

<b>MA2404</b>	
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**PROJECT**

Subject	MATHEMATICS
Title of paper	MA2404 — MARKOV PROCESSES
Time allowed	<u>Deadline: Monday, May 22<sup>nd</sup> 2023, 11.00 UK (18.00 Dalian)</u>

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**Instructions to candidates**

This project represents 30% of the module assessment.

You are required to write a report of approximately 3,000 words. You must work individually and all submitted reports will be checked for plagiarism.

Any literature used should be formally cited.

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An insurance company in some country would like to build a mathematical model to estimate the total sum  $S$  they will spend next year to pay claims resulting from fires. Obviously,  $S = \sum_{i=1}^N X_i$ , where  $N$  is the (random) number of such claims they will receive next year and  $X_i$  is the size of  $i$ -th claim. The company asks you to build a mathematical model to predict the probability distributions of  $N$  and  $X_i$ , and use this to estimate the probability distribution of  $S$ . To estimate  $N$ , you need to predict the number of fires next year. To do this, you need to analyse recent statistical trends on the number of fire incidents per person in this country. *The result may be different for different areas/regions of the country, different types of fires, etc.* The company has specialists that understand statistics, and wants you to include a description of the used mathematical and statistical techniques in your report. It is expected that you actually implement the model in any programming language of your choice: the user should input some parameters (such as number of customers an insurance company have, or area of the country they are located), and the output is the probability distribution of  $S$ .

Part of your task is to find the relevant data - that is, statistics of fires, ideally classified by areas/regions of the country, types of fires, etc. For your project, please select any country of your choice, for which you can find such data. You can select China, if you can find data about fires in China, or you can select UK, where fire statistic is available, for example, at [http://data.gov.uk/dataset/fire\\_statistics\\_monitor\\_uk](http://data.gov.uk/dataset/fire_statistics_monitor_uk), or any other country you like. It is enough to analyse fires in one country only.