The normal distribution

Question Paper 1

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	The normal distribution
Sub Topic	
Booklet	Question Paper 1

Time Allowed: **57 minutes**

Score: **/ 47**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 A farmer finds that the weights of sheep on his farm have a normal distribution with mean 66.4 kg and standard deviation 5.6 kg.

(i) 250 sheep are chosen at random. Estimate the number of sheep which have a weight of between 70 kg and 72.5 kg. [5]

(ii) The proportion of sheep weighing less than 59.2 kg is equal to the proportion weighing more than y kg. Find the value of y. [2]

Another farmer finds that the weights of sheep on his farm have a normal distribution with mean μ kg and standard deviation 4.92 kg. 25% of these sheep weigh more than 67.5 kg.

(iii) Find the value of μ. [3]

2 **(a)** The time, X hours, for which people sleep in one night has a normal distribution with mean 7.15 hours and standard deviation 0.88 hours.

(i) Find the probability that a randomly chosen person sleeps for less than 8 hours in a night. [2]

(ii) Find the value of q such that $P(X < q) = 0.75$. [3]

(b) The random variable Y has the distribution $N(\mu, \sigma^2)$, where $2\sigma = 3\mu$ and $\mu \neq 0$. Find $P(Y > 4\mu)$. [3]

3 Packets of tea are labelled as containing 250 g. The actual weight of tea in a packet has a normal distribution with mean 260 g and standard deviation σ g. Any packet with a weight less than 250 g is classed as 'underweight'. Given that 1% of packets of tea are underweight, fin the value of σ. [3]

4 Gem stones from a certain mine have weights, X grams, which are normally distributed with mean 1.9 g and standard deviation 0.55 g. These gem stones are sorted into three categories for sale depending on their weights, as follows.

Small: under 1.2 g Medium: between 1.2 g and 2.5 g Large: over 2.5 g

(i) Find the proportion of gem stones in each of these three categories. [5]

(ii) Find the value of k such that $P(k < X < 2.5) = 0.8$. [4]

5 Lengths of a certain type of carrot have a normal distribution with mean 14.2 cm and standard deviation 3.6 cm.

(i) 8% of carrots are shorter than c cm. Find the value of c. [3]

(ii) Rebekah picks 7 carrots at random. Find the probability that at least 2 of them have lengths between 15 and 16 cm. [6]

6 It is given that $X \sim \mathrm{N}(1.5, 3.2^2)$. Find the probability that a randomly chosen value of X is less than -2.4. [3]

7 A factory produces flowe pots. The base diameters have a normal distribution with mean 14 cm and standard deviation 0.52 cm. Find the probability that the base diameters of exactly 8 out of 10 randomly chosen flowe pots are between 13.6 c m and 14.8 cm. [5]