Question 1 Multiple choice: circle the best answer to each question:
Use the following for (1), (2), and (3): A study is done in Rathtrevor Beach Park (Parksville, BC) to estimate the proportion of park cedar trees infected with the fungus *Cryptococcus gatti.* A study area of size one hectare is chosen and the number of infected cedar trees in the study area is determined. A count of the total number of cedar trees in the study area is also made.

(1)[2 points] The population in this study is

(a) all trees in the one hectare study area.

(b) all cedar trees in the one hectare area.

(c) all trees in Rathtrevor Beach Park.

(d) all cedar trees in Rathtrevor Beach Park.

(e) the total amount of fungus *Cryptococcus gatti.*

(2)[2 points] The individuals in the study are

(a) the individual trees, regardless of type.

(b) the individual spores of the fungus.

(c) the researchers.

(d) the individual cedar trees.

(e) the single study area of size one hectare.

(3)[2 points] The proportion of cedar trees infected in the one hectare study area is

(a) a statistic.

(b) a parameter.

(c) a sample.

(d) a margin of error.

(e) confounded.

(4)[2 points] In an effort to make a campus-wide assessment of student attitudes toward math, students in our Math 161 are asked whether they like or dislike math. The number of raised hands is counted. This is an example of

(a) a simple random sample.

(b) an experiment.

(c) a voluntary response survey.

(d) a census.

(e) a sample survey.

(5)[2 points] Using line 149 of the attached Table of Random Digits we select a simple random sample of size 5 from a population of 50 labeled $00, 01, \ldots, 49$. The second individual selected is labeled

(a) 71.

(b) 07.

(c) 6.

(d) 43.

(e) 54.

Use the following for (6) and (7): A USA Today/Gallup poll found that 58% of people sampled feel that it was a mistake sending troops to Iraq. A statement at the end of the survey reads: "Results are based on telephone interviews with 1,010 National Adults, aged 18+, conducted September 14-16, 2007. For results based on the total sample of National Adults, one can say with 95% confidence that the margin of sampling error is ±3 percentage points."

(6)[2 points] This statement means that

(a) 95% of the survey responses are reliable.

(b) 3% of those surveyed refused to answer the question.

(c) 3% of those surveyed did not express their true feelings.

(d) repeating this survey 19 more times would result in exactly one incorrect result.

(e) if this survey were repeated many times over, in the long run 95% of the surveys would have sample statistics within 3 percentage points of the true population parameter.

(7)[2 points] Making the sample size 9 times larger would result in a margin of error that is

(a) 9 times larger.

(b) 1/9 as large.

(c) 1/3 as large.

(d) the same size.

(e) 3 times larger.

(8)[2 points] An experiment is designed to test the effect of temperature and soil acidity on a new plant hybrid. 40 plants are weighed after subjecting the plants to different temperature and soil treatments over a three week period. The explanatory variables are

(a) confounded with the experiment.

(b) the plants and soil.

(c) the temperature and growing time.

(d) the temperature and soil acidity.

(e) 40 in number.

(9)[2 points] A company is conducting drug trials to test its new treatment for high blood pressure. The trials are done using a randomized, placebo controlled, double-blind experimental design. "Double-blind" in this context means

(a) the researchers are isolated from the test subjects.

(b) the person giving treatment knows whether the real drug or placebo is being given, but the researcher in charge does not.

(c) the subject knows whether the real drug or placebo is being given, but the researcher does not.

(d) neither the subject nor the person giving treatment knows whether the real drug or placebo is being given.

(e) Test subjects has a second health issue in addition to high blood pressure.

(10)[2 points] In an experiment involving different treatments

(a) a placebo is always given.

(b) a control group is always used.

(c) either single blind or double blind techniques must be used.

(d) all of the above.

(e) none of the above.

Question 2 An opinion poll of Vancouver Island residents was conducted to determine the level of satisfaction with the Vancouver Island Public Library System. The population of Vancouver Island is 723,000 and there are 37 library branches. In the survey, which was based on a simple random sample, 3164 of the people surveyed said they were satisfied with the library system on the Island. The survey used a 95% level of confidence, and using the "quick method" (or rule of thumb), the margin of error was approximately 1.4%.

(a)[**3 points** How large was the sample? Round your answer to the nearest person.

$$\frac{1}{\sqrt{n}} = 0.014$$

$$\therefore \frac{1}{0.014} = \sqrt{n}$$

$$(\sqrt{n})^2 = \left(\frac{1}{0.014}\right)^2$$

$$n \doteq 5102 \text{ people}$$

(b)[**4 points**] What is the estimated proportion $\hat{p}$ of Vancouver Island residents who are satisfied with the library system? Round your answer to one decimal place.

$$\hat{p} = \frac{3164}{5102} \doteq 0.620 = 62.0\%$$

(c)[**3 points**] How large a sample is required if we want a margin of error half as large? Again, round your answer to the nearest person.

$$\left(\tfrac{1}{2}\right)(1.4\%) = 0.7\% = 0.007$$

$$\therefore \frac{1}{\sqrt{n}} = 0.007$$

$$n = \left(\frac{1}{0.007}\right)^2 \doteq 20408 \text{ people}$$

Question 3 A university has 2000 male and 1000 female faculty members. The university president wants to gather opinions from faculty and wants equal representation from male and female members. A poll is designed with a stratified random sample of 400 males and 400 females.

(a)[**3 points**] If the 400 females in the sample are chosen by labelling the 1000 female faculty members $000, 001, \ldots, 999$ and using line 109 of Table A attached, what are the labels of the first three females selected for the sample?

① : 360

② : 091

③ : 936

(b)[**4 points**] What is the chance of a male faculty member being selected for the sample? Give your answer as a percentage rounded to one decimal place.

$$P(\text{male faculty being selected}) = \frac{\#\text{ selections}}{\#\text{ eligible for selection}}$$

$$= \frac{400}{2000}$$

$$= 0.2$$

$$= 20\%$$

(c)[**3 points**] What is the chance of a female faculty member being selected for the sample? Give your answer as a percentage rounded to one decimal place.

$$P(\text{female faculty being selected}) = \frac{\#\text{ selections}}{\#\text{ eligible for selection}}$$

$$= \frac{400}{1000}$$

$$= 0.4$$

$$= 40\%$$

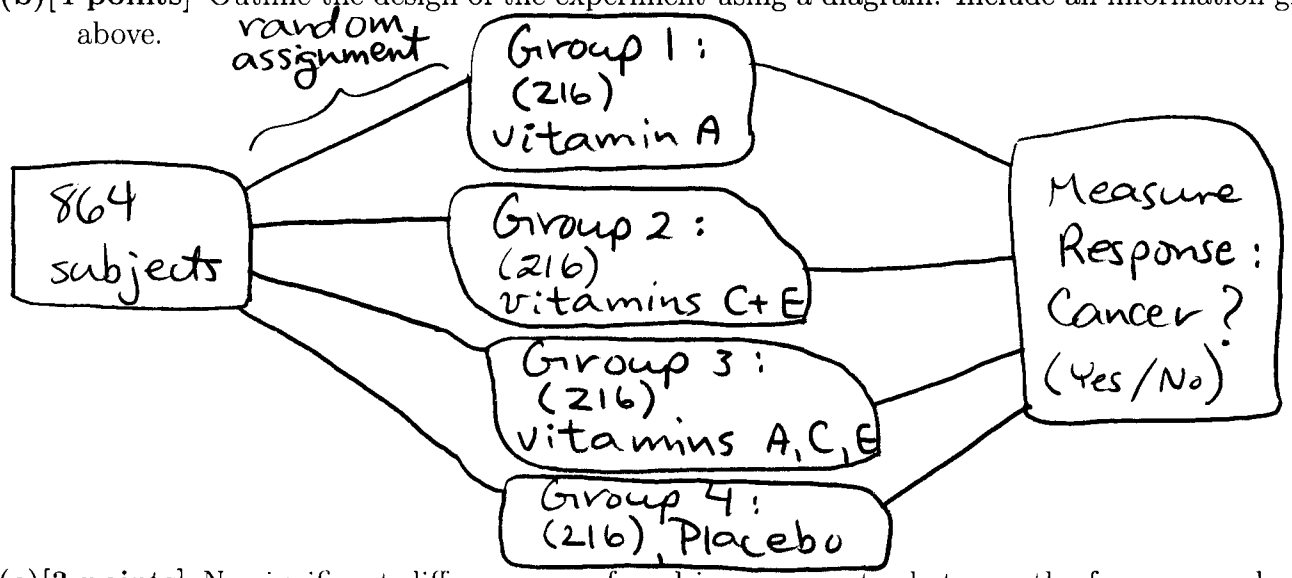
Question 4 Eating lots of fruits and vegetables is associated with lower rates of some cancers. These foods are high in vitamins A, C and E, so an experiment was designed to study the effect of these vitamins on cancer. 864 subjects were randomly divided into four equal groups. The first group received vitamin A, the second vitamins C and E, the third all three vitamins, and the fourth a placebo. The subjects were then regularly screened for cancer over a four year period.

(a)[3 points] What are the explanatory and response variables in this experiment?

explanatory: vitamin taken (A, C+E, A+C+E, Placebo)

response: development of cancer within four years (yes/no).

(b)[4 points] Outline the design of the experiment using a diagram. Include all information given above.



(c)[3 points] No significant difference was found in cancer rates between the four groups by the end of the four years. What lurking variables could explain the lower cancer rates among fruit and vegetable eaters?

Amount of exercise: it is quite possible that this group of healthy eaters is made up of individuals with generally active lifestyles, and this may contribute to low cancer rates.