06/PJC/II/23

$E(X) = 1.5$ $\quad Var(X) = \left(\frac{3}{4}\right)^2$

$E(y) = 10$ $\quad Var(y) = 1$

i) $E(X_1 + y + X_2) = 1.5 + 10 + 1.5 = 13$

$Var(X_1 + y + X_2) = \left(\frac{3}{4}\right)^2 + 1 + \left(\frac{3}{4}\right)^2 = \frac{17}{8}$

ii) Let $\bar{A}$ be the average time taken to complete a work day, in 50 work days.

Since n is large, by CLT,

$$\bar{A} \sim N\left(13, \frac{17}{8(50)}\right) \text{ approx.}$$

$P(\bar{A} > 13.3) = 0.07280504$

$\simeq 0.0728$ (3sf)

iii) No, it is not necessary as the sample size is large, by Central Limit Theorem, the total time taken to complete a workday is normally distributed.

06/YJC/II/29 EITHER OR modified.

Let X be the lifetime of a component

$E(X) = 100$ $\quad Var(X) = 30^2$

Let $A = X_1 + X_2 + \ldots X_n$.

Assuming n is large, $n \geq 30$, by CLT.

$$A \sim N(100n, 30^2 n) \text{ approx}$$

$$P(A \geq 3000) \geq 0.95$$

$$P\left(Z > \frac{3000 - 100n}{30\sqrt{n}}\right) \geq 0.95$$

From g.c., $P(Z > -1.6448536) = 0.95$

$$\therefore \frac{3000 - 100n}{30\sqrt{n}} \leq -1.6448536$$

$$n \geq 32.827$$

The minimum number of components needed is 33.