

Bago University

Department of Mathematics

Second Semester Examination, September 2019

Third Year (B.Sc)

Math-3110

**(Mathematics Specialization
Answer All Questions.**

**Probability and Statistics
Time Allowed: (3) Hours**

1(a) Bev can either take a course in computers or in chemistry. If Bev takes the computer course, then she will receive an A grade with probability $\frac{1}{2}$, while if she takes the chemistry course then she will receive an A grade with probability $\frac{1}{3}$. Bev decides to base her decision on the flip of a fair coin. What is the probability that Bev will get an A in chemistry ?

(b) Assume that each child who is born is equally likely to be a boy or a girl. If a family has two children, what is the probability that both are girls given that
(i) the eldest is a girl, (ii) at least one is the girl?

2(a) Suppose we toss two fair dice. Let E_1 denote the event that the sum of the dice is six, Let E_2 denote the event that the sum of the dice equals seven and F denote the event that the first die equals four respectively. Determine the independent of the events E_1 , E_2 and F .

(b) Show that $(E \cup F)^c = E^c F^c$.

3(a) If X is uniformly distributed over $(0,10)$, calculate the probability that

(i) $X < 3$, (ii) $X > 7$, (iii) $1 < X < 6$.

(b) Calculate the expectation of a geometric random variable having parameter p .

4(a) Calculate $E[X]$ when X is binomially distributed with parameters n and p .

(b) If a and b are constants, prove that $E[aX + b] = aE[X] + b$.

5(a) Let the probability density of X be given by

$$f(x) = \begin{cases} c(4x - 2x^2), & 0 < x < 2. \\ 0, & \text{otherwise} \end{cases}$$

(i) What is the value of c ?

(ii) Find $P\left\{\frac{1}{2} < X < \frac{3}{2}\right\}$.

P.T.O.

(b) Find the standard deviation of the set of the numbers 12, 6, 7, 3, 15, 10, 18, 5.

6(a) Find the mean deviation of the heights of the 100 male students at XYZ University.

Heights of the 100 Male Students at XYZ University

Height (inches)	Number of Students
60-62	5
63-65	18
66-68	42
69-71	27
72-74	8
Total	100

(b) Find the standard deviation of the heights of the students at XYZ University using

the formula $s = \sqrt{\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N}\right)^2}$.

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