The normal distribution
Question Paper 9

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	The normal distribution
Sub Topic	
Booklet	Question Paper 9

Time Allowed: 60 minutes

Score: / 50

Percentage: /100

Grade Boundaries:

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

1   The random variable X is normally distributed with mean μ and standard deviation $\frac{1}{4}\mu$. It is given that $P(X > 20) = 0.04$.

    (i) Find μ. [3]

    (ii) Find $P(10 < X < 20)$. [3]

    (iii) 250 independent observations of X are taken. Find the probability that at least 235 of them are less than 20. [5]

        The random variable X is the length of time in minutes that Jannon takes to mend a bicycle puncture.
2 X has a normal distribution with mean μ and variance σ^2. It is given that $P(X > 30.0) = 0.1480$ and $P(X > 20.9) = 0.6228$. Find μ and σ. [5]

3   The lengths of new pencils are normally distributed with mean 11 cm and standard deviation 0.095 cm.

    (i) Find the probability that a pencil chosen at random has a length greater than 10.9 cm. [2]

    (ii) Find the probability that, in a random sample of 6 pencils, at least two have lengths less than 10.9 cm. [3]

4   The random variable X is normally distributed with mean μ and standard deviation σ.

    (i) Given that $5\sigma = 3\mu$, find $P(X < 2\mu)$. [3]

    (ii) With a different relationship between μ and σ, it is given that $P(X < \frac{1}{3}\mu) = 0.8524$. Express μ in terms of σ. [3]

5 The heights that children of a particular age can jump have a normal distribution. On average, 8 children out of 10 can jump a height of more than 127 cm, and 1 child out of 3 can jump a height of more than 135 cm.

  (i) Find the mean and standard deviation of the heights the children can jump.   [5]

  (ii) Find the probability that a randomly chosen child will **not** be able to jump a height of 145 cm.   [3]

  (iii) Find the probability that, of 8 randomly chosen children, at least 2 will be able to jump a height of more than 135 cm.   [3]

6 The volume of milk in millilitres in cartons is normally distributed with mean μ and standard deviation 8. Measurements were taken of the volume in 900 of these cartons and it was found that 225 of them contained more than 1002 millilitres.

  (i) Calculate the value of μ.   [3]

  (ii) Three of these 900 cartons are chosen at random. Calculate the probability that exactly 2 of them contain more than 1002 millilitres.   [2]

7 In a certain country the time taken for a common infection to clear up is normally distributed with mean μ days and standard deviation 2.6 days. 25% of these infections clear up in less than 7 days.

    (i) Find the value of μ.   [4]

In another country the standard deviation of the time taken for the infection to clear up is the same as in part **(i)**, but the mean is 6.5 days. The time taken is normally distributed.

  (ii) Find the probability that, in a randomly chosen case from this country, the infection takes longer than 6.2 days to clear up.   [3]