Normal Distribution

1 The wingspan of shelduck is normally distributed with mean 121.5 cm and standard deviation 5.3 cm. Find the probability that one randomly chosen shelduck has a wingspan of at least 130 cm. [3]

Jun 04

4 The random variable G has mean 20.0 and standard deviation σ. It is given that $P(G > 15.0) = 0.6$. Assume that G is normally distributed.

Jun 02

(i) (a) Find the value of σ. [4]

(b) Given that $P(G > g) = 0.4$, find the value of g. [2]

(ii) It is known that no values of G are ever negative. State what this tells you about the assumption that G is normally distributed. [1]

2 My expenditure at a supermarket each week is modelled by a normal distribution with mean £65.00 and standard deviation £σ. My expenditure exceeds £80.00 in a week with probability $\frac{1}{12}$.

Jun 03

(i) Calculate the value of σ, giving your answer correct to 4 significant figures. [4]

(ii) Calculate the probability that, in one randomly chosen week, my expenditure is less than £55.00. [2]

4 The random variable X has the distribution $N(10, \sigma^2)$. It is given that $P(X < 7) = p$ and $P(X < 13) = 2p$.

Jun 04

(i) Show that the value of p is $\frac{1}{3}$. [3]

(ii) Find the value of σ. [3]

1 The percentage, X%, of a certain metal in an alloy can be modelled as having a normal distribution with mean 70 and standard deviation σ. It is given that $P(X > 77) = 0.0808$. Find the value of σ. [4]

June 01

1 The random variable Y is normally distributed with mean μ and standard deviation 2.50. Given that $P(Y > 12) = 0.3$, find the value of μ. [3]

Jun 02

3 The random variable X has the distribution $N(\mu, \sigma^2)$. It is given that

$$P(X > 51) = 0.1841 \quad \text{and} \quad P(X > 60) = 0.0082.$$

June 03

(i) Show that $\sigma = 6.00$, and find the value of μ. [5]

(ii) The mean of 81 randomly chosen observations of X is denoted by $\bar{X}$. Find $P(\bar{X} > \mu - 1)$. [2]

Normal Dist (cont 1)

5 The random variable X has the distribution $N(\mu, \sigma^2)$. It is given that $P(X > 2\mu) = 0.0228$.

Jun 04

(i) Find the value of μ in terms of σ. [3]

In order to calculate the actual values of μ and σ, more information is required.

(ii) Explain why neither of the following extra pieces of information would enable you to work out the actual values of μ and σ:

(a) $P(X < 0) = 0.0228$; [1]

(b) $P(X < \mu) = 0.5$. [1]

(iii) Given that $P(X < 7.0) = 0.7881$, calculate the actual values of μ and σ. [4]

2 The continuous random variable Y is normally distributed with mean $17.0 + 2.0d$, where d can take different values. Thus, for example, if $d = 4.0$, the mean of Y is 25.0. The standard deviation of Y is 3.0 whatever the value of d.

June 05

(i) When $d = 5.0$, find $P(Y < 25.0)$. [3]

(ii) Find the value of d for which $P(Y < 40.0) = 0.975$. [4]

3 The lifetime, T months, of properly made tap washers is modelled by a normal distribution with mean μ and standard deviation σ.

Jun 05

(i) It is given that $P(T > 80.0) = 0.05$ and $P(T < 70.0) = 0.75$. Find the values of μ and σ. [6]

(ii) Some tap washers are badly made and therefore have a very short lifetime. Give a reason why a normal distribution may not be a good model for the distribution of the lifetimes of all washers. [1]