

**Math 101**  
**Exam 3**  
**Fall 2010**

**Name:**

1. Three major grain crops raised in the world are wheat, maize, and rice. A survey of 43 countries that raise grain yielded the following results:
- 18 countries raised wheat
  - 16 countries raised maize
  - 12 countries raised rice
  - 9 raised wheat and maize
  - 3 raised maize and rice
  - 3 raised wheat and rice
  - 2 raised all three crops

- (a) 10 pts. Draw a Venn diagram illustrating the information given above.
- (b) 5 pts. How many countries raised none of the three crops?
- (c) 5 pts. How many countries raised exactly one of the crops?
- (d) 5 pts. How many raised wheat and maize, but not rice?
- (e) 5 pts. How many raised maize or rice, but not wheat?

2. 10 pts. Show that the set  $\{3, 9, 15, 21, 27, \dots\}$  is infinite by placing it in a one-to-one correspondence with a proper subset of itself. Be sure to show the pairing of the general terms in the sets!

3. 10 pts. Show that the set  $\{0, 2, 4, 6, 8, \dots\}$  has cardinal number  $\aleph_0$  by establishing a one-to-one correspondence between it and the set of natural numbers. Be sure to show the pairing of the general terms in the sets!

4. 10 pts. Jeb finds an irregularly-shaped five-sided rock on his dirt farm. He labels each side and tosses the rock 100 times whilst tanked on moonshine. The results of his tosses are shown in the table below. Determine the empirical probability that the rock will display side 4 if tossed again.

Side	1	2	3	4	5
Frequency	32	18	15	13	22

5. 10 pts. A traffic light is red for 25 sec, yellow for 5 sec, and green for 55 sec. What is the probability that when you reach the light it will be yellow?

6. 10 pts. One card is selected at random from a deck of cards. Find the probability that the card selected is not a 5.

7. 10 pts. A die is tossed. Find the odds against rolling a number less than 3.

8. 10 pts. The odds in favor of Wendy winning a scholarship are 7:4. Find the probability that Wendy wins.

9. 10 pts. Here's a grand little game: a 15-sided die is rolled once. If an even number comes up you win \$10; if a 1 or 3 comes up you lose \$6; if a 5, 7, 9, or 11 comes up you lose \$1; if a 13 comes up you lose \$50; and if a 15 comes up you break even. What's your expected value if you play this game?

10. 10 pts. each A multiple-choice exam has five possible answers for each question. For each correct answer you get 10 points. For each wrong answer you lose 3 points. For answers left blank, no points are gained or lost.

- (a) If you don't know the correct answer to a question, is it to your advantage to guess? Explain.
- (b) If you don't know the correct answer to a question but can eliminate two possible choices, is it to your advantage to guess? Explain.

11. Frylock has decided to take 3 courses during the summer: an elective, a math course, and a science course. The available choices are:

Elective	Math	Science
Tiddledywinks	Topology	Genetics
Mumblety-peg	Geometry	Planetology
	Algebra	Exobiology

- (a) 10 pts. Make a tree diagram
- (b) 10 pts. What's the probability Frylock will take topology *and* exobiology?
- (c) 10 pts. What's the probability Frylock will take tiddledywinks *or* algebra, but not both?