

QUEEN MARY, UNIVERSITY OF LONDON

MTH 4106

Introduction to Statistics

Assignment 6

For handing in on 28 February 2012

You should attempt all of these questions, as they are designed to help you to learn and understand the material in the course.

The ‘Feedback’ question is the one for handing in. Write your name, student number and group number at the top of your answer before handing it in. Staple all the pages together. Hand it to your allocated tutor when (s)he asks for it during your allocated Minitab laboratory session on Tuesday 28 February 2012.

If you want help on any of the other questions, or want to check that you have done them correctly, you may ask any tutor during your laboratory session or ask me in any of my office hours.

1 Let $X \sim \text{Exp}(2)$ and let $Y \sim \text{uniform}[3, 6]$. Which of X and Y has the bigger variance?

2 Find the median of X when $X \sim \text{Exp}(\lambda)$.

3 Let X be a continuous random variable with expectation μ and probability density function f . Prove that

$$\int_{-\infty}^{\infty} (x - \mu)^2 f(x) \, dx = \mathbb{E}(X^2) - \mu^2.$$

4 Let $X \sim \text{uniform}[0, 4]$ and put $Y = \sqrt{X}$. Find the probability density function of Y . Hence find the expectation and variance of Y .

5 Let Z be a standard normal random variable. Find

(a) $\mathbb{P}(Z < 2.55)$

(b) $\mathbb{P}(Z > 0.10)$

(c) $\mathbb{P}(Z < -1.41)$

(d) $\mathbb{P}(Z < e)$

(e) $\mathbb{P}(-2 \leq Z \leq 1)$.

6 Let $Z \sim N(0, 1)$. Find x such that $\mathbb{P}(Z < x) = 0.875$. Give the answer to three significant figures.

7 (Feedback) Let $X \sim N(4, 16)$. Find

(a) $\mathbb{P}(X < 6)$

(b) $\mathbb{P}(X > 0)$

(c) $\mathbb{P}(2 \leq X \leq 3)$

(d) $\mathbb{P}(X \leq 1.53)$.

8 Let $X \sim N(-10, 25)$. Find x such that $\mathbb{P}(X < x) = 1/10$. Give the answer to three significant figures.