7. (i) As part of a recruitment exercise candidates are required to complete three separate tasks. The times taken, A, B and C, in minutes, for candidates to complete the three tasks are such that

$$A \sim \text{N}(21, 2^2),\ B \sim \text{N}(32, 7^2) \text{ and } C \sim \text{N}(45, 9^2)$$

The time taken by an individual candidate to complete each task is assumed to be independent of the time taken to complete each of the other tasks.

A candidate is selected at random.

(a) Find the probability that the candidate takes a total time of more than 90 minutes to complete all three tasks.

(4)

(b) Find $\text{P}(A > B)$

(4)

(ii) A simple random sample, X_1, X_2, X_3, X_4, is taken from a normal population with mean μ and standard deviation σ

Given that

$$\overline{X} = \frac{X_1 + X_2 + X_3 + X_4}{4}$$

and that

$$\text{P}(X_1 > \overline{X} + k\sigma) = 0.1$$

where k is a constant,

find the value of k, giving your answer correct to 3 significant figures.
You should show all stages of your working.

(7)

(Total for Question 7 is 15 marks)

TOTAL FOR PAPER IS 75 MARKS