1. An athlete believes that her times for running 200 meters in races are normally distributed with a mean of 22.8 seconds.
   a) Given that his time is over 23.3 seconds in 20% of her races, calculate the variance of her times. 4 mks
   b) The record over this distance for women at her club is 21.82 seconds. According to his model, what is the chance that she will beat this record in her next race? 3 mks

A golfer believes that the distance, in meters, that she hits a ball with a siron, follows a continuous uniform distribution over the interval [100,150]

   c) Find the median and interquartile range of the distance she hits a ball, that would be predicted by this model. 3 mks
   d) Explain why the continuous uniform distribution may not be a suitable model. 2 mks

The continuous random variable $x$ has the following cumulative distribution function:

$$F(x) = \begin{cases} 
0 & x < 0 \\
\frac{1}{64} (16x - x^2) & 0 \leq x \leq 3 \\
1 & x > 3
\end{cases}$$
2. The continuous random variable $T$ has the following probability density function:

$$f(t) = \begin{cases} \frac{K(t^2 + 2t)}{18}, & 0 \leq t \leq 3 \\ 0, & \text{Otherwise} \end{cases}$$

a) Show that $K = \frac{1}{18}$

b) Sketch $f(t)$ for all values of $t$.

c) State the mode of $T$.

d) Find $E(T)$.

e) Show that the standard deviation of $T$ is $.798$ correct to 3 significant figures.

A shop receives weekly deliveries of 120 eggs from a local farm. The proportion of eggs, received from the farm that is broken is 0.008.

f) Explain why it is reasonable to use the binomial distribution to model the numbers of eggs that are broken in each delivery.

g) Use the binomial distribution to calculate the probability that at most one egg in a delivery will be broken.

h) Using the poisson approximation to binomial, Find the probability that at most one egg in a delivery will be broken. Comment on your answer.

3. The length of time, in tens of minutes, that patients spend waiting at a doctors surgery is modeled by the continuous random variable $T$, with the following cumulative distribution:

$$F(t) = \begin{cases} 0, & t < 0 \\ \frac{1}{2}, & 0 \leq t < \frac{1}{2} \\ \frac{t}{2} + \frac{1}{2}, & \frac{1}{2} \leq t < 1 \\ 1, & t \geq 1 \end{cases}$$