

AUSTRALIAN CATHOLIC UNIVERSITY

Castle Hill

Semester VI, 1992

MT207: Number Theory and Statistics, Supplementary

LECTURER: W. N. Franzsen

January 1993

TIME ALLOWED: 2 hours, plus 10 minutes reading time

INSTRUCTIONS TO STUDENTS

There are 10 questions on 3 pages. All questions are worth the same, so to pass you must give the complete correct answers to at least 5 questions. If you feel your answers are not complete or correct then you may need to answer more than 5 questions. You may attempt any and all questions.

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

Calculators are permitted.

The question paper must be handed in with your answers.

1. (a) What is a prime number?

(b) What is the prime factorisation of an integer?

(c) What do I mean by $m|n$, where m and n are any two integers?

2. (a) Find $d = \gcd(2486, 2574)$.

(b) Hence or otherwise find two integers x and y such that

$$2486x + 2574y = d.$$

3. (a) What is the last digit in $(23)^{144}$?

(b) What do I mean by

$$a \equiv b \pmod{c}?$$

where a , b and c are integers and $c \neq 0$.

4. Find all the solutions to the Diophantine equation

$$24x - 60y = 144$$

and hence find the solution(s) for which $x + y$ is smallest.

5. In a two hour examination it is impossible to cover the entire course, so you may have studied something that has not yet been examined, here is your chance!

Tell me about a part of the number theory section of the course that has not been examined so far. Your answer should include an explanation of the topic involved and some examples of the problems you might encounter or be asked to solve.

6. (a) Estimate the next term in the following time series, the period of the seasonal effects is 3.

t	1	2	3	4	5	6	7	8
d	2.28	1.83	2.33	2.55	2.16	2.63	2.82	2.46

(b) How might you find the period of a time series? How could you check that you had the correct period?

7. Define the following terms

(a) population

(b) sample

(c) average

(d) mean

(e) median

(f) parameter

(g) precise

(h) accurate

8. (a) What are z -scores, and why are they useful?

(b) What is the mode of a set of scores? Why might the mode not be a useful average in some circumstances?

- 9.** (a) What is an unbiased way to carry out a sample of a population? Your answer should include an example.
- (b) What does the term 'margin of error' mean?

10. In a two hour examination it is impossible to cover the entire course, so you may have studied something that has not yet been examined, here is your chance!

Tell me about a part of the statistics section of the course that has not been examined so far. Your answer should include an explanation of the topic involved and some examples of the problems you might encounter or be asked to solve.