1. (a) The medical literature suggest that the probability of a child contracting chickenpox

(A) is 0.18; of contracting German measles (B), 0.12; and of contracting both, 0.07.

i. Are the two events A and B mutually exclusive? Independent? Explain.

ii. Find the probability that a child will contract at least one of the two diseases.

(b) Records show that the probability is 0.60 that a stolen car in a certain suburb of

NSW will be recovered within one week. Let X be the number of cars recovered from *n* stolen cars in a particular week. Assuming the independence of events explain why

X has a binomial distribution.

i. Find the probability that at least 7 of the 10 stolen cars will be recovered.

ii. Write down an expression for the exact probability that 15 of the 25 stolen cars will be recovered and use it to \_nd this probability to 4 decimal places.

2. (a) The height X in inches of a randomly chosen male is a variable having a normal dis-

tribution with a mean of 70 inches and a variance of 9 inch2. What is the probability that a randomly chosen male will either be smaller than 67 inches or taller than 77.5 inches? What is the probability that the average height of 16 males exceeds 71.5 inches?

(b) The distribution for scores of a particular IQ test for adults is approximately normal with mean 100 and standard deviation 15. Show that for a randomly selected adult, the probability of IQ less than 106 is 0.6554. For 12 randomly selected adults, what is the probability that at least 5 will have IQ's less than 106?

(c) Records show that in the city of Monbing 30% of all marriages have ended in divorce.

A sample of 60 marriages from this is to be selected. Using GenStat find the exact probability that (i) less than 15, (ii) between 10 and 20 (inclusive both end points) of these marriages will have ended in divorce. Find the percentage absolute error if Peter uses the normal approximation with the correction for continuity to calculate the probability in (i).

3. Medical records show that the length of stay in a hospital after a particular operation is normally distributed with a mean of 6.0 days. The medical review board claims that the average stay for Medicare patients has been substantially longer that 6.0 days. To examine this claim a sample of 20 Medicare patients who have had this operation in the past year is selected. The sample mean and standard deviation (in days) respectively are 6.50 and 1.62. Verify the medical review board claim using the following steps from hypothesis testing:

(a) State the null and alternative hypotheses.

(b) Identify a suitable statistical test giving reasons for your choice.

(c) Calculate the test statistic in (b) for testing the null hypothesis in (a).

(d) Write down an expression for the associated P-value.

(e) Find the P-value in (d) and draw your conclusion about the null hypothesis in (a).