

Write your name here

Surname	Other names
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**Pearson**                      Centre Number                      Candidate Number

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**Edexcel GCE**

**A level Mathematics**

**Practice Paper**

**Statistics – Statistical distributions**

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<b>You must have:</b> Mathematical Formulae and Statistical Tables (Pink)	Total Marks
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### 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, centre number and candidate number.
- Answer all the 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.
- Inexact answers should be given to three significant figures unless otherwise stated.

### Information

- A booklet ‘Mathematical Formulae and Statistical Tables’ is provided.
- There are 10 questions in this question paper. The total mark for this paper is 100.
- The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.
- Calculators must not be used for questions marked with a \* sign.

### 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.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

1. The random variable  $X \sim N(\mu, 5^2)$  and  $P(X < 23) = 0.9192$ .

(a) Find the value of  $\mu$ .

(4)

(b) Write down the value of  $P(\mu < X < 23)$ .

(1)

**(Total 5 marks)**

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2. Past records show that the times, in seconds, taken to run 100 m by children at a school can be modelled by a normal distribution with a mean of 16.12 and a standard deviation of 1.60.

A child from the school is selected at random.

(a) Find the probability that this child runs 100 m in less than 15 s.

(3)

On sports day the school awards certificates to the fastest 30% of the children in the 100 m race.

(b) Estimate, to 2 decimal places, the slowest time taken to run 100 m for which a child will be awarded a certificate.

(4)

**(Total 7 marks)**

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3. The time, in minutes, taken to fly from London to Malaga has a normal distribution with mean 150 minutes and standard deviation 10 minutes.

(a) Find the probability that the next flight from London to Malaga takes less than 145 minutes. (3)

The time taken to fly from London to Berlin has a normal distribution with mean 100 minutes and standard deviation  $d$  minutes.

Given that 15% of the flights from London to Berlin take longer than 115 minutes,

(b) find the value of the standard deviation  $d$ . (4)

The time,  $X$  minutes, taken to fly from London to another city has a normal distribution with mean  $\mu$  minutes.

Given that  $P(X < \mu - 15) = 0.35$

(c) find  $P(X > \mu + 15 \mid X > \mu - 15)$ . (3)

**(Total 10 marks)**

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4. A continuous random variable  $X$  has probability density function  $f(x)$  where

$$f(x) = \begin{cases} kx^n & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

where  $k$  and  $n$  are positive integers.

(a) Find  $k$  in terms of  $n$ . (3)

(b) Find  $E(X)$  in terms of  $n$ . (3)

(c) Find  $E(X^2)$  in terms of  $n$ . (2)

Given that  $n = 2$ ,

(d) find  $\text{Var}(3X)$ . (3)

**(Total 11 marks)**

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5. The time taken, in minutes, by children to complete a mathematical puzzle is assumed to be normally distributed with mean  $\mu$  and standard deviation  $\sigma$ . The puzzle can be completed in less than 24 minutes by 80% of the children. For 5% of the children it takes more than 28 minutes to complete the puzzle.

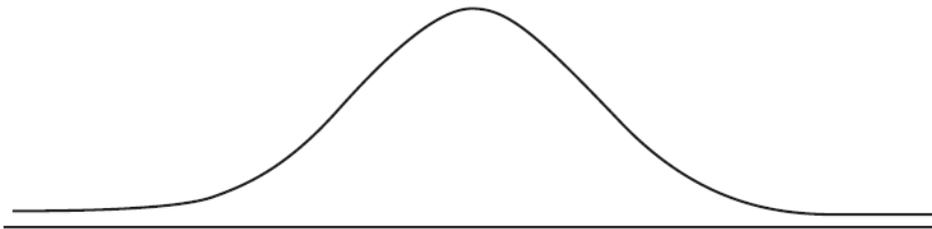
(a) Show this information on the Normal curve below. (2)

(b) Write down the percentage of children who take between 24 minutes and 28 minutes to complete the puzzle. (1)

(c) (i) Find two equations in  $\mu$  and  $\sigma$ .  
(ii) Hence find, to 3 significant figures, the value of  $\mu$  and the value of  $\sigma$ . (7)

A child is selected at random.

(d) Find the probability that the child takes less than 12 minutes to complete the puzzle. (3)



(Total 13 marks)

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6. The weight, in grams, of beans in a tin is normally distributed with mean  $\mu$  and standard deviation 7.8.

Given that 10% of tins contain less than 200 g, find

(a) the value of  $\mu$ , (3)

(b) the percentage of tins that contain more than 225 g of beans. (3)

The machine settings are adjusted so that the weight, in grams, of beans in a tin is normally distributed with mean 205 and standard deviation  $\sigma$ .

(c) Given that 98% of tins contain between 200 g and 210 g find the value of  $\sigma$ . (4)

**(Total 10 marks)**

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7. The heights of adult females are normally distributed with mean 160 cm and standard deviation 8 cm.

(a) Find the probability that a randomly selected adult female has a height greater than 170 cm. (3)

Any adult female whose height is greater than 170 cm is defined as tall.

An adult female is chosen at random. Given that she is tall,

(b) find the probability that she has a height greater than 180 cm. (4)

Half of tall adult females have a height greater than  $h$  cm.

(c) Find the value of  $h$ . (5)

**(Total 12 marks)**

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8. A manufacturer fills jars with coffee. The weight of coffee,  $W$  grams, in a jar can be modelled by a normal distribution with mean 232 grams and standard deviation 5 grams.

(a) Find  $P(W < 224)$ . (3)

(b) Find the value of  $w$  such that  $P(232 < W < w) = 0.20$ . (4)

Two jars of coffee are selected at random.

(c) Find the probability that only one of the jars contains between 232 grams and  $w$  grams of coffee. (3)

**(Total 10 marks)**

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9. In a large school, 20% of students own a touch screen laptop. A random sample of  $n$  students is chosen from the school. Using a normal approximation, the probability that more than 55 of these  $n$  students own a touch screen laptop is 0.0401 correct to 3 significant figures.

Find the value of  $n$ .

**(Total 8 marks)**

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10. The time taken for a randomly selected person to complete a test is  $M$  minutes, where  $M \sim N(14, \sigma^2)$

Given that 10% of people take less than 12 minutes to complete the test,

(a) find the value of  $\sigma$  (3)

Graham selects 15 people at random.

(b) Find the probability that fewer than 2 of these people will take less than 12 minutes to complete the test. (3)

Jovanna takes a random sample of  $n$  people.

Using a normal approximation, the probability that fewer than 9 of these  $n$  people will take less than 12 minutes to complete the test is 0.3085 to 4 decimal places.

(c) Find the value of  $n$ . (8)

**(Total 14 marks)**

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**TOTAL FOR PAPER: 100 MARKS**