Cambridge International AS & A Level

Mathematics 9709/52

Paper 5 Probability & Statistics 1 **May/June 2025**

Question No (5)

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Question No (5)

The times taken, t minutes, by 300 students to travel to Hollowton College are recorded. The results are summarized in the table below.

Time (t minutes)	$t \leq 10$	$t \leq 20$	$t \leq 30$	$t \leq 40$	$t \leq 60$	$t \leq 90$
Cumulative frequency	34	86	142	208	265	300

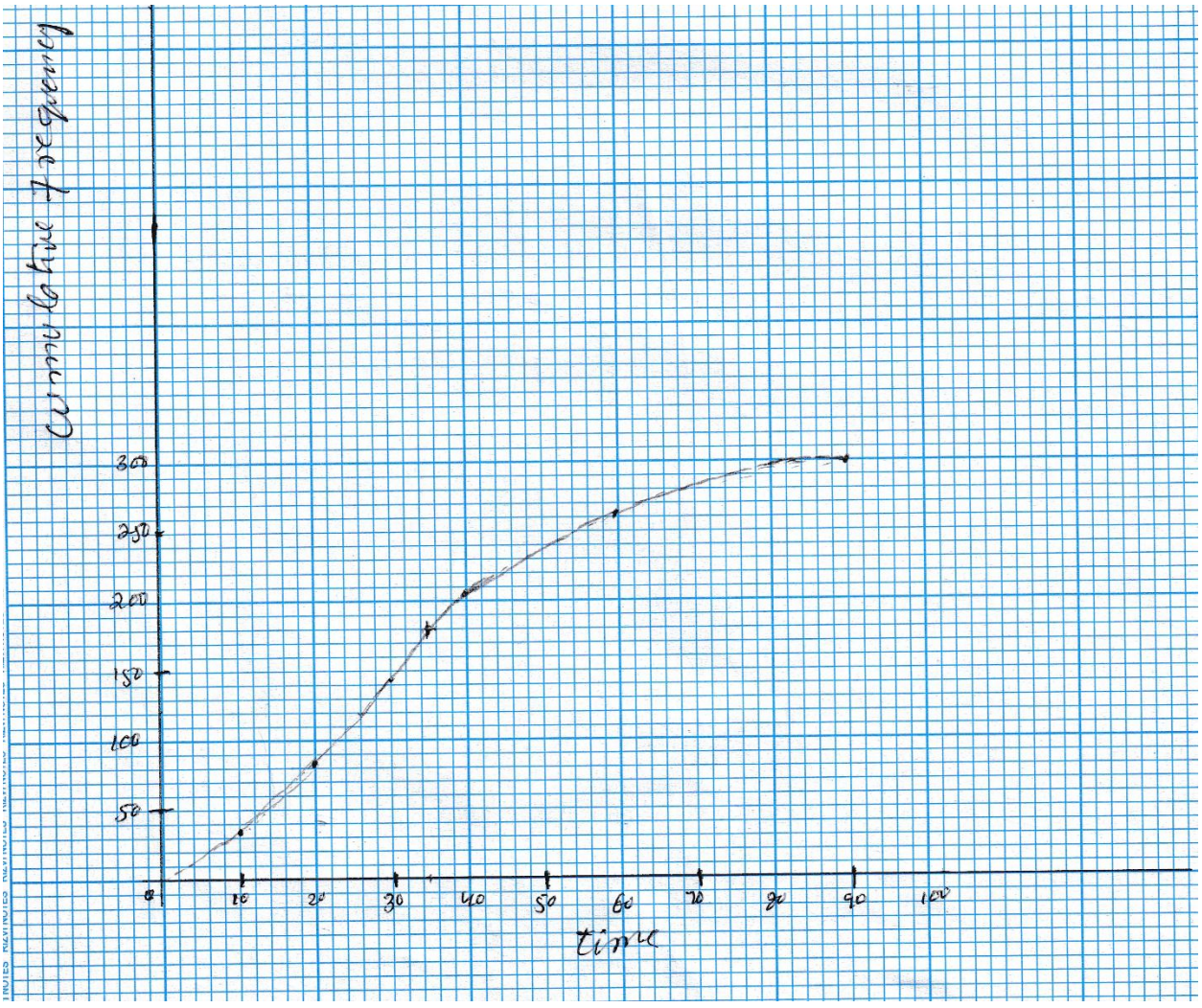
(a) On the grid, draw a cumulative frequency graph to illustrate this information.

(b) 120 students take more than k minutes to travel to college. Use your graph to estimate the value of k.

(c) Calculate estimates of the mean and standard deviation of the times taken to travel to college by the 300 students.

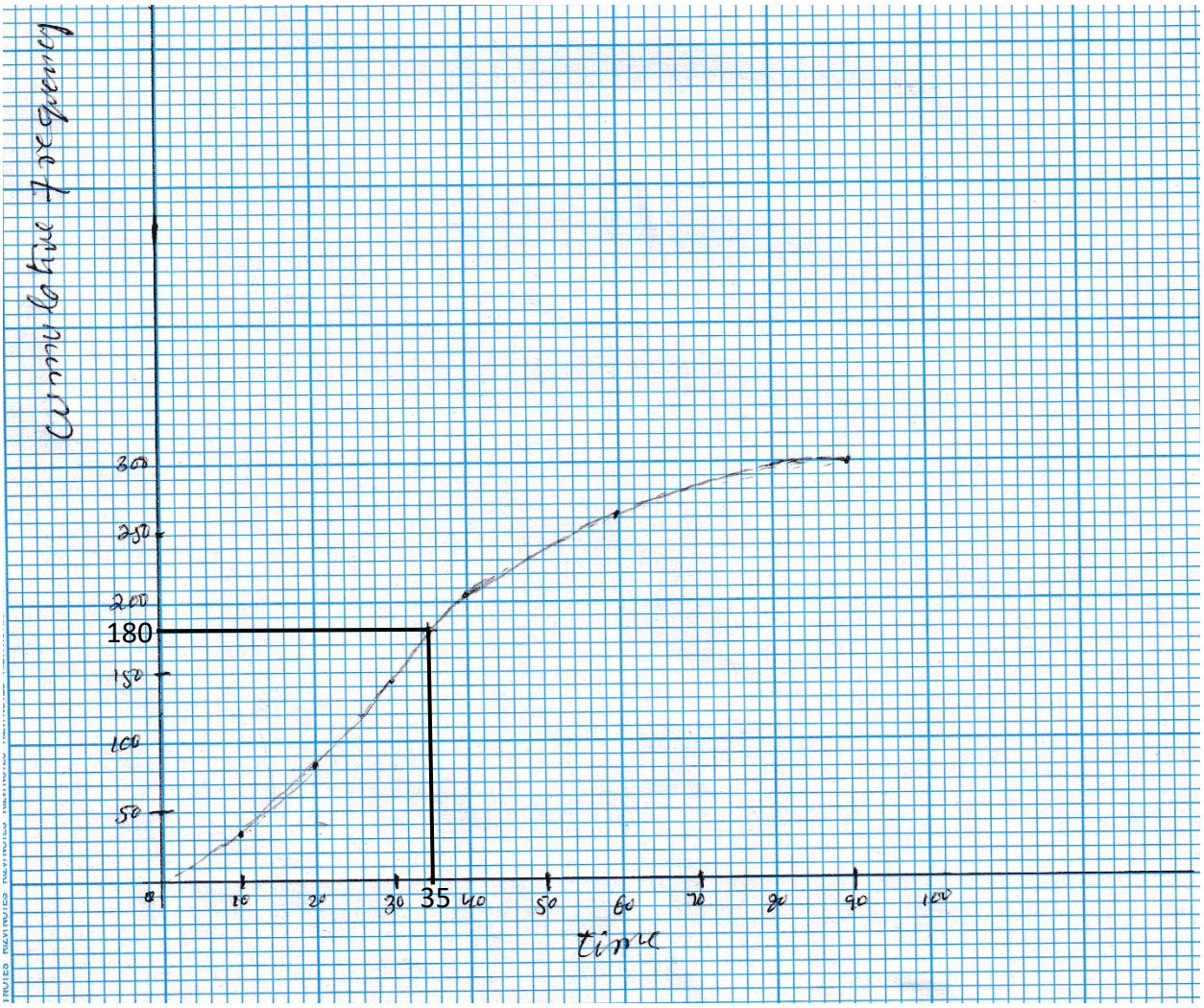
Solution:

(a)



(b)

As 120 students takes more than K minutes, remaining students are
300 − 120 = 180
draw a line at 180 which map on x-axis (minutes) at 35 minu



(c)

Time (t minutes)	$t \le 10$	$t \le 20$	$t \le 30$	$t \le 40$	$t \le 60$	$t \le 90$
cumulative frequency	34	86	142	208	265	300
frequency (f)	34	86-34=52	142-86=56	208-142=66	265-208=57	300-265=35
midpoints of time (t)	$\frac{0+10}{2}=5$	$\frac{20+10}{2}=15$	$\frac{30+20}{2}=25$	$\frac{40+30}{2}=35$	$\frac{60+40}{2}=50$	$\frac{90+60}{2}=75$

$$\text{mean} = \frac{\Sigma ft}{n}$$

$$= \frac{34\times5 + 52\times15 + 56\times25 + 66\times35 + 57\times50 + 35\times75}{300}$$

$$\text{Mean} = \frac{170+780+1400+2310+2850+2625}{300}$$

$$\text{mean} = \frac{10135}{300}$$

$$\text{mean} = 33.78$$

$$\text{variance} = \sum_i \frac{f_i t_i^2}{300} - (\text{Mean})^2$$

$$= \frac{34\times5^2 + 52\times15^2 + 56\times25^2 + 66\times35^2 + 57\times50^2 + 35\times75^2}{300} - (33.78)^2$$

$$= \frac{850 + 11700 + 35000 + 80850 + 142500 + 196875}{300} - 1141.0884$$

$$= 1559.25 - 1141.0884$$

$$= 418$$

$$\text{S.D} = \sigma = \sqrt{418} = 20.4$$