Assignment 2

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Download all python codes from

https://github.com/ayush−2321/AI1103/tree/main/assignment2

and latex-tikz codes from

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PROBLEM 8 (GATE EE 2018)

A class of twelve children has two more boys than girls. A group of three children are randomly picked from this class to accompany the teacher on the field trip. What is the probability that the group accompanying the teacher contains more girls than boys.

(a) 0

(b) $\frac{325}{864}$

(c) $\frac{525}{864}$

(d) $\frac{5}{12}$

1 SOLUTION

Let $X \in \{0, 3\}$ be a discrete random variable which denotes the number of girls in the group of 3.
Since, there are two more boys than girls:

$$\text{Total number of boys}(B) = 7$$
$$\text{Total number of girls}(G) = 5$$
$$\Pr(X = c) = \frac{{}^{5}\mathrm{C}_{c} \times {}^{7}\mathrm{C}_{3-c}}{{}^{12}\mathrm{C}_{3}} \tag{1.0.1}$$

X	0	1	2	3
P(X)	$\frac{{}^{5}\mathrm{C}_{0}\times{}^{7}\mathrm{C}_{3}}{{}^{12}\mathrm{C}_{3}}$	$\frac{{}^{5}\mathrm{C}_{1}\times{}^{7}\mathrm{C}_{2}}{{}^{12}\mathrm{C}_{3}}$	$\frac{{}^{5}\mathrm{C}_{2}\times{}^{7}\mathrm{C}_{1}}{{}^{12}\mathrm{C}_{3}}$	$\frac{{}^{5}\mathrm{C}_{3}\times{}^{7}\mathrm{C}_{0}}{{}^{12}\mathrm{C}_{3}}$

TABLE 4: Probabilities of each case

For number of girls more than boys following cases are possible

1) X=3

$$\Pr(X = 3) = \frac{{}^{5}\mathrm{C}_{3}}{{}^{12}\mathrm{C}_{3}}, \text{using (1.0.1)}$$

2) X=2

$$\Pr(X = 2) = \frac{{}^{5}\mathrm{C}_{2} \times {}^{7}\mathrm{C}_{1}}{{}^{12}\mathrm{C}_{3}}, \text{using (1.0.1)}$$

$$\text{So, required probability } = \frac{{}^{5}\mathrm{C}_{2} \times {}^{7}\mathrm{C}_{1}}{{}^{12}\mathrm{C}_{3}} + \frac{{}^{5}\mathrm{C}_{3}}{{}^{12}\mathrm{C}_{3}} = \frac{4}{11}$$