

Math 105: Finite Mathematics

Homework 1: Due Jan 22, 2008

January 15, 2008

1 The Game of Pig

To play the game **Pig**, you need two or more players, one die, a pad of paper and a pencil to keep score. A starting player is chosen randomly and given the die. The following rules are taken from Wikipedia. [http://en.wikipedia.org/wiki/Pig_\(dice\)](http://en.wikipedia.org/wiki/Pig_(dice))

Each turn, a player repeatedly rolls a die until either a 1 is rolled or the player holds and scores the sum of the rolls (i.e. the turn total). At any time during a player's turn, the player is faced with two options:

- **roll** - If the player rolls a
 - **1**: the player scores nothing and it becomes the next player's turn.
 - **2 - 6**: the number is added to the player's turn total and the player's turn continues.
- **hold** - The turn total is added to the player's score and it becomes the next player's turn.

The first player to score 100 or more points wins.

1.1

Play **Pig** with another person in class. Record each turn the player and number of points saved. What was the *maximum* number of points earned in any turn? What was the *minimum*? What was the *average*?

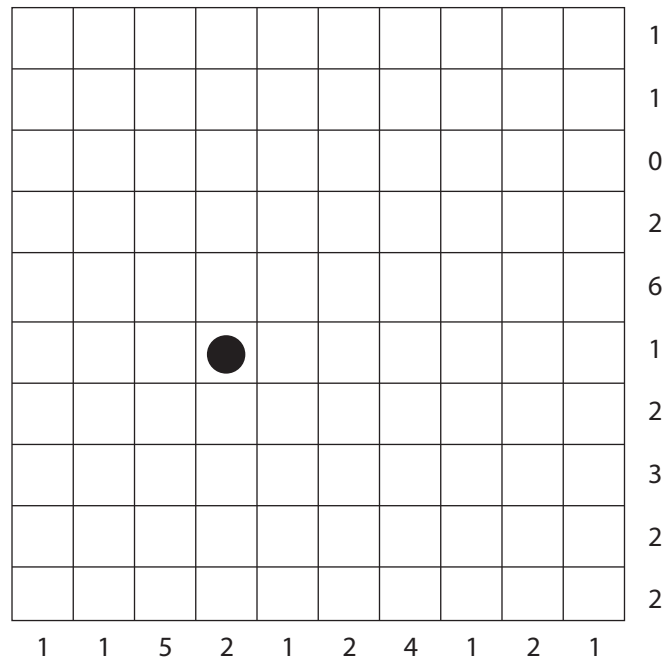
1.2

Play **Pig** with someone not in this class. Your strategy will be to stop rolling after **two** rolls. The other player may use whatever strategy they wish. Record each turn the player and number of points saved. Do you believe this is a good strategy?

1.3

Play **Pig** with someone not in this class. Your strategy will be to stop rolling after earning **20** points. The other player may use whatever strategy they wish. Record each turn the player and number of points saved. Do you believe this is a good strategy?

2 Battleships



The object of Battleships is to find the locations of 10 ships (one of length 4, two of length 3, three of length 2, and four of length 1) hidden in the above ocean. The ships may be oriented either horizontally or vertically in

the grid, but no two ships will occupy adjacent grid squares, even diagonally. The digits along the side of and below the grid indicate the number of grid squares in the corresponding rows and columns occupied by vessels.

2.1

Solve the above Battleships puzzle.

2.2

Write three statements in Logic that capture one constraint each on the placement of a ship in the above grid.

3 Logic

3.1 Evaluation

Given the statements P , Q and R , where

- P = “20 is larger than 10.”
- Q = “The moon is made of green cheese.”
- R = “4 is a possible value from a six-sided die.”

Evaluate the truth value of the following formulas. Show your work for full credit.

3.1.1

$$P \wedge Q$$

3.1.2

$$P \vee R$$

3.1.3

$$\neg P \vee R$$

3.1.4

$$(R \Rightarrow Q) \wedge P$$

3.1.5

$$Q \Rightarrow \neg R$$

3.2 Tautologies and Contradictions

State whether the following formulas are tautologies, contradictions, or neither. Use a truth table to justify your claim.

3.2.1

$$T \vee \neg T$$

3.2.2

$$(V \wedge \neg S) \vee (\neg V \vee S)$$

3.2.3

$$S \wedge V$$

3.2.4

$$S \wedge \neg S$$

3.2.5

$$(V \vee \neg T) \wedge (T \wedge \neg V)$$

3.2.6

$$(((A \wedge B) \Rightarrow C) \wedge (B \Rightarrow A) \wedge B) \Rightarrow C$$