

Questions 1 to 3, on *Chapters 8 to 10*, form Tutor-marked Assignment M246 03. Question 1 is marked out of 30; Question 2 is marked out of 40; Question 3 is marked out of 30. Your overall mark for TMA 03 will be the sum of your marks on all three questions.

Please send all your answers to your tutor, along with an appropriately completed assignment form (PT3). Be sure to fill in the Assignment Number on this form as

M246 03

Question 1 (*Chapter 8 Testing hypotheses*)

- (a) On page 304 of the course text you are invited to consider an advertiser's claim that 'at least 80% of dogs prefer Pupkins', and you are asked whether you would place any credence in the claim if as few as '11 or 12 dogs in a sample of 20' exhibited this preference.

(i) Assuming a fixed-level test at 5%, set up appropriate null and alternative hypotheses for the underlying proportion p of dogs that prefer Pupkins, in a test of this claim. [2]

(ii) Assuming a sample of 20 dogs is tested and that those preferring Pupkins are tested, identify the critical region that would lead to rejection of the advertiser's claim. [4]

(iii) Say what conclusion you would draw if in the sample of 20 tested, only half the dogs preferred Pupkins. [2]

- (b) In Example 2.20 on page 84 of the course text a medical investigation is described in which levels of the hormone ornithine carbonyl-transferase were measured on 57 individuals suffering from acute viral hepatitis and also on 40 patients suffering from aggressive chronic hepatitis. The aim of the research was to try to develop a differential diagnostic test for different forms of hepatitis.

The data set blood in the SSC data subdirectory lists these measurements; also 44 patients suffering from persistent chronic hepatitis and 77 suffering from post-necrotic cirrhosis were tested.

- (i) Load the data into your SSC worksheet and list the four sample means. At first sight (i.e. based only on these summary data) which two forms of hepatitis seem to lead to the greatest difference in the levels of the hormone? Which two forms appear least easily distinguishable? [4]

It is possible to test all four samples simultaneously for significant differences in the underlying mean hormone levels for the four different populations from which the samples were drawn, but the appropriate test is beyond the scope of the course and is mentioned only briefly in *Chapter 14*. However, a partial analysis of the data may be achieved by considering two of the samples.

- (ii) Notwithstanding the limitations of the test and of the conclusions to be drawn from it in the context of these data, it is decided to use the two-sample t -test to compare the hormone measure just for patients suffering from persistent chronic hepatitis and those suffering from post-necrotic cirrhosis. State the three assumptions of the test and comment on their validity in this case. [6]

- (iii) Perform the comparison for these two sets of patients, and state clearly your conclusions and any practical consequences of it. [5]

- (c) In a comparison of accident rates for military aircraft in Britain in early 1996 it was reported that 'in the first two months of this year there have been eight crashes reported compared with ten accidents during the first half of last year'. There then followed commentary on possible reasons for this 'significant increase'.