Section E (Statistics 1)

Answer all the questions.

Answer these questions in a separate answer book, showing clearly the section chosen.

E1. A taxi was involved in a hit-and-run accident at night in the only city on an island. Only two taxi companies, the Green and the Yellow, trade in the city. The police investigation revealed that of the taxis in the city 85% are Green and 15% are Yellow and that there was only one witness to the accident.

Reliability testing of the witness revealed that, under conditions similar to those prevailing on the night of the accident, she correctly identified taxis from each of the companies 80% of the time and failed 20% of the time.

Using the above information, calculate the probability that the taxi involved in the accident was actually Yellow given that the witness claimed that it was Yellow.

5

E2. The MacBurger fast food restaurant chain has determined that, once outline planning permission has been granted, the time taken to obtain full planning permission for a new outlet has mean 180 days with standard deviation 12 days. The construction time for an outlet has mean 20 days and standard deviation 5 days.

On the assumption that the two phases, planning time and construction time, are independent, obtain the mean and standard deviation of the total time from the granting of outline planning permission to completion of construction.

3

On the day that outline planning permission for an outlet has been granted, the Marketing Department wishes to be able to display posters in the location of the site announcing **"Your new MacBurger opening within n days!!!"**

Stating any assumption required, calculate an integer value n such that there is at least 99·9% probability that the outlet will open within the specified number of days.

3

E3. The number of pupils in each of the classes in the top three years in Newtown Secondary School is given below.

Year	Class	Number
6	6a	34
5	5a	32
	5b	28
4	4a	30
	4b	32
	4c	24

(a) Describe how you could use this data to enable you to select a systematic sample of 10% of senior pupils. **3**

(b) State an advantage and a disadvantage of systematic sampling. **2**

E4. A major construction company found that 75% of building projects which it undertakes are completed on schedule. Using a suitable approximation, calculate the probability that, out of 100 randomly selected projects, at most 70 will be completed on schedule. **6**

E5. A transportation company determined that the time for a bus journey, on a particular route during peak traffic periods, had mean 28 minutes with standard deviation 3 minutes. Following the introduction of a new traffic management system on the route the times for a random sample of journeys were as follows.

26	21	24	28	28	26	24	24

It can be assumed that the standard deviation of journey time has not changed.

(a) Stating any further assumption required, use a z-test at the 1% level to determine whether or not there is evidence of a change in the mean time for the journey. **6**

(b) Calculate the p-value for the test and explain how it confirms your previous answer. **3**

(c) Explain how further confirmation of your answer is provided by the information that the 99% confidence interval for the mean journey time, calculated from the data, is (22·4, 27·9). **1**

[END OF SECTION E]

[Turn over