Question 10 **(7 marks)**

A group of researchers conducted a study into the number of siblings of adult Australian citizens. They surveyed a total of 200 participants and recorded the number of siblings, X, of each participant.

A few days later the lead researcher discovered that the survey data had been misplaced. Fortunately, one of the research assistants had been doing some rough calculations on a whiteboard and the lead researcher was able to recover the following information about the probability distribution for X and the mean μ.

x	0	1	2	3
$P(X=x)$	0.2	a	b	0.1

$$\mu = 1.3$$

The letters a and b have been used to denote unknown probabilities.

(a) (i) Write **two** independent equations for a and b. (2 marks)

(ii) Hence solve for the unknown probabilities. (2 marks)

Later that day the research assistant found the complete probability distribution in their records and discovered that they had made an error in their original calculation of the mean. The correct probability distribution is given in the table below.

x	0	1	2	3
$P(X=x)$	0.2	0.3	0.4	0.1

(b) (i) Given that there were 200 participants in the study, complete the table below to show the number of participants N with 0, 1, 2 and 3 siblings. (1 mark)

x	0	1	2	3
$P(X=x)$	0.2	0.3	0.4	0.1
N	40			

(ii) Determine the correct mean and standard deviation of the number of siblings X. (2 marks)