Question 19 **(12 marks)**

A global financial institution transfers a large aggregate data file every evening from offices around the world to its Hong Kong head office. Once the file is received it must be processed in the company's data warehouse. The time T required to process a file is normally distributed with a mean of 90 minutes and a standard deviation of 15 minutes.

(a) An evening is selected at random. What is the probability that it takes more than two hours to process the file? (2 marks)

(b) What is the probability that the process takes more than two hours on two out of five days in a week? (3 marks)

The company is considering outsourcing the processing of the files.

(c) (i) A quotation for this job from an IT company is given in the table below. Complete the table. (1 mark)

Job duration (minutes)	$T \leq 60$	$60 < T < 120$	$T \geq 120$
Probability			
Cost Y (\$)	200	600	1200

(ii) What is the mean cost? (2 marks)

(iii) Calculate the standard deviation of the cost. (2 marks)

(iv) In the following year, the cost (currently $\$Y$) will increase due to inflation and also the introduction of an additional fixed cost, so the new cost $\$N$ is given by: $N = aY + b$. In terms of a and/or b, state the mean cost in the following year and the standard deviation of the cost in the following year. (2 marks)