Normal Distribution

Question Paper 4

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Descrete random variables
Sub Topic	Normal Distribution
Booklet	Question Paper 4

Time Allowed: **62 minutes**

Score: **/ 51**

Percentage: **/100**

Grade Boundaries:

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

1 The times spent by people visiting a certain dentist are independent and normally distributed with a mean of 8.2 minutes. 79% of people who visit this dentist have visits lasting less than 10 minutes.

(i) Find the standard deviation of the times spent by people visiting this dentist. [3]

(ii) Find the probability that the time spent visiting this dentist by a randomly chosen person deviates from the mean by more than 1 minute. [3]

(iii) Find the probability that, of 6 randomly chosen people, more than 2 have visits lasting longer than 10 minutes. [3]

(iv) Find the probability that, of 35 randomly chosen people, fewer than 16 have visits lasting less than 8.2 minutes. [5]

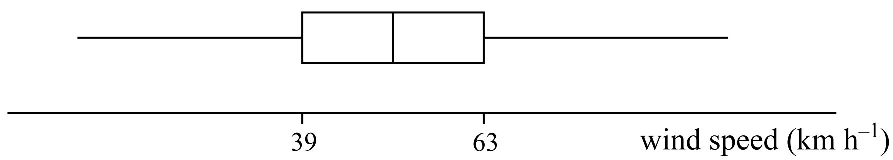
2 The times for a certain car journey have a normal distribution with mean 100 minutes and standard deviation 7 minutes. Journey times are classif ed as follows:

'short'	(the shortest 33% of times),
'long'	(the longest 33% of times),
'standard'	(the remaining 34% of times).

(i) Find the probability that a randomly chosen car journey takes between 85 and 100 minutes. [3]

(ii) Find the least and greatest times for 'standard' journeys. [4]

3



Measurements of wind speed on a certain island were taken over a period of one year. A box-and-whisker plot of the data obtained is displayed above, and the values of the quartiles are as shown. It is suggested that wind speed can be modelled approximately by a normal distribution with mean μ km h^{-1} and standard deviation σ km h^{-1}.

(i) Estimate the value of μ. [1]

(ii) Estimate the value of σ. [3]

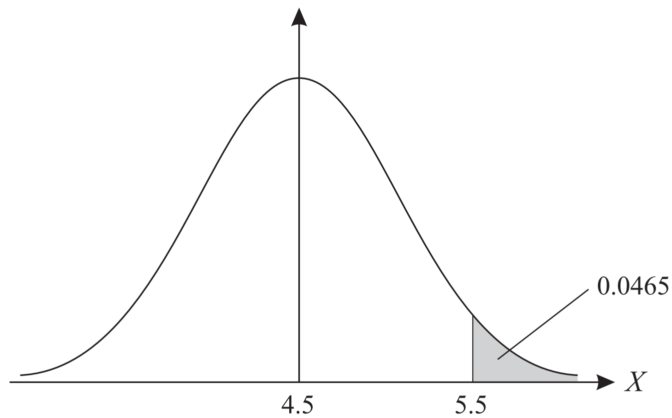
4 The weights, X grams, of bars of soap are normally distributed with mean 125 grams and standard deviation 4.2 grams.

(i) Find the probability that a randomly chosen bar of soap weighs more than 128 grams. [3]

(ii) Find the value of k such that $P(k < X < 128) = 0.7465$. [4]

(iii) Five bars of soap are chosen at random. Find the probability that more than two of the bars each weigh more than 128 grams. [4]

5



The random variable X has a normal distribution with mean 4.5. It is given that $P(X > 5.5) = 0.0465$ (see diagram).

(i) Find the standard deviation of X. [3]

(ii) Find the probability that a random observation of X lies between 3.8 and 4.8. [4]

6 **(i)** Give an example of a variable in real life which could be modelled by a normal distribution. [1]

(ii) The random variable X is normally distributed with mean μ and variance 21.0. Given that $P(X > 10.0) = 0.7389$, find the value of μ. [3]

(iii) If 300 observations are taken at random from the distribution in part **(ii)**, estimate how many of these would be greater than 22.0. [4]