Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Statistics
The Normal Distribution

You must have:
Ruler graduated in centimetres and millimetres, protractor, pen
HB pencil, eraser, electronic calculator.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

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.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

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

Higher Tier Formulae

You must not write on this page.
Anything you write on this page will gain NO credit.

Mean of a frequency distribution $= \dfrac{\sum fx}{\sum f}$

Mean of a grouped frequency distribution $= \dfrac{\sum fx}{\sum f}$, where x is the mid-interval value.

Variance $= \dfrac{\sum (x-\bar{x})^2}{n}$

Standard deviation (set of numbers) $\sqrt{\left[\dfrac{\sum x^2}{n} - \left(\dfrac{\sum x}{n}\right)^2\right]}$

or $\sqrt{\left[\dfrac{\sum (x-\bar{x})^2}{n}\right]}$

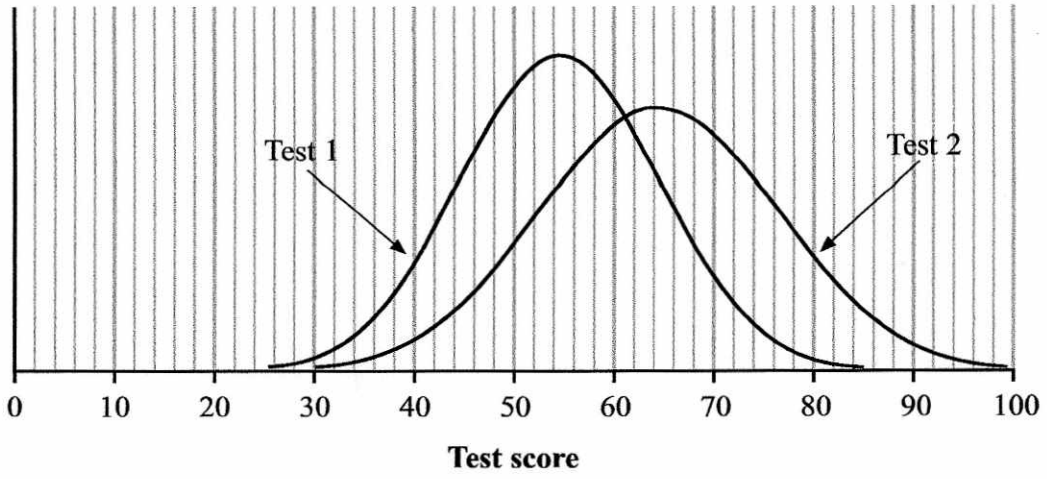
where $\bar{x}$ is the mean set of values.

Standard deviation (discrete frequency distribution) $\sqrt{\left[\dfrac{\sum fx^2}{\sum f} - \left(\dfrac{\sum fx}{\sum f}\right)^2\right]}$

or $\sqrt{\left[\dfrac{\sum f(x-\bar{x})^2}{\sum f}\right]}$

Spearman's Rank Correlation Coefficient $1 - \dfrac{6\sum d^2}{n(n^2-1)}$

1 Some students did two mathematics tests.
The students' marks for the tests are normally distributed.
The diagram shows the distribution of marks for Test 1 and Test 2



(a) Estimate the mean and standard deviation of the marks for Test 1

Mean = centre of normal dist.

99.7% of data is within 6 standard deviations (3 each side of the mean)

$\frac{85 - 25}{6} = 10$

Mean 55

Standard deviation 10

(3)

For Test 2 the mean mark is 64 and the standard deviation is 12

One student got 60 marks on both Test 1 and Test 2

(b) Find this student's standardised scores and compare how well the student did on the two tests.

Test 1: $\frac{60 - 55}{10} = 0.5$

Test 2: $\frac{60 - 64}{10} = -0.4$

The student performed better on test 1. They have a higher standardised score on test 1.

(5)

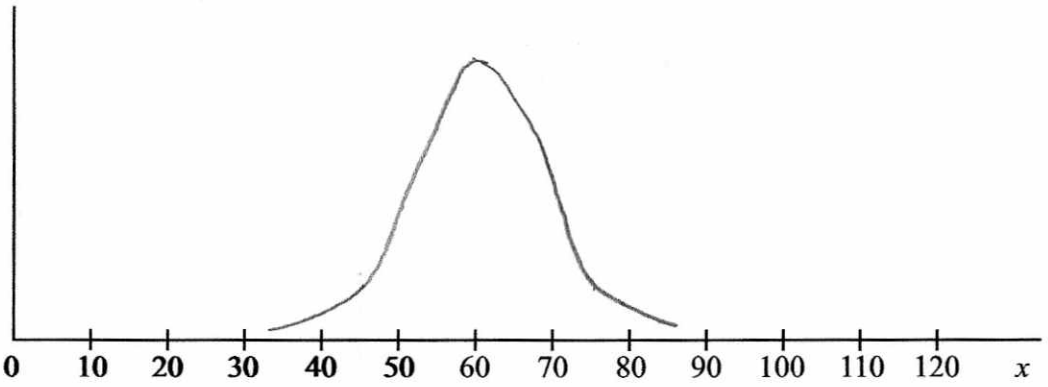
(Total for Question 1 is 8 marks)

2 A variable, X, has a normal distribution with mean 60

95% of the values of X lie between 45 and 75

(a) Sketch a diagram to show this distribution.

2 standard deviations each side of the mean



(3)

Ross wants to find out how long it takes boys and girls in different year groups to complete jigsaw puzzles.

He collects the following information for each child.

Gender
Year group
Number of pieces in the jigsaw puzzle
Time taken to complete the puzzle
Favourite subject

(b) Which of these variables is most likely to be modelled by a normal distribution? Give a reason for your answer.

Time taken to complete the puzzle → it is continuous data.

(2)

(Total for Question 2 is 5 marks)