UNIT 18 *Measures of Variation* CSEC Revision Test

1. The countries of the world are divided into 'developed' and 'under-developed' countries.

   The frequency table shows the distribution of ages for the population in the developed countries.

   The figures are percentages and were estimated for the year 1985.

Age (y years)	*Percentage of population*	*Cumulative Percentage*
$0 < y \leq 15$	19	
$15 < y \leq 30$	22	
$30 < y \leq 45$	20	
$45 < y \leq 60$	17	
$60 < y \leq 75$	11	
$75 < y \leq 90$	9	
$90 < y \leq 105$	2	

   (a) Construct a cumulative frequency diagram to show this information. (*4 marks*)

   (b) (i) What was the median age for the population in developed countries in 1985?

   (ii) The median age for the population in the under-developed countries in 1985 was 21.

   What do the medians tell you about the difference between the population in the developed countries and the population in the under-developed countries?

   (*3 marks*)

   (c) Estimate the upper and lower quartiles, and hence deduce the interquartile range.

   (*3 marks*)

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2. The table below gives the distribution of heights of 400 female applicants for the Police Service.

Height (cm)	Number of Applicants	Cumulative Frequency
151 - 155	10	10
156 - 160	55	65
161 - 165	105	170
166 - 170	110	280
171 - 175	80	360
176 - 180	30	390
181 - 185	10	400

(a) Using a horizontal scale of 2 cm to represent a height of 5 cm and a vertical scale of 2 cm to represent 50 applicants, draw a cumulative frequency curve of the heights.

Start your horizontal scale at 150 cm.

(b) Use your graph to estimate

(i) the number of applicants whose heights are less than 170 cm.

(ii) the median height of applicants.

(iii) the height that 25% of the applicants are less than.

(iv) the probability that an applicant selected at random has a height that is no more than 162 cm.

Credit will be given for drawing appropriate lines on your graph to show how the estimates were obtained.

(CXC)

(12 marks)

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3. In an athletics event, the distance x, in kilometres, run by each of a group of 80 children was recorded. The data obtained was then expressed in two ways as shown in the tables below.

Distance x (km)	*Number of children*
$0 < x \leq 1$	2
$1 < x \leq 2$	5
$2 < x \leq 3$	11
$3 < x \leq 4$	18
$4 < x \leq 5$	17
$5 < x \leq 6$	*A*
$6 < x \leq 7$	8
$7 < x \leq 8$	5

Distance x (km)	*Number of children running this distance or less*
1	2
2	7
3	*B*
4	36
5	53
6	67
7	75
8	80

(a) Find the value of A and B. (*1 mark*)

(b) Using a vertical scale of 2 cm to represent 10 children and a horizontal scale of 2 cm to represent 1 km, draw a smooth cumulative frequency curve to represent the results in the second table. (*2 marks*)

(c) Showing your method clearly, use your graph to estimate

(i) the median,

(ii) the interquartile range. (*3 marks*)

(d) Find the probability that one child, chosen at random, has run more than 4 km. (*1 mark*)

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4. In order to check the efficiency of branches of QuickFood stores in California, USA, a survey was carried out. The number of customers using 80 branches on Monday 12 June 2010 was as follows.

Number of customers	100 or less	200 or less	300 or less	400 or less	500 or less	600 or less	700 or less
Number of branches	4	14	30	50	69	76	80

(a) Use the table to draw a cumulative frequency curve to represent the data.

(b) Use your curve, showing all construction lines, to

(i) find the median number of customers;

(ii) calculate the interquartile range for these data;

(iii) estimate the number of branches with 240 customers or less;

(iv) estimate the number of branches with 530 customers or more.

(10 marks)

TOTAL MARKS: 39

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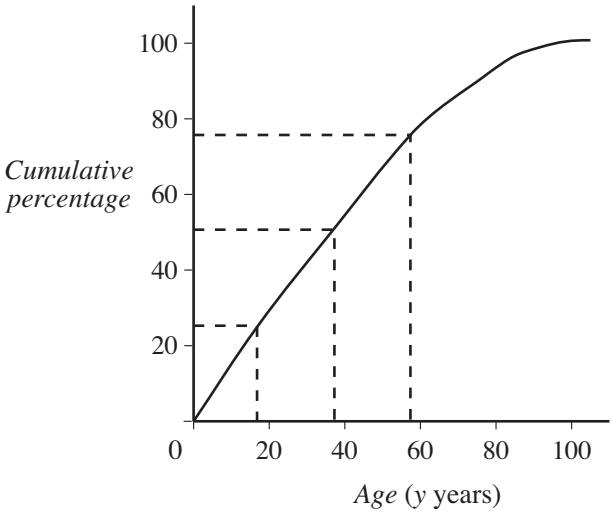
ANSWERS

1. (a)

Age (y years)	Percentage of population	Cumulative Percentage
$0 < y \leq 15$	19	19
$15 < y \leq 30$	22	41
$30 < y \leq 45$	20	61
$45 < y \leq 60$	17	78
$60 < y \leq 75$	11	89
$75 < y \leq 90$	9	98
$90 < y \leq 105$	2	100

(correct values) B1



points B2

curve B1

(b) (i) Estimate of median age = 37 years (allow ±1) B2

(ii) The 'under-developed ' countries have a much younger age profile. B1

(c) upper quartile = 57 (allow ±2) B1

lower quartile = 18 (allow ±2) B1

interquartile range = 57 – 18 = 39 (allow ±2) B1 (*10 marks*)

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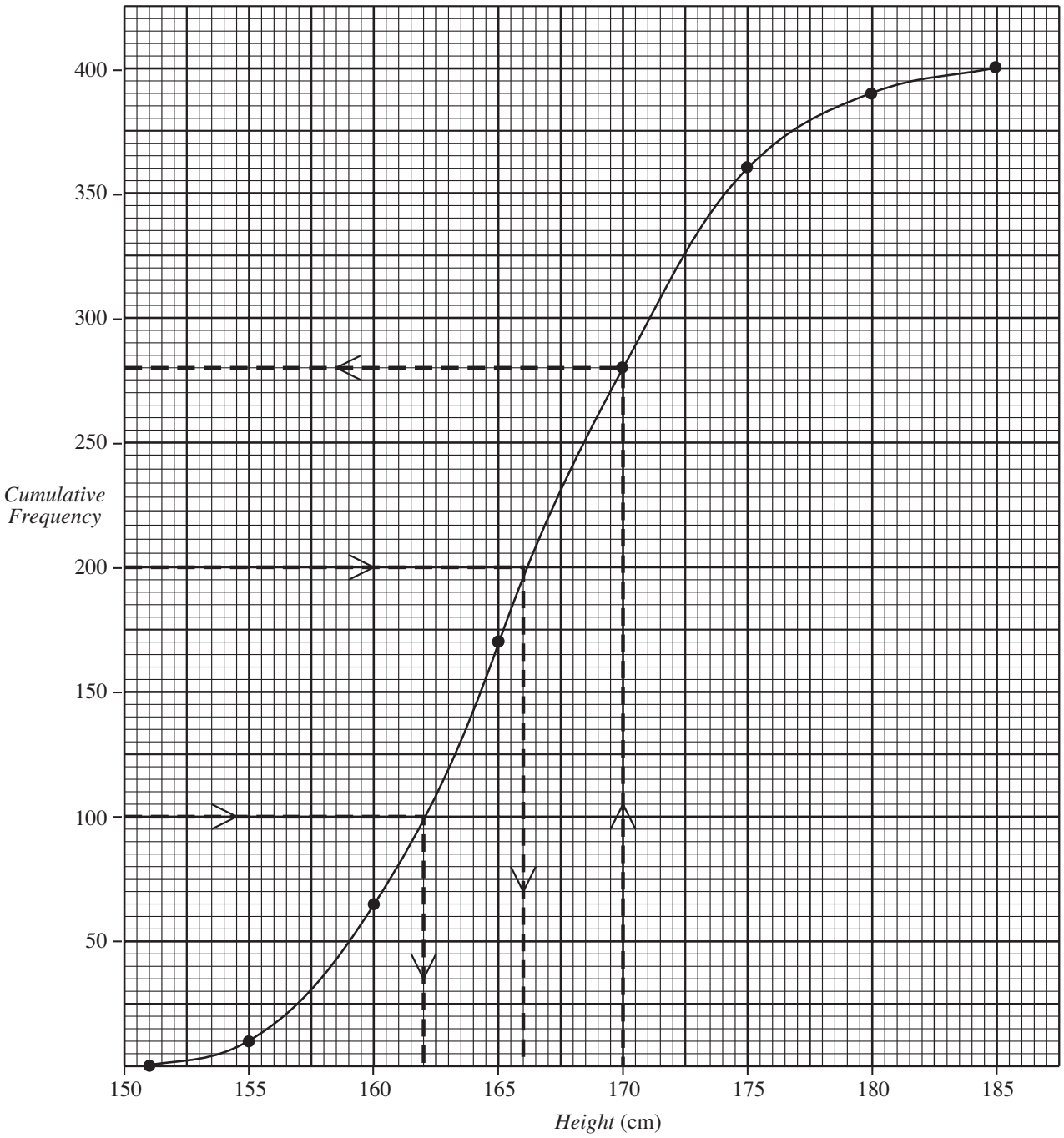
ANSWERS

2. (a)



(–1 for each mistake) B5

(b) (i) 280 applicants B1

(ii) about 166 - 166.5 cm M1 A1

(iii) about 162 cm M1 A1

(iv) 25% M1 A1 *(12 marks)*

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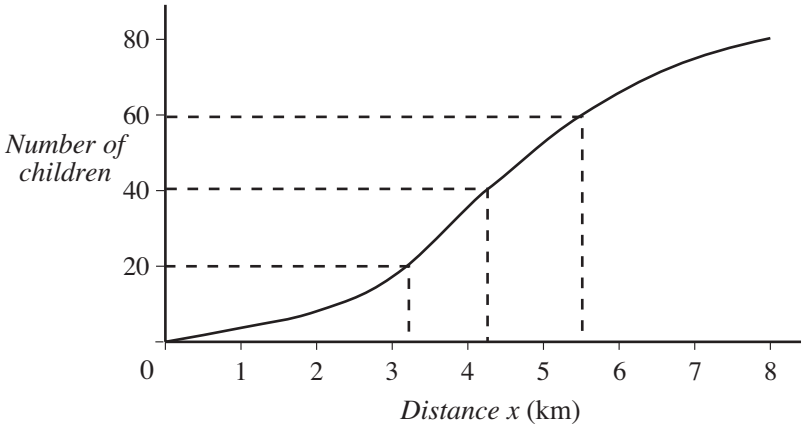
ANSWERS

3. (a) $A = 14,\ B = 18$ (for both correct) B1

(b)



B2

(c) (i) 4.2 km

B1

(ii) 5.5 – 3.2 = 2.3 km

M1 A1

(d) $\frac{44}{80} = \frac{11}{20}$ B1 (*7 marks*)

4. (a) Curve through correct points. (one error - B2) B3

(b) (i) 350 (construction) M1 A1

(ii) 450 – 240 = 210 M1 A1

(iii) 20 B1

(iv) 9 B2 *(10 marks)*

(TOTAL MARKS: 39)