

Math 141

Final

Version 1

Name	
Section	

**Allowed:** 5 pages of cheat sheet, calculator

Total number of points: 33

Time: 2 hours

**Multiple Choice** (1 point each)

1. What number correctly completes the following probability distribution?

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

- a) 0.0  
b) 0.1  
c) 0.2  
d) 0.3
2. 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?  
a) 1 to 3  
b) 3 to 1  
c) 3 to 7  
d) 3 to 10
3. 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?  
a) 0.080  
b) 0.020  
c) 0.0042  
d) 0.0015
4. 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?  
a) 97%  
b) 95%  
c) 93%  
d) 91%

5. 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%
  - 73.6%
  - 82.6%
6. 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?
- \$500
  - \$530
  - \$550
  - \$575
7. A casino card game takes \$4 bets. Players have a 32% chance of winning and winning back their bets plus \$8, and they have a 68% chance of losing their bets. What is the house edge.
- 1 cent per dollar
  - 2 cents per dollar
  - 3 cents per dollar
  - 4 cents per dollar
8. 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.
- $1/32$
  - $1/64$
  - $1/128$
  - $1/512$
9. 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 3<sup>rd</sup> square, eight grains of rice on the fourth square, and so on, up to and including the 19<sup>th</sup> square. Find the total number of grains on the board.
- $2^{19}$
  - $2^{19} - 1$
  - $2^{20}$
  - $2^{20} - 1$
10. 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?
- 84 years
  - 126 years
  - 168 years
  - 672 years

11. 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?
- 32 milligrams
  - 56 milligrams
  - 117 milligrams
  - 190 milligrams
12. The population growth of Laos has been estimated at 2.8% per year. What is the approximate doubling time?
- 15 years
  - 20 years
  - 25 years
  - 30 years
13. 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.
- 1.9%
  - 2.0%
  - 2.1%
  - 2.2%

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?
- 5
  - 45
  - 47
  - none of the above
15. Find the winner by a sequential runoff.
- A
  - B
  - C
  - D

**Written Answer (3 points )**

16. 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:

- a) Condorcet criterion (criterion 2)
- b) Monotonicity criterion (criterion 3)
- c) Independence of irrelevant alternatives criterion (criterion 4)
- d) None of these