Normal Distribution Exam Questions

Q1, (Edexcel 6683, Jun 2005, Q6)

A scientist found that the time taken, M minutes, to carry out an experiment can be modelled by a normal random variable with mean 155 minutes and standard deviation 3.5 minutes.

Find

(a) $P(M > 160)$.

(3)

(b) $P(150 \leqslant M \leqslant 157)$.

(4)

(c) the value of m, to 1 decimal place, such that $P(M \leqslant m) = 0.30$.

(4)

Q2, (Edexcel 6683, Jun 2007, Q6)

The random variable X has a normal distribution with mean 20 and standard deviation 4.

(a) Find $P(X > 25)$.

(3)

(b) Find the value of d such that $P(20 < X < d) = 0.4641$

(4)

Q3, (Edexcel 6683, Jan 2008, Q6)

The weights of bags of popcorn are normally distributed with mean of 200 g and 60% of all bags weighing between 190 g and 210 g.

(a) Write down the median weight of the bags of popcorn.

(1)

(b) Find the standard deviation of the weights of the bags of popcorn.

(5)

A shopkeeper finds that customers will complain if their bag of popcorn weighs less than 180 g.

(c) Find the probability that a customer will complain.

(3)

Q4, (OCR 4733, Jan 2008, Q1)

The random variable T is normally distributed with mean μ and standard deviation σ. It is given that $P(T > 80) = 0.05$ and $P(T > 50) = 0.75$. Find the values of μ and σ. [6]

Q5, (Edexcel 6683, Jun 2008, Q7)

A packing plant fills bags with cement. The weight X kg of a bag of cement can be modelled by a normal distribution with mean 50 kg and standard deviation 2 kg.

(a) Find P(X>53).

(3)

(b) Find the weight that is exceeded by 99% of the bags.

(5)

Three bags are selected at random.

(c) Find the probability that two weigh more than 53 kg and one weighs less than 53 kg.

(4)

Q6, (Edexcel 6683, Jan 2010, Q7)

The heights of a population of women are normally distributed with mean μ cm and standard deviation σ cm. It is known that 30% of the women are taller than 172 cm and 5% are shorter than 154 cm.

(a) Sketch a diagram to show the distribution of heights represented by this information.

(3)

(b) Show that $\mu = 154 + 1.6449\sigma$.

(3)

(c) Obtain a second equation and hence find the value of μ and the value of σ.

(4)

A woman is chosen at random from the population.

(d) Find the probability that she is taller than 160 cm.

(3)

Q7, (OCR 4733, Jun 2006, Q3)

The continuous random variable T has mean μ and standard deviation σ. It is known that P(T < 140) = 0.01 and P(T < 300) = 0.8.

(i) Assuming that T is normally distributed, calculate the values of μ and σ. [6]

In fact, T represents the time, in minutes, taken by a randomly chosen runner in a public marathon, in which about 10% of runners took longer than 400 minutes.

(ii) State with a reason whether the mean of T would be higher than, equal to, or lower than the value calculated in part **(i)**. [2]

Q8, (Edexcel 6683, Jun 2012, Q6)

The heights of an adult female population are normally distributed with mean 162 cm and standard deviation 7.5 cm.

(a) Find the probability that a randomly chosen adult female is taller than 150 cm.

(3)

Sarah is a young girl. She visits her doctor and is told that she is at the 60th percentile for height.

(b) Assuming that Sarah remains at the 60th percentile, estimate her height as an adult.

(3)

The heights of an adult male population are normally distributed with standard deviation 9.0 cm.

Given that 90% of adult males are taller than the mean height of adult females,

(c) find the mean height of an adult male.

(4)

Q9, (Edexcel 6683, Jun 2013(R), Q4)

The time, in minutes, taken to fly from London to Malaga has a normal distribution with mean 150 minutes and standard deviation 10 minutes.

(a) Find the probability that the next flight from London to Malaga takes less than 145 minutes.

(3)

The time taken to fly from London to Berlin has a normal distribution with mean 100 minutes and standard deviation d minutes.

Given that 15% of the flights from London to Berlin take longer than 115 minutes,

(b) find the value of the standard deviation d.

(4)

The time, X minutes, taken to fly from London to another city has a normal distribution with mean μ minutes.

Given that $P(X < \mu - 15) = 0.35$

(c) find $P(X > \mu + 15 \mid X > \mu - 15)$.

(3)

Q10, (Edexcel 6683, Jun 2013, Q6)

The weight, in grams, of beans in a tin is normally distributed with mean μ and standard deviation 7.8

Given that 10% of tins contain less than 200 g, find

(a) the value of μ

(3)

(b) the percentage of tins that contain more than 225 g of beans.

(3)

The machine settings are adjusted so that the weight, in grams, of beans in a tin is normally distributed with mean 205 and standard deviation σ.

(c) Given that 98% of tins contain between 200 g and 210 g find the value of σ.

(4)

Q11, (OCR 4733, Jan 2012, Q3)

The random variable G has a normal distribution. It is known that

$$P(G < 56.2) = P(G > 63.8) = 0.1.$$

Find $P(G > 65)$. **[6]**

Q12, (OCR 4733, Jun 2015, Q1)

The random variable Y is normally distributed with mean μ and variance σ^2. It is found that $P(Y > 150.0) = 0.0228$ and $P(Y > 143.0) = 0.9332$. Find the values of μ and σ. **[6]**

Q13, (OCR 4733, Jun 2016, Q2)

The mass, in kilograms, of a packet of flour is a normally distributed random variable with mean 1.03 and variance σ^2. Given that 5% of packets have mass less than 1.00 kg, find the percentage of packets with mass greater than 1.05 kg. **[6]**
