

Math 141

Final

Version 1

Name	

Allowed: 3 pages of cheat sheet, calculator

Total number of points: 56

Time: 2 hours

Multiple Choice (2 points each)

- The probability that our team will finish first in the relay race is 0.30. What are the odds of our team winning the race?
 - 1 to 3
 - 3 to 1
 - 3 to 7
 - 3 to 10
- What number correctly completes the following probability distribution?

Result	Probability
3 boys	0.25
2 boys	0.35
1 boy	0.30
0 boys	?

 - 0.0
 - 0.1
 - 0.2
 - 0.3
- The welds done in a certain factory are all inspected by two inspectors working separately. 95% are passed by inspector A, 93% are passed by inspector B, and 91% are passed by both. What percent of welds are passed by at least one inspector?
 - 97%
 - 95%
 - 93%
 - 91%
- A televised debate is being taped using two independent sound systems. The first has a 0.03 probability of failure during taping; the second has a 0.05 probability of failure. What is the probability that both will fail during taping?
 - 0.080
 - 0.020
 - 0.0042
 - 0.0015
- A bicycle rider has a spill once every 23 days, on average. What is the probability of at least one fall in the next 30 days?
 - 68.2%
 - 70.5%

- c) 73.6%
 - d) 82.6%
6. A casino card game takes \$4 bets. Players have a 32% chance of winning, i.e. winning back their bets plus \$8, and they have a 68% chance of losing their bets. What is the house edge, i.e. the expected win from the house perspective.
- a) 1 cent per dollar
 - b) 2 cents per dollar
 - c) 3 cents per dollar
 - d) 4 cents per dollar
7. A child has a 35% chance of being sent to a day care facility that charges \$400 per month and a 65% chance of being sent to one that charges \$600. What is the expected cost of the child's day care?
- a) \$500
 - b) \$530
 - c) \$550
 - d) \$575
8. Suppose a chess board has one grain of wheat on the first square, two grains of rice on the second square, four grains of rice on the 3rd square, eight grains of rice on the fourth square, and so on, up to and including the 19th square. Find the total number of grains on the board.
- a) 2^{19}
 - b) $2^{19} - 1$
 - c) 2^{20}
 - d) $2^{20} - 1$
9. Suppose that a single bacterium is in a bottle at 11:00 am. It divides into two bacteria at 11:01, and the population continues to double every minute until the bottle is completely full at 12:00 noon. Find the fraction of the bottle that is full at 11:53 am.
- a) $1/32$
 - b) $1/64$
 - c) $1/128$
 - d) $1/512$
10. If the half life of a drug in the blood stream is 9 hours, how much drug is left in the bloodstream 20 hours after a 260 milligram dose?
- a) 32 milligrams
 - b) 56 milligrams
 - c) 117 milligrams
 - d) 190 milligrams
11. If the doubling time of a state's population is 42 years, how long does it take for the population to increase by a factor of 16?
- a) 84 years
 - b) 126 years
 - c) 168 years
 - d) 672 years

12. Suppose a country currently has a population of 28 million and an annual growth rate of 2.2%. If the population growth follows a logistic model with a carrying capacity of 74 million, calculate the annual growth rate when the population is 32 million.
- a) 1.9%
 - b) 2.0%
 - c) 2.1%
 - d) 2.2%
13. The population growth of Laos has been estimated at 2.8% per year. What is the approximate doubling time?
- a) 15 years
 - b) 20 years
 - c) 25 years
 - d) 30 years

For the next two questions refer to the following preference schedule:

First	C	A	B	B	D
Second	D	B	D	C	A
Third	B	C	A	D	B
Fourth	A	D	C	A	C
	18	12	9	5	3

14. How many voters participated in the survey?
- a) 5
 - b) 45
 - c) 47
 - d) none of the above

Written Answer

- 15.(5 points)Find the winner by a sequential runoff .

16. (8 points) Given the preference schedule:

First	C	B	B	A
Second	A	C	A	C
Third	B	A	C	B
	11	9	7	6

If the winner is selected by a Borda count, which of the following fairness criteria is violated:

Condorcet criterion (criterion 2)

Monotonicity criterion (criterion 3)

Independence of irrelevant alternatives criterion (criterion 4)

17. (5 points) Suppose you want to save up for a down payment on a house of \$20,000. You make monthly payments to an account bearing 5.5% interest over 12 years. How much would you have to deposit each month?

18. (5 points) You are in the 28% marginal tax bracket and make monthly pretax deposits of \$ 700 into an IRA. By how much is your take home pay reduced?

19. (5 points) You are paying off a car loan of \$18,000. The APR is 4.8% and the duration of the loan is 3 years. What are your monthly payments?