Coventry University
School of Computing, Electronics and Mathematics

5005CEM **Probability Problem Sheet 2b** **Week 6**

1 Suppose X has a uniform distribution on the interval $[-2, 8]$.

(a) Determine $E(X)$ and $\text{var}(X)$.

(b) Find $P(-3 < X < 5)$.

(c) Find $P(X > 6)$. epr050

2 You arrive at a bus stop at 10am, knowing that the bus will arrive at some time uniformly distributed between 10am and 10:30am.

(a) What is the probability that you will have to wait longer than 10 minutes?

(b) If at 10:15am the bus has not yet arrived, what is the probability that you will have to wait at least an additional 10 minutes? epr053

3 The continuous random variable S is uniformly distributed on the interval $[c, d]$. Given that $P(S < 3) = \frac{1}{4}$ and $P(S < 7) = \frac{3}{4}$, find c and d. epr051

Normal Distribution

Use the R functions `pnorm` and `qnorm` to answer the following questions. *Include any R code you write in your answer.*

4 The mass of a small loaf of bread is normally distributed with mean 500g and standard deviation 20g. Find the probability that a randomly chosen loaf has a mass:

(a) not exceeding 475g

(b) not less than 495g

(c) at most 510g

(d) at least 515g epr043a

5 A psychological introvert-extrovert test produces scores that follow a normal distribution with mean 75 and standard deviation 12.

(a) Find the probability that a randomly selected person obtains a score between 60 and 70.

(b) If we wish to label the highest 15% of scores as "extroverts", what would be the score to choose as the cutoff point? epr046

6 Chicken eggs have mass which follows a normal distribution with mean 60g and standard deviation 15g. Eggs of mass greater than 75g are labelled as "large".

(a) Find the probability that a randomly selected egg is large.

(b) Eggs that are not large are labelled as "small" or "medium". If 40% of eggs are small, suggest the mass at which the division of between small and medium should be made.

epr047

7 Support the length of time (L hours) that a mobile phone will work before it needs charging is normally distributed with a mean of 100 hours and a standard deviation of 15 hours.

(a) Find $P(L > 127)$.

(b) Find the value of d such that $P(L < d) = 0.10$.

(c) Sarah is about to go on a 6 hour journey. Given that it is 127 hours since Sarah last charged her phone, find the probability that her phone will **not** need charging before her journey is completed.

epr048

8 CoffeeCo fills jars with coffee. The weight of coffee (W grams) in a jar can be modelled by a normal distribution with mean 232 grams and standard deviation 5 grams.

(a) Find $P(W < 224)$.

(b) Find the value of f such that $P(232 < W < f) = 0.20$.

(c) Two jars of coffee are selected at random. Find the probability that exactly one of the jars contains between 232 and f grams of coffee.

epr049

Challenge Problem

9 The radius of a circle, R cm, has a uniform distribution in the interval from 1 to 3.

(a) Find the expected *radius* of the circle, i.e., $E(R)$.

(b) Denoting the area of the circle by A cm^2, determine the expected area of the circle.

epr052