

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. (3pts) $\sqrt[7]{16} =$

2. (4pts) $475 \left(1 + \frac{0.05}{12}\right)^{60} =$

3. (4pts) $\sqrt[4]{3.75 \cdot 11.9} =$

4. (3pts) $\frac{\log 1.43}{\log 0.763} =$

5. (4pts) $\frac{\log(1.75)}{12 \log 1.004} =$

6. (6pts) $\frac{\left(1 + \frac{0.054}{4}\right)^{20} - 1}{\frac{0.054}{4}} =$

7. (6pts) $\frac{1 - \left(1 + \frac{0.095}{12}\right)^{-60}}{\frac{0.095}{12}} =$

1. (5pts) Sharon borrowed \$300 from a local lender. If she repays the loan with \$347 after 3 months, what annual simple interest rate is she being charged?

2. (6pts) What is a better deal on a certificate of deposit:

- a) an account earning 4.77%, compounded monthly, or
- b) an account earning 4.81%, compounded quarterly?

3. (6pts) A family can afford to save \$300 every month toward the purchase of new furniture. If the family is depositing money into an account bearing 5.4%, compounded monthly, how long will it be until they have \$9,000?

4. (6pts) In January of 1991 the stock of LSI Logic company was trading at \$1.88 per share. In January of 2007 it is trading at \$9.50 per share. Find the annual compound interest rate that this growth corresponds to.

5. (7pts) You would like to buy a car for \$17,540. Suppose you are putting 10% down and getting a loan for the remainder. If you can get an interest rate of 3.75%, compounded monthly, what will your monthly payment be?

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. (2pts) 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. (7pts) Find a financial services website that computes a monthly payment based on a loan amount. Many banks' or mortgage originators' websites have mortgage calculators, for example. Use their calculator and the actual interest rate that they offer to find the monthly payment on your hypothetical loan. 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. (6pts) Using our loan formula from 3.5, 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. (7pts) Find the balance of the hypothetical loan after half of all payments have been made.

5. (8pts) Write an amortization schedule for the four payments after half of all payments have been made. (For example, if it's a 60-month loan, consider payments 31, 32, 33 and 34.)

Group	1	2	3	4	5	6	7	8	9
15-year	5.20	5.20	5.20	6.05	6.05	6.05	7.55	7.55	7.55
30-year	5.88	5.88	5.88	6.33	6.33	6.33	8.00	8.00	8.00
savings	7	9	11	7	9	11	7	9	11

A family buying a home will need to take out a loan for \$150,000. They can afford payments both on a 15-year loan (which are higher) and a 30-year loan, but are trying to decide what is better for them in the long term.

1. (7pts) Compute the monthly payment R_1 on the 15-year loan if the interest rate is _____%, compounded monthly. Find the total payments that the family made on this loan.

2. (7pts) Compute the monthly payment R_2 on the 30-year loan if the interest rate is _____%, compounded monthly. Find the total payments that the family made on this loan.

Now we consider how much this family could save in 30 years. Suppose they can deposit money in an account bearing _____% compounded monthly.

3. (7pts) If the family took the 15-year loan, after 15 years it doesn't have a monthly payment, so for the remaining 15 years it can put the monthly payment R_1 into savings. How much is in the savings account after 15 years?

4. (7pts) If the family took the 30-year loan, it will have a monthly payment throughout the 30 years. However, since the family could have afforded the higher payment R_1 , we assume they can put the difference $D = R_1 - R_2$ into a savings account every month for all of the 30 years. How much is in the savings account after 30 years?

5. (2pts) What option ends up with more money in the savings account at the end of 30 years? What other considerations might come in when choosing the term of the loan?

1. (6pts) Two dice are rolled.

a) How many outcomes does this experiment have?

b) List the outcomes for which the sum on the dice is 8.

c) What is the probability of getting a sum of 8 on one roll of two dice?

2. (3pts) Suppose the house odds on the horse Seven Legs are 3 to 7. If you think the horse's chances of winning are 70%, is this a fair bet?

3. (5pts) In a class of 27 children, 13 play soccer, 8 play basketball and 18 play at least one of the sports. If a child is randomly selected, what is the probability that

a) it plays soccer and basketball?

b) it plays neither sport?

4. (2pts) If a random card is drawn from a deck, the odds against this card being a spade are _____ to _____.

5. (7pts) A bag has 8 white and 10 black balls. If two balls are pulled from the bag without looking, what is the probability

a) that they are both white?

b) that the second ball is black, given that the first one is white?

c) that the second ball is black?

6. (7pts) Suppose a multiple-choice exam has four possible answers for each question, only one of them correct. You get 5 points for each correct answer, lose 2 points for each incorrect answer and get nothing if you leave the question unanswered.

a) What is the expected point value of a random guess on this exam?

b) What is the expected point value if you can eliminate one of the answers as incorrect and choose a random answer from the remaining three?

c) Assuming you can always eliminate one answer and choose a random answer from the remaining ones, how many points would you expect to get on a test with 50 questions?

(Final answers should have accuracy to 2 decimal places.)

1. (8pts) On his drive to work, Richard passes 10 stoplights. The table below shows the number of times Richard has come to a red stoplight during a drive to work (data over 55 days).

- What is the mode of the data?
- What is the median of the data?
- What is the mean of the data?
- Find the relative frequencies.
- Draw a pie chart representing the data.

Red	Freq.	Rel. Freq.	Angle
2	7		
3	2		
4	15		
5	16		
6	6		
7	9		

2. (10pts) On exam 2, this 117 class achieved scores summarized in the table below. Do the following.

- Draw a bar graph for the data.
- Enter a representative value for each interval.
- Estimate the mean of data. State the actual mean, found on the course webpage and compare it with your number.
- Estimate the standard deviation of data.

Range	Frequency	Rep. value
≥ 90	9	
80–89	7	
70–79	5	
60–69	6	
< 60	9	

3. (6pts) Compute the following probabilities for a standard normal distribution. Draw a picture showing which area you are computing.

a) $P(0.5 \leq Z \leq 0.75)$

b) $P(Z < -0.25)$

4. (6pts) Suppose that exam scores in a math class are graded “on a curve”, where it is decided ahead of time that a certain percentage of the class will earn A’s, B’s, and so on. Assume that the top 10% of the class is given an A. If the exam scores are normally distributed with a mean of 68 and a standard deviation of 14, what is the minimum score required to get an A?

1. (6pts) Suppose 140 votes are cast in an election among five candidates. After the first 100 votes are counted, the tallies are as follows: Stein 12, O'Rourke 23, Cohen 17, Holt 29, Massey 19.

- a) What is the minimal number of remaining votes Holt needs to be assured of a win?
- b) What is the minimal number of remaining votes Cohen needs to be assured of a win?

2. (4pts) If 273 votes are cast, what is the smallest number of votes a winning candidate can have in a 4-candidate race decided by plurality?

3. (20pts) A small town must decide whether to build tennis courts, a basketball court, or a baseball field. The residents are polled and their preference rankings are as follows:

percentage of voters:	12	20	11	24	10	23
Tennis courts	1	1	2	3	2	3
Basketball court	2	3	1	1	3	2
Baseball field	3	2	3	2	1	1

- Which choice wins the vote in a plurality election?
- Which choice wins the vote in a plurality election with a runoff?
- Which choice is the Condorcet winner, if any?
- Which choice is the winner using Borda's method? Perform the check on the sum of Borda points.
- In the Borda election, could the 12% of voters from the first column achieve a preferable outcome by voting strategically, assuming all the other members voted as shown?