} - 1}{\dfrac{0.0375}{12}} =$

7. (12pts) $\dfrac{1 - \left(1 + \dfrac{0.0425}{12}\right)^{-120}}{\dfrac{0.0425}{12}} =$

1. (10pts) a) 75 is 64% of what?   b) 17 is what percent of 57?

2. (6pts) You bought a nice set of silverware for $125. If sales tax is 6%, what is the total cost?

3. (12pts) In 2008, Jane filed a tax return separately from her husband. Her total income was $45,900, she deposited $1500 into a retirement account, paid $850 in property taxes on a property she inherited, and donated $550 to charity. Use the table on page 448 of our book to first determine Jane's taxable income (don't forget the exemption) and then find the tax on this income.

4. (12pts) At a building-supply store, a certain type of brick costs $156 per cube of bricks. Due to lack of demand, the store decided to reduce the price of these bricks by 25%. Not long afterwards, a strong storm that blew through the area created demand for building supplies and the store raised the price of the bricks by 15%. How much does a cube of bricks cost now?

5. (10pts) How much money should you deposit in a simple-interest account bearing 2.25% if you wold like to have $1500 in three years? How much of the final $1500 is from interest?

6. (10pts) Emily borrowed $1200 from Amanda and repaid her five months later with $1400. What simple annual interest rate did Emily pay on this transaction?

1. (8pts) DJ Phonick would like to have $2000 for a good turntable system. How much should he deposit now in an account bearing 3.75%, compounded quarterly in order to have the desired amount in one and a half years? How much of the $2000 came from interest?

2. (6pts) Bank of Eggner's Ferry is offering a 2.45% interest rate on an account that is compounded quarterly, while New Bridge Bank has an account at 2.35%, compounded daily. Which account is the better deal?

3. (10pts) If you deposit $1000 into an account bearing 7% interest, compounded monthly, how long will it take until you have $3500 in the account?

4. (10pts) To save for an addition to the house, the Jorgensons deposit $300 every month into an account bearing 3.25% interest, compounded monthly.
a) How much do they have in the account in 4 years?
b) How much did they earn in interest over these 4 years?

5. (14pts) At the time of little Mia's birth, her parents decided to save some money for her college. They set aside $1000 every quarter for 12 years in an account bearing 4.5% interest, compounded quarterly. Then, financial hardship forced them to stop contributing, but they left the accumulated money in the account.
a) How much is in the account when Mia is 18?
b) How much of it was from deposits, and how much from interest?

6. (12pts) The Jimenezes would like to save $20,000 for a new car. If they can set aside $300 every month into an account bearing 3.72%, compounded monthly, how long will it take them to save the desired amount?

Mathematical Concepts — Joysheet 4 **MAT 117, Spring 2012 — D. Ivanšić**	**Name:** _____
	Show all your work!

This is an exercise in computing the payment on a hypothetical loan and comparing it with the numbers that financial services websites give you. Do the following:

1. (4pts) Decide on an amount and purpose for a hypothetical loan (e.g. buying a car, house, starting a business, etc.) Choose over how many years it should be repaid. Standard choices for each category are suggested: 15, 20, 30 years for a home, 3, 4, 5 years for a car, etc.

2. (14pts) Find a financinal services website (bank, mortgage originator) that gives you interest rate quotes for the kind of loan that you chose and computes the monthly payment based on a loan amount. Use their computation to find the monthly payment on your hypothetical loan. **Don't use a website with a "generic" calculator such as bankrate.com, rather, find one that offers actual loans with current interest rates.** Print out the webpage, showing loan amount, term, interest rate and payment and attach it to this one. Try to keep it to just one sheet.

(Attachment)

3. (12pts) Using our loan formula from 8.5, compute (write the computation here) the monthly payment on your hypothetical loan. Use the interest rate that you found on the website. The frequency of compounding is typically monthly. Does your number agree with the information on the website you found?

4. (14pts) Find the balance of the hypothetical loan after two thirds of all payments have been made.

5. (16pts) Write an amortization schedule for the four payments after two thirds of all payments have been made. (For example, if it's a 60-month loan, consider payments 41, 42, 43 and 44.)

1. (15pts) Do this part on your own. Roll two dice 50 times.

a) Record how many times you get each of the possible sums on the dice in the first row.

b) In the second row, enter the empirical probabilities for each sum based on your 50 rolls. Then compute the theoretical probabilities for each sum and enter them in the third row of the table. Round everything to 4 decimal points.

c) Find the difference between the row P_E and P_T.

Sum on roll	2	3	4	5	6	7	8	9	10	11	12
Times occured											
Empirical prob. P_E											
Theoretical prob. P_T											
Difference $P_E - P_T$											

2. (15pts) Do this part with 3 classmates. Write their names in the space provided. Each of you has to fill in the table independently, but the last three rows of this table should be the same for everyone in your group (check!).

a) Copy the "Times occured" line from above into row "You" and do the same for each of your classmates.

b) Sum by column and enter the sums in the row "Total times occured".

c) Compute the empirical probability for each sum on the dice. Keep in mind that your number of experiments is now larger.

d) Find the difference between the row P_E and P_T. Are they smaller than in the table above?

Sum on roll	2	3	4	5	6	7	8	9	10	11	12
You											
Total times occured											
Empirical prob. P_E											
Difference $P_E - P_T$											

3. (8pts) You are planning a night in Nashville with your sweetie, with plans to go to one restaurant, one movie and one bar. If you have seven restaurants to choose from, five movies and eight bars, in how many different ways can you enjoy a night on the town?

4. (10pts) New York state has the following format for car license plates: three letters followed by four numbers, where the first letter cannot be any of the letters A, B, C, D, E, and the first number cannot be a 0. How many different license plates are possible under these rules?

5. (12pts) A coin is tossed 10 times.
a) How many different outcomes are there to this experiment?
b) How many different outcomes have heads on the third toss and tails on the sixth toss?

1. (10pts) A retiree counts vehicles passing on a road by his house over several Tuesday afternoons. He obtains the following results:

Vehicle	car	SUV	minivan
In-state	35	45	21
Out-of-state	12	13	17

If a random vehicle is observed on a Tuesday afternoon, what is the empirical probability that it is
a) an SUV?   b) an in-state vehicle?
c) an out-of-state car?   d) not a car?

2. (20pts) Write the probabilities and odds against and in favor of the following events (show any work needed below):

Event	probability	odds against	odds in favor
a) Getting a head on a coin toss			
b) Drawing an even-number-card from a deck of cards			
c) Drawing a red face card from a deck of cards			
d) Getting at most one head on three coin tosses			
e) Getting sum divisible by 4 on a roll of two dice			

3. (4pts) The odds in favor of an ice storm in January are 2-to-11.
a) What is the probability an ice storm occurs in January?
b) What is the probability there is no ice storm in January?

4. (4pts) 15% of all weddings happen in June.
a) What are the odds against a random wedding taking place in June?
b) What are the odds in favor of a random wedding taking place in June?

5. (12pts) Two dice are rolled. What is the probability that
a) you got sum 1 or 11?
b) you got sum in range 4–6 or both of the numbers are even?
c) at least one of the numbers is different from 3 or 5.

6. (10pts) In a certain big city, 65% of all companies have done business with a partner in Asia or Europe, 45% have done business with an Asian partner and 35% have done it with a European partner. What is the probability that a randomly chosen company from this city
a) has done business both with an Asian and a European partner?
b) has not done business with either an Asian or a European partner?

1. (12pts) When rolling a single die multiple times, what is the probability of
a) rolling a 2 twice on two tries?
b) not rolling a 5 on any of four tries?
c) rolling a 3 at least once on six tries?

2. (14pts) A bag contains 15 yellow M&M's and 9 red M&M's. Two pieces are drawn without replacement. What is the probability that:
a) the second is red, given that the first one is yellow?
b) both are red?
c) first is red, second is yellow?
d) at least one is red?

3. (10pts) The table shows the pattern of beverage purchases at a certain grocery store one fine Friday. What is the probability that a random shopper:
a) bought soda?
b) was 50 and over?
c) was 31–49 and bought soda?
d) bought soda, given they were 31–49?
e) was 30 and under, given that they bought juice?

Age	Soda	Juice	Total
30 and under	14	32	
31–49	23	22	
50 and over	17	13	
Total			

4. (10pts) A company wishes to offer insurance against failure of the Sangfroid smartphone during its first two years of use. It figures that 5% of Sangfroids fail during the first year, and 12% fail during the second year. An insured customer receives $100 if their Sangfroid fails during the first year, and $75 if it fails during the second year.
a) What is the expected payout of a policy?
b) What premium should the company charge in order to break even?
c) What premium should the company charge in order to profit $20 per policy?

5. (14pts) A game of chance is set up as follows: A player pays $3 and two dice are rolled. The player collects $10 if the sum on the dice is 2 or 12, $5 if the sum is 9, $2 if sum is 6 and nothing if the sum is any other number.
a) Find the expected value of this game.
b) If you play this game 20 times, how much do you expect to win or lose?
c) What is the fair price of this game?

Final answers should have accuracy to 6 decimal places. Show some work how medians and means are computed. *Giving only the answer will bring you few points.*

1. (8pts) A new sports stadium is proposed for a city. To gauge support for the idea, city officials decide to do a survey of the city's population. Comment on whether each of the following methods will produce a good random sample of the city's population:

    a Surveying the patrons at a local sports bar.
    b Picking random names from the phone book, and surveying those people by phone.
    c Surveying the patrons of the city's art museum.
    d Surveying patrons of one McDonald's.

2. (22pts) A shoe store would like to see how well their sales promotion is working. The employees record how many pairs of shoes are sold over 30 days, with results below. Do the following:
a) Construct a frequency distribution with first class 10–14.
b) Draw a histogram for the data
c) Enter a representative value for each interval.
d) Estimate the mean of the data based on the frequency distribution.
e) Find the actual mean and compare your answer to e).

11, 15, 33, 44, 17, 27, 21, 19, 20, 20, 13, 15, 22, 23, 29, 41, 19, 28, 32, 34 25, 31, 37, 26, 24, 25, 18, 22, 24, 33

Class	Frequency	Rep. value

3. (10pts) Student Steve examines the number of assignments due he has every week of a 15-week semester. They are listed below.
a) Find the midrange of the data.   0, 2, 3, 5, 3, 4, 3, 5, 4, 2, 4, 3, 2, 4, 2
b) Find the median of the data.
c) Find the mean of the data.

4. (20pts) Jane counts how many pieces of mail she gets daily over a course of 26 days on which mail is delivered. Do the following:
a) Draw a histogram for the data.
b) Find the midrange of the data.
c) Find the median of the data.
d) Find the mean of the data.

Pieces of mail	Frequency (days)
0	4
1	3
2	7
3	6
4	2
5	3
6	1

Bonus. (2pts) Use the grade computer on the website to determine your grade in the course so far. Assume you are getting 3 points for participation, and no bonus for attendance. Write down your course average so far, and what you would need on the next exam to increase it by a letter grade.

Final answers should have accuracy to 6 decimal places (or 4 decimal places for table-derived answers). Show some work how the mean and standard deviation are computed. *Giving only the answer will bring you few points.*

1. (18pts) A survey was conducted to determine how often students go home during the weekend over the course of a semester (among those who don't live at home). The number of visits is recorded below.
a) Find the range of the number of visits.
b) Find the mean of the number of visits.
c) Find the standard deviation of the number of visits.

Number of visits	Frequency (students)
1	5
2	7
3	12
4	13
5	15
6	8
7	5
8	4

2. (10pts) The amount paid for a certain type of car is normally distributed with mean $22,000 and standard deviation $1,000. Use the 68-95-99.7 rule (draw a picture) to find the percentage of buyers who paid:

a) between $22,000 and $24,000

b) under $21,000

c) over $23,000

d) between $19,000 and $21,000

3. (6pts) A set of data items is normally distributed with mean 45 and standard deviation 3.4. Find the data items that correspond to the z-scores given below.

a) $z = 0$ b) $z = 1.3$ c) $z = -2.2$

4. (4pts) John scored 34 points on an exam with mean 30 and standard deviation 3 and Jay scored 77 points on a similar exam with mean 70 and standard deviation 6. Use z-scores to determine who did better.

5. (22pts) A baker knows that the daily demand for apple pies normally distributed with mean 42.5 pies and standard deviation 4.6 pies. Draw a picture showing which area you are computing as you answer:
a) On what percentage of days is the demand less than 45 pies?
b) On what percentage of days is the demand greater than 44 pies
c) What is the percentile of the daily demand of 40 pies? What does this mean?
d) What is the probability that on a random day the demand is between 38 and 44 pies?

1. (30pts) A fraternity organizing a trip for spring break is deciding where to go. Its members were asked to rank their preferences among the following destinations: Cancun, Daytona Beach, Punta Cana or South Padre Island.

Votes	7	3	4	2	2	2	5	6
1st	C	D	D	D	P	P	S	S
2nd	D	S	C	P	C	C	D	P
3rd	S	C	P	S	S	D	C	D
4th	P	P	S	C	D	S	P	C

a) Which choice wins the vote in a plurality election?

b) Which choice wins the vote in a plurality election with elimination?

c) Which choice is the pairwise comparison winner?

d) Which choice is the winner using Borda's method? Perform the check on the sum of Borda points.

2. (10pts) Determine whether each of the following graphs has an Euler path or an Euler circuit. If it does, find it, if not, explain why not.
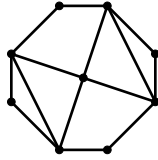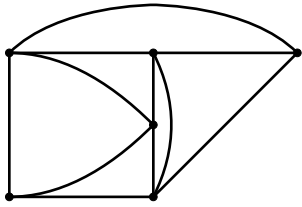
3. (20pts) A Tennessee salesman would like to visit Chattanooga, Knoxville, Memphis and Nashville while trying to minimize the distance traveled. The table below has the distances between the cities.

a) Draw a weighted graph that corresponds to this problem.

b) Use the brute force method to find the route that minimizes the distance traveled. First list all the possible orders of visits with Nashville the starting city.

c) Use the nearest neighbor algorithm to find an approximate solution to the problem. Is it the same as in b)?

	C	K	M
K	112		
M	322	387	
N	129	178	210