

# The normal distribution

## Question Paper 2

<b>Level</b>	International A Level
<b>Subject</b>	Maths
<b>Exam Board</b>	CIE
<b>Topic</b>	The normal distribution
<b>Sub Topic</b>	
<b>Booklet</b>	Question Paper 2

**Time Allowed:** 52 minutes

**Score:** / 43

**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  $X$  is normally distributed with mean 82 and standard deviation 7.4. Find the value of  $q$  such that  $P(82 - q < X < 82 + q) = 0.44$ . [3]
- (b) The random variable  $Y$  is normally distributed with mean  $\mu$  and standard deviation  $\sigma$ . It is given that  $5\mu = 2\sigma^2$  and that  $P(Y < \frac{1}{2}\mu) = 0.281$ . Find the values of  $\mu$  and  $\sigma$ . [4]

- 2 Lengths of rolls of parcel tape have a normal distribution with mean 75 m, and 15% of the rolls have lengths less than 73 m.

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

Alison buys 8 rolls of parcel tape.

(ii) Find the probability that fewer than 3 of these rolls have lengths more than 77 m. [3]

- 3 The random variable  $X$  is the daily profit, in thousands of dollars, made by a company.  $X$  is normally distributed with mean 6.4 and standard deviation 5.2.

(i) Find the probability that, on a randomly chosen day, the company makes a profit between \$10 000 and \$12 000. [3]

(ii) Find the probability that the company makes a loss on exactly 1 of the next 4 consecutive days. [4]

4 A fair tetrahedral die has four triangular faces, numbered 1, 2, 3 and 4. The score when this die is thrown is the number on the face that the die lands on. This die is thrown three times. The random variable  $X$  is the sum of the three scores.

(i) Show that  $P(X = 9) = \frac{10}{64}$ . [3]

(ii) Copy and complete the probability distribution table for  $X$ . [3]

$x$	3	4	5	6	7	8	9	10	11	12
$P(X = x)$	$\frac{1}{64}$	$\frac{3}{64}$			$\frac{12}{64}$					

(iii) Event  $R$  is ‘the sum of the three scores is 9’. Event  $S$  is ‘the product of the three scores is 16’. Determine whether events  $R$  and  $S$  are independent, showing your working. [5]

5 The random variable  $X$  is such that  $X \sim N(82, 126)$ .

(i) A value of  $X$  is chosen at random and rounded to the nearest whole number. Find the probability that this whole number is 84. [3]

(ii) Five independent observations of  $X$  are taken. Find the probability that at most one of them is greater than 87. [4]

(iii) Find the value of  $k$  such that  $P(87 < X < k) = 0.3$ . [5]