

The normal distribution

Question Paper 3

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	The normal distribution
Sub Topic	
Booklet	Question Paper 3

Time Allowed: 48 minutes

Score: / 40

Percentage: /100

Grade Boundaries:

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

- 1** The weights of letters posted by a certain business are normally distributed with mean 20 g. It is found that the weights of 94% of the letters are within 12 g of the mean.
- (i) Find the standard deviation of the weights of the letters. [3]
 - (ii) Find the probability that a randomly chosen letter weighs more than 13 g. [3]
 - (iii) Find the probability that at least 2 of a random sample of 7 letters have weights which are more than 12 g above the mean. [3]
- 2** (i) In a certain country, the daily minimum temperature, in $^{\circ}\text{C}$, in winter has the distribution $N(8, 24)$. Find the probability that a randomly chosen winter day in this country has a minimum temperature between 7°C and 12°C . [3]
- The daily minimum temperature, in $^{\circ}\text{C}$, in another country in winter has a normal distribution with mean μ and standard deviation 2μ .
- (ii) Find the proportion of winter days on which the minimum temperature is below zero. [2]
 - (iii) 70 winter days are chosen at random. Find how many of these would be expected to have a minimum temperature which is more than three times the mean. [3]
 - (iv) The probability of the minimum temperature being above 6°C on any winter day is 0.0735. Find the value of μ . [3]
- 3** The random variable X is normally distributed and is such that the mean μ is three times the standard deviation σ . It is given that $P(X < 25) = 0.648$.
- (i) Find the values of μ and σ . [4]
 - (ii) Find the probability that, from 6 random values of X , exactly 4 are greater than 25. [2]

- 4 The times taken by students to get up in the morning can be modelled by a normal distribution with mean 26.4 minutes and standard deviation 3.7 minutes.
- (i) For a random sample of 350 students, find the number who would be expected to take longer than 20 minutes to get up in the morning. [3]
 - (ii) ‘Very slow’ students are students whose time to get up is more than 1.645 standard deviations above the mean. Find the probability that fewer than 3 students from a random sample of 8 students are ‘very slow’. [4]
- 5 The distance the Zotoc car can travel on 20 litres of fuel is normally distributed with mean 320 km and standard deviation 21.6 km. The distance the Ganmor car can travel on 20 litres of fuel is normally distributed with mean 350 km and standard deviation 7.5 km. Both cars are filled with 20 litres of fuel and are driven towards a place 367 km away.
- (i) For each car, find the probability that it runs out of fuel before it has travelled 367 km. [3]
 - (ii) The probability that a Zotoc car can travel at least $(320 + d)$ km on 20 litres of fuel is 0.409. Find the value of d . [4]