The normal distribution
Question Paper 7

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	The normal distribution
Sub Topic	
Booklet	Question Paper 7

Time Allowed: **47 minutes**

Score: **/ 39**

Percentage: **/100**

Grade Boundaries:

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

1 **(a)** The random variable Y is normally distributed with positive mean μ and standard deviation $\frac{1}{2}\mu$.
Find the probability that a randomly chosen value of Y is negative.

[3]

   (b) The weights of bags of rice are normally distributed with mean $2.04\,\text{kg}$ and standard deviation $\sigma\,\text{kg}$. In a random sample of 8000 such bags, 253 weighed over $2.1\,\text{kg}$. Find the value of σ. [4]

2 The random variable Y is normally distributed with mean equal to five times the standard deviation.
It is given that $P(Y > 20) = 0.0732$. Find the mean. [3]

3 Cans of lemon juice are supposed to contain $440\,\text{ml}$ of juice. It is found that the actual volume of juice in a can is normally distributed with mean $445\,\text{ml}$ and standard deviation $3.6\,\text{ml}$.

   (i) Find the probability that a randomly chosen can contains less than $440\,\text{ml}$ of juice.

[3]

It is found that 94% of the cans contain between $(445 - c)\,\text{ml}$ and $(445 + c)\,\text{ml}$ of juice.

   (ii) Find the value of c.

[3]

4 Buildings in a certain city centre are classified by height as tall, medium or short. The heights can be modelled by a normal distribution with mean 50 metres and standard deviation 16 metres. Buildings with a height of more than 70 metres are classified as tall.

  (i) Find the probability that a building chosen at random is classified as tall. [2]

  (ii) The rest of the buildings are classified as medium and short in such a way that there are twice as many medium buildings as there are short ones. Find the height below which buildings are classified as short. [5]

5 It is given that $X \sim N(28.3, 4.5)$. Find the probability that a randomly chosen value of X lies between 25 and 30. [3]

6 The lengths of body feathers of a particular species of bird are modelled by a normal distribution. A researcher measures the lengths of a random sample of 600 body feathers from birds of this species and finds that 63 are less than 6 cm long and 155 are more than 12 cm long.

  (i) Find estimates of the mean and standard deviation of the lengths of body feathers of birds of this species. [5]

  (ii) In a random sample of 1000 body feathers from birds of this species, how many would the researcher expect to find with lengths more than 1 standard deviation from the mean? [4]

7 The ages, x years, of 150 cars are summarised by $\Sigma x = 645$ and $\Sigma x^2 = 8287.5$. Find $\Sigma(x - \bar{x})^2$, where $\bar{x}$ denotes the mean of x. [4]