

Math 116
Dr. John Maharry
Winter 2012
Practice Final Exam
Final Exam is Tuesday March 13 at 10:00 – 11:48

Name _____

These problems are typical of the type of problem that will be on the final exam. However, that does not mean that only these topics will be on the exam. I would also suggest looking over all of the midterms, homeworks and quizzes to make sure that you understand those ideas. It might be helpful to make a list of all of the “methods”, “Criteria”, “Formulas”.

1. Suppose I bought a sweater and after 7% tax is cost \$40.12. What was the original price?
2. If a TV was worth \$475 and a store sold it for \$550, what was their percent profit?
3. How much money would you have in an account after 10 years if you invested \$2000 at 6% annual interest? How much would you have if it was compounded monthly?
4. Suppose the population of a small town increases by 8%, 12% and 6% each year during the last three years. By what percent did it increase over the three year period? Second, what was the average yearly percent increase over the period?

5. Suppose the value of an investment was decreasing by 12% per year for 5 years. Then it started increasing at 4% for 3 more years. If the account started at \$20,000. What is the value of the account at the end of the 8 year period?
6. Suppose I invest \$250 each month into a retirement fund starting when I am 21 years old. If it earns 4% interest compounded monthly until I retire at 65, how much will it be worth then?
7. Suppose I buy a new car for \$24000 and agree to a 4 year loan at 5% annual interest compounded monthly. What are my monthly payments? How much less would they be if I took the same loan but paid it pack in 6 years instead?

8. Suppose you and I are playing a game to determine your grade for a test. Naturally, you want it to be as high as possible and I want it to be as low as possible. I can either make the test all on game theory, all on probability or comprehensive. You can decide to study only game theory, to study only probability or spend your time studying for all of the topics.

Based on the following payoff matrix, what is Student A's strategy and why? What is the professor's strategy?

Is that an equilibrium? Why or why not? If not, who would want to change their strategy to something else? (And start the second guessing...)

		Professor		
		Game Theory	Probability	Comprehensive
Student A	Game Theory	94	35	58
	Probability	27	92	65
	Comprehensive	80	82	87

9. Suppose in the above example with the final exam, I tell you that the probability that I have an exam completely on game theory is 20%, completely on probability is 30% and a comprehensive final is 50%. What is your expected exam grade if you choose to study only Probability?

10. Suppose you and a competitor play the following game. You pick a row and they pick a column. They pay you the result. Here are the payoffs for each of the possible situations.

Find your optimal strategy.

		Competitor (wants low numbers)	
		A	B
You (Wants High numbers)	A	9	3
	B	1	5

What is the expected value if you call A with probability P , and call B with probability $(100-P)$ and they call A every time?

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What is your MaxiMin Strategy?

11. Describe the idea of Prisoner's Dilemma. Use the idea of whether two candidates should run negative ads against each other during a primary before the general election.

12. Randomly pick 2 cards from a deck. What is the probability that they are different suits?

13. Randomly choose 3 cards from a standard deck. What is the probability that you have no pairs (and therefore no three-of-a-kind either)?

14. You flip a coin 10 times. What is the probability that you get all heads?
Second, what is the probability that you will get exactly 5 heads?

15. Evaluate ${}_{82}C_2$ ${}_{96}P_2$ ${}_{100}C_{99}$

16. Find the odds in favor of getting a total of 11 when rolling two fair dice.

17. Suppose you flip a coin 5 times.

a. Find N (the number of outcomes in the sample space)

b. Find the Probability that the first three flips are all heads.

c. Find the probability that exactly three of the flips are heads.

18. Now consider a deck of cards. You are dealt three random cards. What is the probability that:

a. They are all Aces.

b. They are all the same suit.

c. They are all different suits

19. An airport limo must take 6 passengers to different downtown hotels from the airport before returning to the airport. Is this an example where an Euler circuit, an Euler path, a spanning tree, a Hamilton circuit or a Hamilton path would be of most use?

20. Circle all of the algorithms that would be appropriate above:
 Fleury's, Kruskal's, Cheapest Link, Repetitive Nearest neighbor, Brute force.

21. Using the mileage chart below find the Hamilton circuit given by using the nearest-neighbor method beginning with L. Give the total mileage for your trip.

	B	D	H	L	N	P
B		1748	1804	941	1088	561
D	1748		243	819	660	1204
H	1804	243		928	768	1313
L	941	819	928		168	388
N	1088	660	769	168		553
P	561	1204	1313	388	553	

22. How would repetitive nearest neighbor be different? You don't have to actually do it.

23. Is repetitive nearest neighbor an efficient algorithm? Is it optimal?

24. Find a Hamilton circuit for the mileage chart above using the cheapest-link algorithm.

	B	D	H	L	N	P
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N	1088	660	769	168		553
P	561	1204	1313	388	553	

6. The population of state A is 1407 thousand, of state B is 6804 thousand, of state C is 1101 thousand, of state D is 1998 thousand, of state E is 2295 thousand and of state F is 1695 thousand. Find the apportionment of 51 seats using Hamilton's Method.

7. For the same states as in question 6, with the same populations and with 51 seats, use modified divisors of 320 and 325 and determine the apportionment for either Adam's method or Webster's method. (One of them will work out nicely with one of the divisors given above).

11. Determine the value of $701 + 702 + 703 + \dots + 2218 + 2219 + 2220$. Think about the formula for the number of edges in a graph with 2220 nodes.

12. In an election with 7 candidates and 150 voters, how many total points are there in a Borda count election?