Math 193: Practice for Final

1. What survey design is used in each of the following situations?

   (a) A random sample of classes at Camosun is chosen, and every student in that class is asked a question.

   (b) The Camosun student body is divided up into program areas (Civil Engineering, Nursing, etc.) and a random selection of students from each area is asked a question.

   (c) A certain number of student records are selected randomly from the entire student record database, and those students are asked a question.

   (d) The student records are listed in order by student number. The 11th student and every 25th student thereafter (11th, 36th, 61st, etc.) is asked a question.

2. A study of people's weights indicates that the weight of an adult is normally distributed, with mean of 150 lbs and standard deviation of 35 lbs. As a civil engineer, you are asked to study the maximum number of people who can occupy a particular elevator.

   (a) What is the probability that any one person's weight exceeds 170 lbs?

   (b) If ten people occupy an elevator, what is the probability that the average weight per person exceeds 170 lbs?

   (c) If the elevator's design gives a maximum load of 1700 lbs (10×170 lbs), would you recommend that ten be the maximum number of passengers? Explain your answer.

3. A regional computer centre wants to determine the average time between failures for its disk drives. To estimate this, the centre recorded the time between failures for a random sample of disk-drive failures, and found that the mean was 1762 hours with a standard deviation of 215 hours. Based on this sample data, estimate the true mean time between failures with a 90% confidence interval, if

   (a) the size of the sample was 45 disk-drive failures

   (b) the size of the sample was 12 disk-drive failures (assume normally distributed)

4. An entomologist wishes to estimate the average development time of the citrus red mite correct to within 0.5 days. From previous experiments it is known that σ is in the neighbourhood of 4 days. How large a sample should the entomologist take to be 95% confident of her estimate?

5. Leonardo DaVinci claimed that a person's height is roughly equal to their armspan (length from fingertip to fingertip when their arms are stretched wide). To test this claim, Mech students measured the armspan and height of eight volunteers.

person	armspan (cm)	height (cm)
1	172.7	175.3
2	158.1	157.5
3	165.1	165.1
4	176.5	177.8
5	172.7	170.2
6	175.3	170.2
7	157.5	160.0
8	153.0	157.5

The equation of the best fit line is $\hat{y} = 0.815x + 31.1$, where x is the armspan and y is the height. The correlation coefficient of this fit is 0.946.

(a) Is the linear association positive or negative?

(b) Calculate the coefficient of determination.

(c) What percentage of the variation in y is accounted for by the best fit line?

(d) If a person has an armspan of 157.5 cm, what would you predict the person's height to be?

(e) If a person has a height of 157.5 cm, what would you predict the person's armspan to be?

(f) According to the best fit line, a person with zero armspan should be 31.5 cm tall. Why should we not use the best-fit line to make this prediction?

6. Consider the following bivariate data set:

x	y
2	3
3	5
4	5.5
6	8
7	9.5

(a) Calculate the best fit line $\hat{y}$.

(b) Calculate the coefficient of determination r^2.