

Practice First Midterm Exam

Statistics 200 Spring 2008 (Pfenning)

This is a closed book exam worth 150 points. You are allowed to use a calculator and a two-sided sheet of notes. There are 8 problems, with point values as shown. If you want to receive partial credit for wrong answers, show your work. Don't spend too much time on any one problem.

1. (25 pts.) An article entitled **Prevent Migraines Naturally** states that "Patients who took 100 milligrams of the supplement Coenzyme Q10 (CoQ10) three times a day had up to 50 percent fewer migraines and less nausea after three months, finds a new Swiss study. Their headaches were also shorter and not as severe. Researchers believe that CoQ10 prevents migraines by boosting energy production in cells." Identify each of the following as well as you can.

- (a) explanatory variable _____
- (b) explanatory variable type: (i) quantitative (ii) categorical (iii) not clear
- (c) response variable _____
- (d) What comparison is being made?
 - i. patients who do or do not take CoQ10
 - ii. patients before and after taking CoQ10
- (e) Which one of the following additional pieces of information would be **most** helpful in deciding whether CoQ10 is really beneficial for migraine sufferers?
 - i. Was there a control group taking a placebo?
 - ii. Were the patients randomly chosen to participate in the study?
 - iii. How did researchers define a migraine?
 - iv. Were different dosages of CoQ10 tested?
 - v. How realistic was the setting?

2. (20 pts.) Researchers are interested in how pesticides affect children's health. Here are designs for two actual studies:

Design A: The EPA proposes to pay each family in their study \$970, some children's clothing and a camcorder in exchange for their participation for two years, during which they would use various household pesticides and have their children tested for absorption rates.

Design B: A study will recruit and enroll participants in 96 locations over the next four years and track them from conception through their children's 21st year. The 2.7 billion dollar study will monitor the children's health, along with pesticide exposures in the air, food, and water.

- (a) Which design is an observational study? (i) A (ii) B (iii) both (iv) neither
- (b) Which design is more vulnerable to confounding variables?
 - (i) A (ii) B (iii) both the same (iv) neither

- (c) What is the most worrisome flaw in Design A?
- (d) Which of the above in this problem are closed questions?
(a), (b), or (c) (Circle any that are closed.)

3. (20 pts.) Weights of male mallard ducks are normally distributed with mean 800 grams, standard deviation 100 grams.

- (a) According to the 68-95-99.7 Rule, 95% of male mallards weigh between _____ and _____ grams.
- (b) Almost none of the mallards weighed less than how many grams?
- (c) What is the z-score for a male mallard weighing 740 grams? _____
- (d) A male mallard weighing 740 grams could best be described as
(i) very light (ii) a bit light (iii) a bit heavy (iv) very heavy

4. (15 pts.) Breadths (in centimeters) of a sample of male Egyptian skulls from 4000 B.C. and 150 A.D. are listed below and displayed with a side-by-side boxplot.

4000 B.C.	131	119	138	125	129	126	131	132	126	128	128	131
150 A.D.	136	130	126	126	139	141	137	138	133	131	134	129

- (a) During which time did skulls tend to be broader?
(i) 4000 B.C. (ii) 150 A.D. (iii) both about the same
- (b) During which time did breadth vary the most for the middle half of values? (i) 4000 B.C. (ii) 150 A.D. (iii) both about the same
- (c) Which of these is your best guess for standard deviation of skull breadths in 150 A.D.? (i) 5 cm (ii) 20 cm (iii) 50 cm
- (d) We could characterize shapes as being
(i) both skewed left
(ii) both skewed right
(iii) 4000 B.C. skewed left, 150 A.D. skewed right
(iii) 4000 B.C. skewed right, 150 A.D. skewed left
(v) both symmetric
- (e) Sample mean skull breadth in 4000 B.C. would be denoted (i) \bar{x}_1 (ii) s_1 (iii) μ_1
(iv) σ_1 (v) \hat{p}_1 (vi) p_1 (vii) n_1