2. In a large calculus class of 200 students, 40 earn an A on a text, 60 earn a B, and the remaining students earn a C, D, or F. Suppose a random sample of size 25 is taken.

(a) Find the probability that five students in the sample earned an A on the exam.

(b) Find the marginal probability function for the variable
A: number of students who earned an A on the exam.

(c) Write down a formula that computes the probability of the event
E: Between 2 and 5 students in the sample earn a B on the exam, given that 10 students in the sample earned an A.

(d) Give the bivariate probability function for (A, B).

Use hypergeometric random variable or.

a) $P(A=5) = \dfrac{\binom{40}{5}\binom{160}{20}}{\binom{200}{25}}$

b) $p_A(a) = \dfrac{\binom{40}{a}\binom{160}{25-a}}{\binom{200}{25}}$ $\quad a = 0, 1, \ldots, 25$

c) $P(E) = P(2 \le B \le 5 \mid A = 10) = \dfrac{P(A=10,\ 2 \le B \le 5,\ C = 15-B)}{p_A(10)}$

$$= \dfrac{\sum_{b=2}^{5} \dfrac{\binom{40}{10}\binom{60}{b}\binom{100}{15-b}}{\binom{200}{25}}}{\dfrac{\binom{40}{10}\binom{160}{15}}{\binom{200}{25}}}$$

$$= \dfrac{\sum_{b=2}^{5} \binom{60}{b}\binom{100}{15-b}}{\binom{160}{15}}$$

d) $p(a,b) = \dfrac{\binom{40}{a}\binom{60}{b}\binom{100}{25-a-b}}{\binom{200}{25}}$, $\quad 0 \le a+b \le 25$ $\quad$ Not independent.