

## FREC 408 Assignment 3

**Issued:** September 28, 2003

**Due:** End of class, October 8

**Be sure to:**

- Put your name and the Assignment # on the front
- Answer as completely as you can. All I can go on is what you give me, so show your work.
- Be as neat as possible. You can write it out, but please be neat.
- Staple or place in a folder

1. Look at the following table from a study of unintentional carbon monoxide (CO) poisoning of Colorado residents. A total of 981 cases of CO poisoning were reported over a six-year period. Each case was classified as Fatal or Nonfatal and by source of exposure. Answer the following questions:

Source of Exposure	Fatal	Nonfatal	Total
Fire	63	53	116
Auto Exhaust	60	178	238
Furnace	18	345	363
Kerosene or spaceheater	9	18	27
Appliance	9	63	72
Other gas-powered motor	3	73	76
Fireplace	0	16	16
Other	3	19	22
Unknown	9	42	51
TOTAL	174	807	981

- a. Let A be the event that the CO poisoning is caused by fire. Find  $P(A)$
- b. Let B be the event that CO poisoning is caused by auto exhaust. Find  $P(B)$
- c. Let C be the event that the CO poisoning is caused by auto exhaust and is fatal. Find  $P(C)$
- d. Given that the source of the poisoning is fire, what is the probability that the case is fatal?
- e. Given that the case is nonfatal, what is the probability that it is caused by auto exhaust?
- f. If the case is fatal, what is the probability that the source is not a furnace or a kerosene/space heater?

2. Answer Exercise 4.25 in the book on page 208 in Chapter 4 (pheromones) 15 pts
3. Answer Exercise 4.55 on page 225 in Chapter 4 (a pair of dice) 20 pts
4. **An individual's genetic makeup is determined** by the genes obtained from each parent. 20 pts  
For every genetic trait, each parent possesses a gene pair, and each contributes  $\frac{1}{2}$  of the gene pair, with equal probabilities, to their offspring, forming a new gene pair. The offspring's traits (eye color, baldness, etc.) come from this new gene pair, where each gene in this pair possesses some characteristic.
- For the gene pair that determines eye color, each gene trait may be one of two types, dominant brown, (B) or recessive blue (b). A person possessing the gene pair  $BB$  or  $Bb$  has brown eyes, whereas the gene pair  $bb$  produces blue eyes.
- a. Suppose both parents of an individual are brown eyed, each with a gene pair  $Bb$ . What is the probability that a randomly selected child of this couple will have blue eyes?
- b. If one parent has brown eyes, type  $Bb$ , and the other has blue eyes, what is the probability that a randomly selected child of this couple will have blue eyes?
- c. Suppose one parent is brown-eyed, type  $BB$ . What is the probability that a child has blue eyes?
5. **Consider an experiment where 10 identical small boxes are placed side-by-side on a table.** 15 pts  
A crystal is placed, at random, inside one of the boxes. A self-professed "psychic" is asked to pick the box that contains the crystal.
- a. If the psychic simply guesses, what is the probability that she picks the box with the crystal?
- b. If the experiment is repeated seven times, what is the probability that the psychic guesses correctly at least once? *Hint: use the complement of this event, defined as no correct guesses in seven tries.*
- c. A group called the Tampa Bay Sceptics recently tested a psychic using the above test. The psychic failed to pick the correct box all seven times. What would you infer about this person's psychic ability?

6. I want each person in the class to run an experiment on playing Solitaire on the computer. This is done by getting ony PC with Windows and using START PROGRAMS Accessories Games Solitaire 10 pts

- a. You need to get on any computer with solitaire and set the game up in the following way.
- Under GAME picks OPTIONS
  - Pick draw three
  - Pick Vegas Style
  - Pick Keep Score

Vegas Style plays a game where it costs you \$52 to play one hand. The draw three options turns the deck over three cards at a time and let's you go through the deck three times. You get \$5 for each card you place on the top (i.e., Ace, two, three... of a suit). If you get all 52 cards on top you would get back \$208  $(52 \times 5) - 52 = \$208$

It is very hard to a priori determine the odds of winning, so we will do an experiment to see what the probabilities are for this game. If each person plays 10 games we will have over 400 trials. I will tally the results.

- b. If you haven't played Solitaire this way before, I suggest you try a few hands to see how it works.
- c. I want you to play 10 games and keep track of the winnings for each game. By this I mean mark down the result after the game, **THEN QUIT Solitaire**, and then start it again.

This gives a fresh start each time and makes it easy to tally. **Note: your answer for each game can only be between -\$52 to \$208. Be sure and note a minus!**

Make a table with the winnings (or losings) for each hand. Then answer the following two questions.

Example:

Hand 1	\$12
Hand 2	-\$52
Hand 3	\$75

You can e-mail this list to me so I can enter it into the computer for class, and also include it with your homework. Be sure and answer the following two questions:

1. Based on your own ten games, what do you expect is the average winnings per hand?
2. What factors do you think would influence the outcome of this class experiment? Are there any sources of bias?