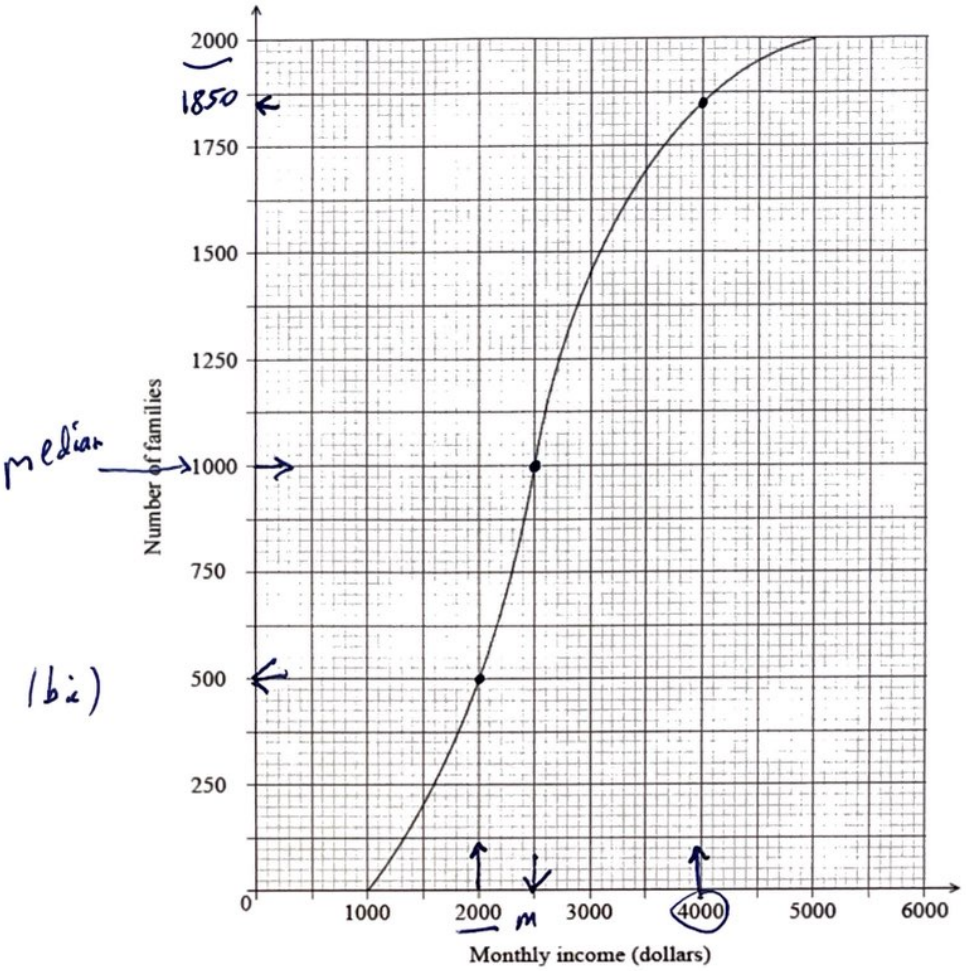
Solution

3.5 Cumulative Distributions

1a. The following cumulative frequency graph shows the monthly income, I dollars, of 2000 families.



(1bi)

Find the median monthly income. *[2 marks]*

$2500

1b. *[4 marks]*

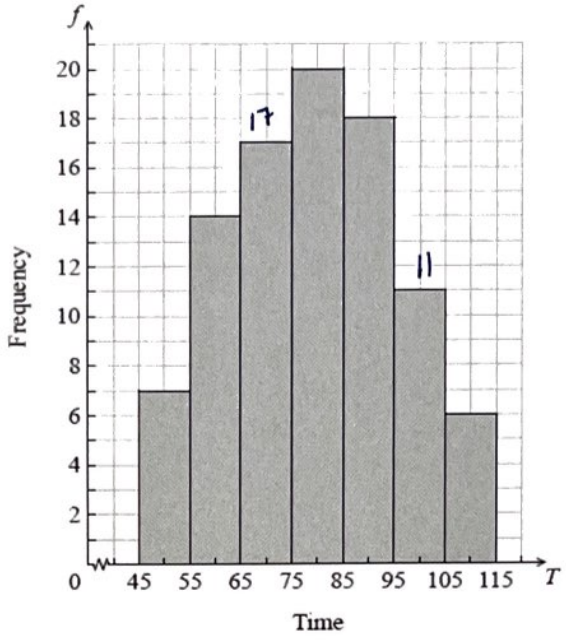
(i) Write down the number of families who have a monthly income of 2000 dollars or less.

500

(ii) Find the number of families who have a monthly income of more than 4000 dollars.

$N(x > 4000) = 2000 - 1850$
$= 150$

2a. The histogram below shows the time T seconds taken by 93 children to solve a puzzle. *[3 marks]*



The following is the frequency distribution for T.

Time	$45 \le T < 55$	$55 \le T < 65$	$65 \le T < 75$	$75 \le T < 85$	$85 \le T < 95$	$95 \le T < 105$	$105 \le T < 115$
Frequency	7	14	p	20	18	q	6

cum 7 21 38 58 76 87 93

(i) Write down the value of p and of q.

$p = 17$ $q = 11$

(ii) Write down the median class.

$N(\text{median}) = \frac{1}{2}(93+1) = 47^{\text{th}}$ Student $75 \le T < 85$

2b. A child is selected at random. Find the probability that the child takes less than 95 seconds to solve the puzzle. *[2 marks]*

$\frac{76}{93}$

2c. Consider the class interval $45 \le T < 55$.

(i) Write down the interval width.

10

(ii) Write down the mid-interval value. *[2 marks]*

50

2d. Hence find an estimate for the

(i) mean;

$\bar{x} = \frac{1}{93}(7 \cdot 50 + 14 \cdot 60 + 17 \cdot 70 + 20 \cdot 80 + 18 \cdot 90 + 11 \cdot 100 + 6 \cdot 110)$

(ii) standard deviation. *[4 marks]*

$\approx 79.1398\ldots \approx 79.1$

$\sigma \approx 16.4386\ldots \approx 16.4$