3. During weekday mornings, cars are known to pass a certain junction on a road at a mean rate of 4.25 each minute.

(a) Suggest a suitable distribution to model the number of cars that pass this junction in a 2-minute interval on weekday mornings.

(1)

(b) State an assumption necessary for this distribution to be a suitable model of this situation.

(1)

(c) Find the probability that in a given 2-minute interval on a weekday morning

(i) fewer than 3 cars pass the junction,

(ii) more than 5 but fewer than 11 cars pass the junction.

(3)

(d) Use a suitable approximation to find the probability that more than 280 cars will pass the junction in a one-hour period during a weekday morning.
You must show your working.

(4)

Traffic calming measures are installed on the road.

A council officer wishes to perform a hypothesis test to determine whether there are now fewer cars passing the junction each minute.

The officer notes the number of cars passing the junction during a randomly chosen 2-minute period on a weekday morning.

(e) Write down suitable null and alternative hypotheses for the test.

(1)

(f) Find, using a 5% significance level, the critical region for the test.

(2)

During the randomly chosen 2-minute period, the council officer noted exactly 5 cars passing the junction.

(g) Comment on this finding in the light of your critical region found in part (f)

(2)

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Question 3 continued

(Total for Question 3 is 14 marks)