

AUSTRALIAN CATHOLIC UNIVERSITY

Castle Hill

Semester VI/VIII, 1992

MT207/MA282: Statistics

LECTURER: W. N. Franzsen

November 1992

TIME ALLOWED: 2 hours, plus 10 minutes reading time

INSTRUCTIONS TO STUDENTS

There are 10 questions on 4 pages. Complete, correct answers to 7 questions will obtain full marks. The marks available for each question are indicated at the end of each question.

This examination is worth 50% of your final mark.

You must give reasons, if none are given then you will get no marks for that part of the question.

Calculators are permitted.

You may attempt any and all questions.

The question paper must be handed in with your answers.

1. Estimate the next term in the following two time series.

(a) In this one the period of the seasonal effects is 3.

t	1	2	3	4	5	6	7	8
d	1.28	0.83	1.33	1.55	1.16	1.63	1.82	1.46

(b) No hint about the period with this one.

t	1	2	3	4	5	6	7	8	9	10
d	2.5	2.5	12.5	8.5	18.5	19.5	27.5	25.5	33.5	35.5

(25)

2. (a) Find the line of best fit through the following points. Estimate the values of y for $x = 1.75$ and $x = 10$. How confident are you in these estimates?

x	1	2	3	4	5	6
y	8	3	3	8	10	10

- (b) The following data satisfies a law of the form

$$y = Ax^m,$$

where A and m are constants, find an approximation to A and m and hence estimate the value of y for $x = 5$.

x	1	2	3	4
y	2.9	37.2	175	524

(15)

3. (a) The consumer price index (CPI) for Sydney was

130.9 in 1983
 136.0 in 1984
 147.5 in 1985 and
 161.4 in 1986

- (i) Which year had the highest inflation?
 (ii) What was a wage of \$1 000 per week in 1986 worth in 1983?
 (iii) By how much did the value of the dollar dropped between 1983 and 1986?

- (b) How would *you* work out the CPI?

(10)

4. (a) What does the term “margin of error” mean?

- (b) “In the latest opinion poll Bill Franzsen had a comfortable lead with the support of 54% of the voters.” Why can’t we trust this statement? In particular why is it not certain that Bill would win?

(20)

5. (a) Name your 3 favourite averages. Describe how they are calculated and give the benefits and disadvantages of each.

(b) Explain the difference between an experiment and a sample. When would we use each and why?

(20)

6. (a) Define the following terms.

(i) sample frame

(ii) error curve

(iii) statistic

(iv) parameter

(v) range

(b) Find the seventieth percentile of the following data.

23, 34, 38, 48, 4, 2, -68, 0, 38, 56, 100, 38, 15, 15, 0, 68, 94, 9, 20, 5.

(c) What is another name for the one hundredth percentile.

(15)

7. (a) In last years statistics examination the mean was 124% and the standard deviation was 32%. Convert the following marks into standardised scores with a mean of 62% and standard deviation of 12.

47, 58, 62, 77, 84, 93.

(b) Why is the arithmetic mean not always useful for working our average incomes?

(20)

8. (a) Why is a “phone-poll” never a valid sample?

(b) A teacher wishes to study the effectiveness of a new compter teaching system. To do this she asks for volunteers to use the system in their classes. Teachers that did not volunteer for the system were used to teach the control classes. At the end of the year the classes using the system were noticeably ahead of the control groups. Would you trust this information? How could you improve the experiment?

(20)

9. What is wrong (if anything) with each of the following statements.

- (a) There are 48 million people in the US who call themselves Roman Catholic. From a nationwide survey of US Catholics above the age of 17 it was found that more than a third do not attend Mass regularly.

This information was interpreted as an indication that many Catholics are falling away from their religion.

- (b) A recent harbour cruise was considered a success by its planners because only four of the two hundred in attendance complained. “When only four people are unhappy and 196 delighted, then as far as I’m concerned it’s a success”, one of the planners was quoted as saying.
- (c) Alcoholism costs us \$4.3 billion annually, according to a recent study by the Australian Confederation of Industry. Others, citing botched deals and lost sales at high executive levels, felt this estimate is too low and claim the losses are closer to \$7 billion.

(15)

10. (a) A member of the NSW senate is interested in the views of his electorate on the gun-control bill before parliament. His staff report that of the 294 letters recieved on the subject 189 were opposed to the legislation. What could he deduce from this information?

Describe how *you* would investigate the question of how much support or opposition there is in his electorate to this bill. Detail the pitfalls of your approach and how they might be avoided, minimized or taken into account.

- (b) In the time series given below the trend follows a parabolic curve and has seasonal effects of period four superimposed. How might we seperate the two? Can we use the usual method of centred moving averages (period four remember)? If yes, why does it work?

t	1	2	3	4	5	6	7	8	9	10
d	15	10	4	-2	2	6	8	11	23	34

(40)