

Write your name here

Surname

Other Names

# AS/A Level Mathematics

## Normal Distribution

**Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.**

### Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled..
- Answer the questions in the spaces provided  
– there may be more space than you need.
- You should show sufficient working to make your methods clear.  
Answers without working may not gain full credit.
- Answers should be given to three significant figures unless otherwise stated.

### Information

- The marks for **each** question are shown in brackets  
– use this as a guide as to how much time to spend on each question.

### Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

1 Given that  $X \sim N(20, 25)$  find the following probabilities

- (a)  $P(X > 25)$  (1)  
(b)  $P(X < 14.8)$  (1)  
(c)  $P(13 < X < 19)$  (1)

(Total for question 1 is 3 marks)

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2 The distribution of the weights of coffee in a jar is normally distributed with a mean of 200 g and a standard deviation of 4.2 g.

Find the probability that the weight of the coffee is:

- (a) More than 205 g (1)  
(b) Less than 195 g (1)  
(c) Between 195 g and 205 g (1)

(Total for question 1 is 3 marks)

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3 The times it takes students to complete a test are normally distributed with a mean of 58 minutes and a standard deviation of 12 minutes.

Find the time by which 90% of students complete the test.

(Total for question 3 is 2 marks)

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4 The heights of a group of people are normally distributed with a mean of 164 cm and 10% of the people have a height of less than 150 cm.

Find the standard deviation of the heights of the people.

(Total for question 4 is 4 marks)

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5 A variable  $Y$  is normally distributed with a standard deviation of 2.8. Given  $P(Y < 26) = 0.3$

Find the mean of  $Y$ .

(Total for question 5 is 4 marks)

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6 The 100m race times an athlete records are normally distributed.

16% of the time the athlete is faster than 10 seconds.

23% of the time the athlete is slower than 11 seconds.

Find the mean and standard deviation of the times.

(Total for question 6 is 6 marks)

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7 A variable  $X$  is normally distributed. Given  $P(X < 52) = 0.2$  and  $P(X > 60) = 0.3$

Find the mean and standard deviation of  $X$ .

(Total for question 7 is 6 marks)

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