This assignment is worth 5% of your assessment for this subject. You may do the assignment in groups of up to three students (i.e. 1, 2 or 3) and each group should submit only one copy of the assignment. The completed assignment is to be dropped in the MM2 assignment box designated to your tutor near the lifts on Level 15 (CB01/15) by **5pm Monday 8th September, 2008**.

1. **(Descriptive Statistics)** **[3 Marks]**

   A sample of 26 offshore oil workers took part in a simulated escape exercise, resulting in the following data on time (in seconds) to complete the escape.

389	356	359	363	375	424	325	394	402
373	373	370	364	366	364	325	339	393
392	369	374	359	356	403	334	397	

   (i) Draw a box plot for these 26 values using Minitab and comment on the shape of the distribution.

   (ii) Obtain the mean, standard deviation, median, first quartile, third quartile and inter-quartile range of these 26 values using Minitab.

   (iii) By how much could the longest time be increased without affecting the value of the sample median? By how much could this value be decreased without affecting the sample median?

2. **(Exponential Distribution)** **[3 Marks]**

   Extensive experience with fans of a certain type used in diesel engines has suggested that the exponential distribution provides a good model for time until failure. Suppose the mean time until failure is 25,000 hours. Find the following probabilities and **check the answers using Minitab**.

   (i) A randomly selected fan will last at least 20,000 hours. At most 30,000 hours.

   (ii) The lifetime of a fan exceeds the mean value by more than 2 standard deviations. By more than 3 standard deviations.

3. **(Normal Distribution & Binomial Distribution)** **[3 Marks]**

The automatic opening device of a military cargo parachute has been designed to open when the parachute is 200m above the ground. Suppose opening altitude actually follows a normal distribution with mean value of 200m and standard deviation of 30m. Equipment damage will occur if the parachute opens at an altitude less than 100m. Find the following probabilities and **check the answers using Minitab**.

(i) There is equipment damage to the payload of a single dropped parachute.

(ii) If five parachutes are dropped independently, there is equipment damage to the payload of at least one parachute.

4. **(Binomial Distribution & Normal approximation)** **[4 Marks]**

Suppose that only 0.1% of all computers of a certain type experience CPU failure during the warranty period. Consider a sample of 10,000 computers.

(i) What are the expected value and standard deviation of the number of computers in the sample that have the defect?

Find the following (approximate) probabilities and **calculate their exact probabilities using Minitab**.

(ii) More than 10 sampled computers have the defect.

(iii) No sampled computers have the defect.

5. **(Poisson Distribution)** **[2 Marks]**

Suppose small aircraft arrive at a certain airport according to a Poisson process. The average number of arrivals is 8 per hour.

(i) What is the probability that exactly 6 small aircraft arrive during a 1-hour period? **Check your answer using Minitab.**

(ii) What are the expected value and standard deviation of the number of small aircraft that arrive during a 90-min period?