Quiz 1-A [17 marks]

1. [Maximum mark: 17] 23N.1.SL.TZ1.7

A ballet company performs *The Sleeping Beauty* every year. Last year they gave a total of 60 performances at their theatre which has a maximum capacity of 800. The number of tickets sold, n, at each performance is shown in the following frequency table.

Number of tickets sold, n	Number of performances
$0 < n \leq 200$	3
$200 < n \leq 400$	p
$400 < n \leq 600$	18
$600 < n \leq 800$	30

(a.i) Find the value of p. [1]

Markscheme

$p = 9$ **A1**

[1 marks]

Examiners report

Most candidates had a good understanding of frequency, modal class and using a cumulative frequency curve to read values. Many candidates gave an answer for 'at most' instead of 'at least' when determining a number of outcomes using a cumulative frequency curve.

Many candidates struggled to give pertinent answers when reflecting on the sampling process used. Reflections such as these should always be contextual to ensure validity to statements. e.g., there is a difference between surveying 5% and surveying the first 5% and this should be evident in the disadvantage given by the candidate.

(a.ii) Write down the modal class. [1]

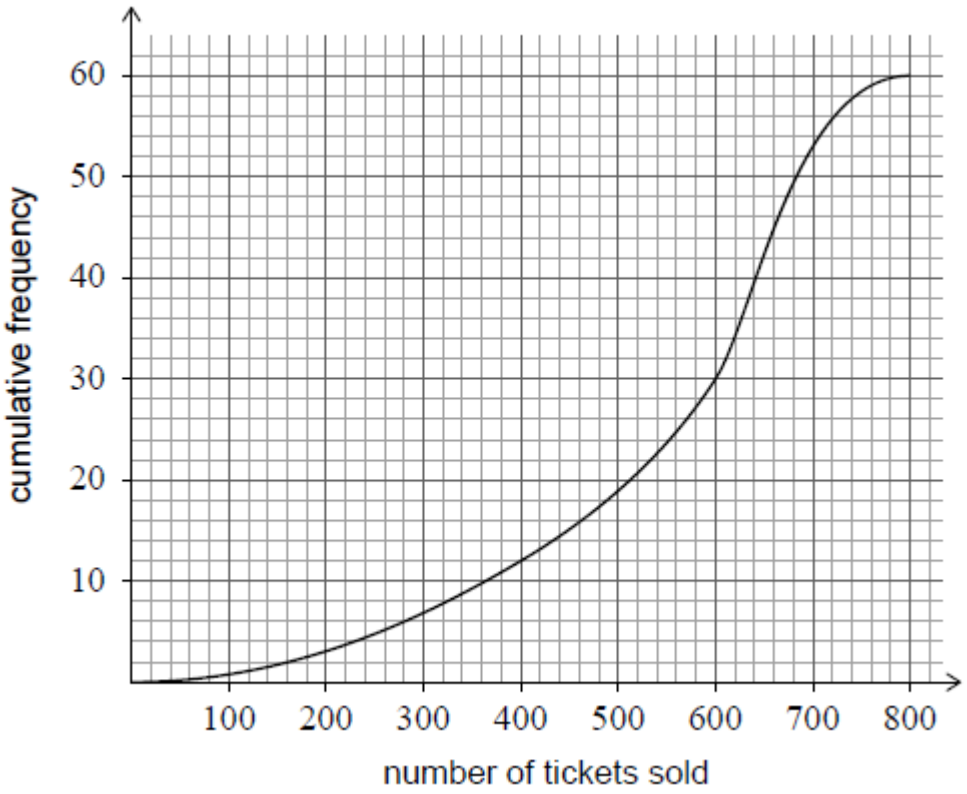
Markscheme

$600 < n \leq 800$ ***A1***

Note: Award ***A0*** if candidate answers 700.

[1 marks]

The following cumulative frequency diagram also displays these data.



(b) Use the cumulative frequency curve to estimate

(b.i) the median number of tickets sold. [1]

Markscheme

median $= 600$ ***A1***

[1 marks]

(b.ii) the number of performances where at least 80% of the tickets were sold. [3]

Markscheme

80% of $800 = 640$ ***(A1)***

40 (performances less than 80% of tickets sold) ***(A1)***

20 (performances) ***A1***

[3 marks]

After a performance, the company decides to conduct a survey to obtain feedback from the audience.

(c.i) State one disadvantage of the company surveying only the first 5% of the audience as they leave the theatre. [1]

Markscheme

any reasonable answer which suggests a biased sample (must include reason, do not accept reasons such as "sample size is too small", or answers that simply say "not representative of entire audience" without a valid reason) **A1**

e.g. likely to come from the same part of the theatre OR be part of same group OR be from priority seating OR it is convenience sampling

[1 marks]

(c.ii) Describe briefly how the company could collect feedback from $5\,\%$ of the audience using the systematic sampling method. [2]

Markscheme

every 20^{th} person ***A1A1***

Note: Award ***A1*** for recognizing that sampling occurs at regular intervals e.g. "every".

Award ***A1*** for interval length is 20.

[2 marks]

(c.iii) State the sampling method which should be used if the survey is to be representative of the number of children and the number of adults in the audience. [1]

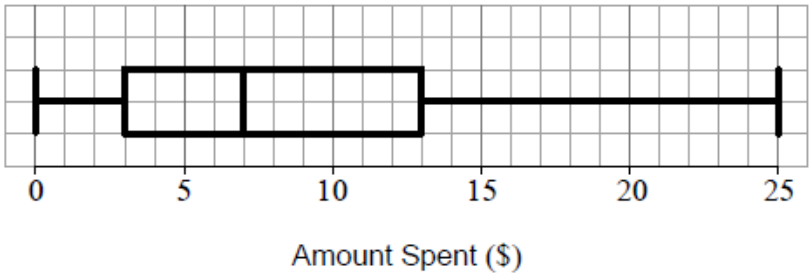
Markscheme

quota (sampling method) ***A1***

[1 marks]

Last year $36\,000$ tickets were sold to *The Sleeping Beauty.*

(d) The following box and whisker diagram displays the amount spent by the audience at the souvenir shop when they attended the performance.



(d.i) Estimate the number of people who spent between $\$3$ and $\$25$. [2]

Markscheme

$75\,\%$ (of 36000 spent between $\$3$ and $\$25$) ***(M1)***

$= 27000$ ***A1***

[2 marks]

(d.ii) Half the audience spent less than $\$a$. Estimate the value of a. [1]

Markscheme

$a = 7$ ***A1***

[1 marks]

This year the company will again give 60 performances and expects to sell 18 additional tickets for each performance.

(e.i) Calculate the mean number of tickets the company expects to sell this year for each performance. [3]

Markscheme

METHOD 1

old mean is 600 (tickets) ***(A1)***

recognising new mean is old mean $+18$ ***(M1)***

$600 + 18$

$= 618$ (tickets) ***A1***

METHOD 2

new total number of tickets $= 36000 + 60 \times 18 (= 37080)$
(A1)

$\text{new mean} = \frac{36000+60\times18}{60} \left(= \frac{37080}{60}\right)$ ***(M1)***

$= 618$ (tickets) ***A1***

[3 marks]

(e.ii) State what effect, if any, this increase in ticket sales would have on the variance of the number of tickets sold for each performance. [1]

Markscheme

no effect on the variance ***A1***

[1 marks]

© International Baccalaureate Organization, 2025