

## LC 2015 (SET B): PAPER 2

### QUESTION 9 (70 MARKS)

#### Question 9 (a)

Categorical Nominal	
Categorical Ordinal	
Numerical Discrete	
Numerical Continuous	✓

**Explanation:** Heights are numerical measurements which can take on any real value.

#### MARKING SCHEME NOTES

##### Question 9 (a) [Scale 5C (0, 3, 4, 5)]

- 3: • Tick in Numerical Continuous with no explanation  
 4: • A tick and an incomplete explanation for Numerical Continuous  
 5: • A tick and a correct explanation for Numerical Continuous  
 • A tick and a correct explanation for Numerical Discrete

#### Question 9 (b)

Table 1 (Girls)								
Height (cm)	145-150	150-155	155-160	160-165	165-170	170-175	175-180	180-185
Number of girls	15	48	80	112	125	81	29	10

(i)

Mid-interval value	$f$	$fx$
147.5	15	2212.5
152.5	48	7320.0
157.5	80	12 600.0
162.5	112	18 200.0
167.5	125	20 937.5
172.5	81	13 972.5
177.5	29	5147.5
182.5	10	1825.0
	500	82 215.0

Draw up a frequency distribution table by calculating mid-interval values.

Class 145-150:

$$\text{Mid-interval value} = \frac{145+150}{2} = 147.5$$

#### FORMULAE AND TABLES BOOK

##### Statistics and probability:

Mean from a frequency table

[page 33]

$$\mu = \frac{\sum fx}{\sum f}$$

$$\mu = \frac{\text{Sum of } (fx)}{\text{Sum of } f} = \frac{\sum fx}{\sum f} = \frac{82\,215}{500} = 164.43$$

#### MARKING SCHEME NOTES

##### Question 9 (b) (i) [Scale 20C (0, 10, 17, 20)]

- 10: • Work of merit  
 17: • Correctly calculates  $\sum fx$  and fails to finish e.g. [ 82215]  
 • Finishes  $\frac{\sum fx}{\sum f} = \frac{\Delta}{500}$  (with only one error).

**Note:**  $\Delta$  = Candidate's  $\sum fx$  worked

- 20: • Correct answer without work

- (ii) Largest possible value for the range of heights =  $185 - 145 = 40$  cm
- (iii) The median is the middle value when all the values are arranged in order.  
50% have a height below 164.5 cm and 50% have a height above 164.5 cm.

**MARKING SCHEME NOTES**

**Question 9 (b) (ii) [Scale 5C (0, 3, 4, 5)]**

- 3: • One end of range identified correctly  
• Subtraction of two boundaries indicated e.g. 170–155
- 4: • Both ends of range identified correctly
- 5: • Correct answer without work

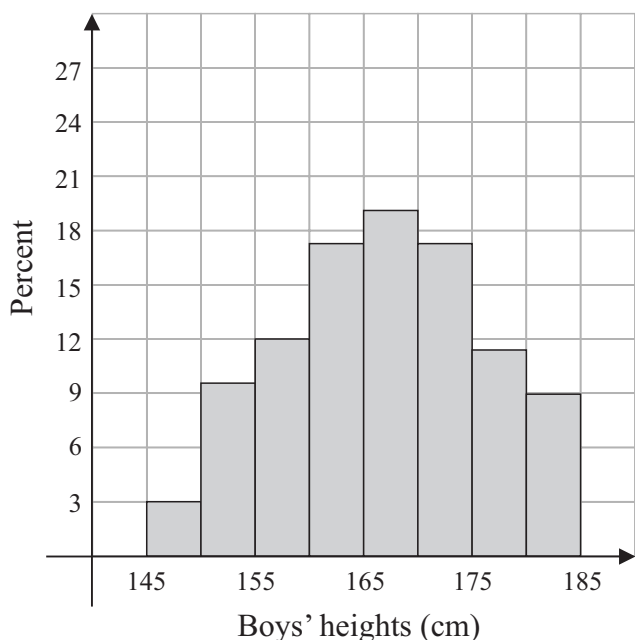
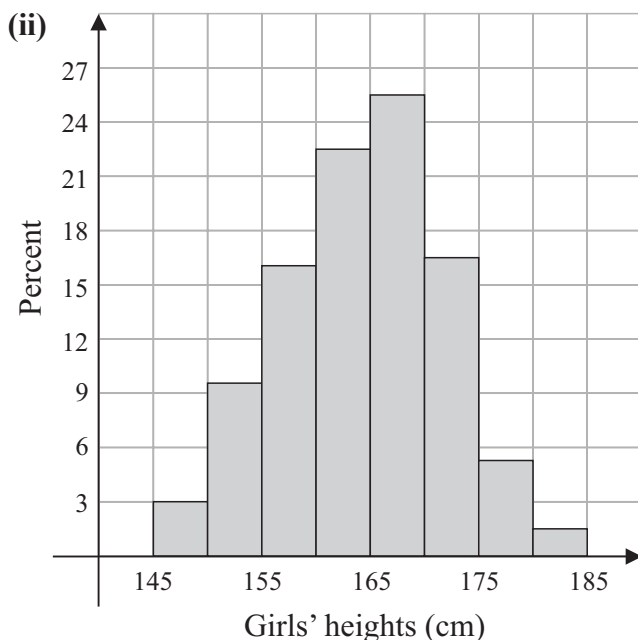
**Question 9 (b) (iii) [Scale 5B (0, 3, 5)]**

- 3: • Presents an incomplete explanation e.g. “Half are tall”
- 5: • Indicates “middle” of the sample

**Question 9 (c)**

- (i) 15 girls out of 500 have heights between 145-150.  
 $\frac{15}{500} \times 100\% = 3\%$  of girls have heights between 145-150.

Table 2 (Girls, %)								
Height (cm)	145-150	150-155	155-160	160-165	165-170	170-175	175-180	180-185
Percentage of girls	3	9.6	16	22.4	25	16.2	5.8	2



- (iii) Yes - there are roughly twice as many boys as girls in the 175 to 180 cm category because the samples were the same size.
- (iv) No. There are more boys with big heights. A bigger percentage of boys are over 165 cm. The area is bigger.

**MARKING SCHEME NOTES**

**Question 9 (c) (i) [Scale 5C (0, 3, 4, 5)]**

- 3: • One/two correct percentage  
• Attempt to find % e.g. Writes 100
- 4: • Any three correct percentages  
• Decimal format used

**Question 9 (c) (ii) [Scale 10B (0, 4, 10)]**

- 4: • Any work of merit e.g. One correct block

**Question 9 (c) (iii) [Scale 5B (0, 3, 5)]**

- 3: • Indicates correct answer only  
• Incomplete explanation

**Question 9 (c) (iv) [Scale 5B (0, 3, 5)]**

- 3: • Indicates correct answer  
• Indicates correct answer and an incomplete explanation

**Question 9 (d)**

(i)

In any normal distribution with mean  $\mu$  and standard deviation  $\sigma$ :

1. 68% of the data falls within  $1\sigma$  of the mean  $\mu$ .
2. 95% of the data falls within  $2\sigma$  of the mean  $\mu$ .
3. 99.7% of the data falls within  $3\sigma$  of the mean  $\mu$ .

$$\mu = 166.7 \text{ cm}$$

$$\sigma = 8.9 \text{ cm}$$

95% lie between  $\mu \pm 2\sigma$

$$= [166.7 - 2 \times 8.9, 166.7 + 2 \times 8.9]$$

$$= [148.9 \text{ cm}, 184.5 \text{ cm}]$$

- (ii) The variation of the heights of the girls about their mean height of 165 cm is less than that of the boys about their mean height.

**MARKING SCHEME NOTES**

**Question 9 (d) (i) [Scale 5C (0, 3, 4, 5)]**

- 3: • Writes a correct formula and stops  
• Some work using  $\sigma$  [Interval as  $157.8$ , or  $175.6$ ]
- 4: • One end of range identified correctly [  $148.9$ , or  $184.5$  ]  
• Incorrect consistent error [Works with  $\bar{x} \pm \sigma$  ]

**Question 9 (d) (ii) [Scale 5B (0, 3, 5)]**

- 3: • An incomplete interpretation e.g. Says different values/Subtracts values, with no interpretation