MATHSAURUS

A Level Mathematics Year 2 Exam Questions by Topic
Chapter 16: Statistical distributions

These questions are taken from the Specimen Exam materials and the real 2018 papers for the new syllabus AS and A-level mathematics courses and arranged by chapter of the textbooks by Goldie et al (available here: `https://amzn.to/39umfr5` and `https://amzn.to/3hE8kBL`). There are a mixture of questions from OCR A, OCR B (MEI) and Edexcel. Although the style of questions varies a little across the exam boards the content of the syllabus is almost identical so these are suitable for students preparing for any exam board.

Free problem sets for all other chapters, as well as video solutions, full past papers and other content for GCSE and A-level maths can be found at:

`https://mathsaurus.com/`

OCR A 2018 Paper 2 Question 8:

8 **(i)** The variable X has the distribution N(20, 9).

(a) Find $P(X > 25)$. **[1]**

(b) Given that $P(X > a) = 0.2$, find a. **[1]**

(c) Find b such that $P(20 - b < X < 20 + b) = 0.5$. **[3]**

(ii) The variable Y has the distribution $N(\mu, \frac{\mu^2}{9})$. Find $P(Y > 1.5\mu)$. **[3]**

OCR B MEI Sample Paper 2 Question 6:

6 Each day, for many years, the maximum temperature in degrees Celsius at a particular location is recorded. The maximum temperatures for days in October can be modelled by a Normal distribution; the appropriate Normal curve is shown in Fig. 6.

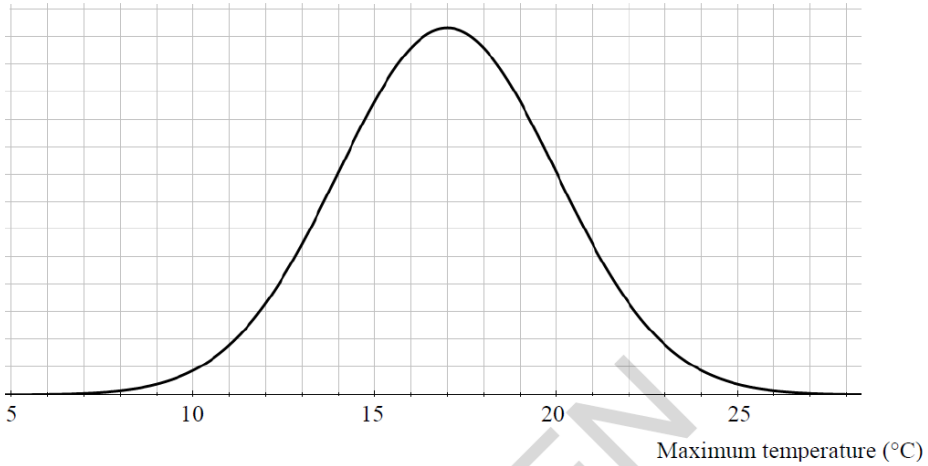


Fig. 6

(i) (*A*) Use the model to write down the mean of the maximum temperatures.

(*B*) Explain why the curve indicates that the standard deviation is approximately 3 degrees Celsius. **[2]**

Temperatures can be converted from Celsius to Fahrenheit using the formula $F = 1.8C + 32$, where F is the temperature in degrees Fahrenheit and C is the temperature in degrees Celsius.

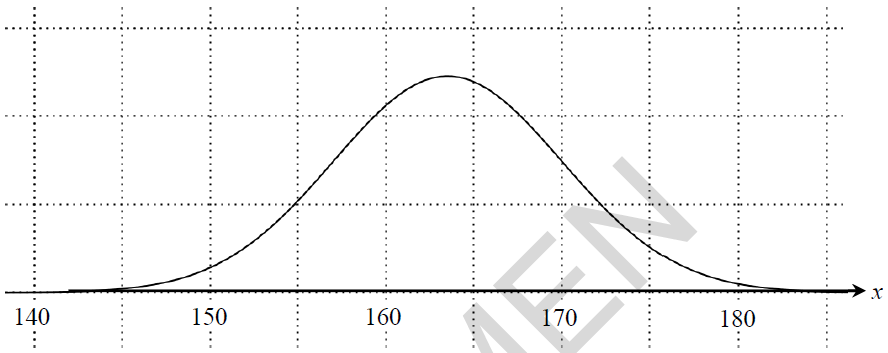
(ii) For maximum temperature in October in degrees Fahrenheit, estimate

- the mean,
- the standard deviation. **[2]**

OCR A Sample Paper 2 Question 7:

7 **(i)** The heights of English men aged 25 to 34 are normally distributed with mean 178 cm and standard deviation 8 cm. Three English men aged 25 to 34 are chosen at random. Find the probability that all three of them have a height less than 194 cm. **[3]**

(ii) The diagram shows the distribution of heights of Scottish women aged 25 to 34.



It is given that the distribution is approximately normal. Use the diagram in the Printed Answer Booklet to estimate the standard deviation of these heights, explaining your method. **[3]**

OCR A Sample Paper 2 Question 8:

8 A market gardener records the masses of a random sample of 100 of this year's crop of plums. The table shows his results.

Mass, m grams	$m < 25$	$25 \le m < 35$	$35 \le m < 45$	$45 \le m < 55$	$55 \le m < 65$	$65 \le m < 75$	$m \ge 75$
Number of plums	0	3	29	36	30	2	0

(i) Explain why the normal distribution might be a reasonable model for this distribution. **[1]**

The market gardener models the distribution of masses by $\mathrm{N}\left(47.5, 10^2\right)$.

(ii) Find the number of plums in the sample that this model would predict to have masses in the range

(a) $35 \le m < 45$, **[2]**

(b) $m < 25$. **[2]**

(iii) Use your answers to parts **(ii)(a)** and **(ii)(b)** to comment on the suitability of this model. **[1]**

(iv) The market gardener plans to use this model to predict the distribution of the masses of next year's crop of plums. Comment on this plan. **[1]**

10 The screenshot in Fig. 10 shows the probability distribution for the continuous random variable X, where $X \sim \mathrm{N}(\mu, \sigma^2)$.

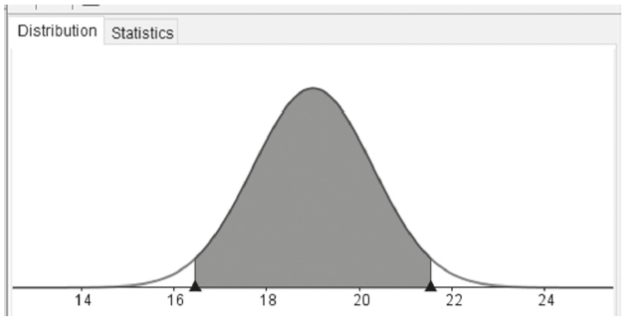


Fig. 10

The area of each of the unshaded regions under the curve is 0.025. The lower boundary of the shaded region is at 16.452 and the upper boundary of the shaded region is at 21.548.

(i) Calculate the value of μ. **[1]**

(ii) Calculate the value of σ^2. **[3]**

(iii) Y is the random variable given by $Y = 4X + 5$.

(A) Write down the distribution of Y. **[3]**

(B) Find $\mathrm{P}(Y > 90)$. **[1]**