National University
of Computer & Emerging Sciences Peshawar Campus

Program: BS (CS & SE)
Semester: Spring-2022
Time Allowed: **01 hour**
Course: Probability & Statistics (MT2005)

Examination: **SESSIONAL-I**
Total Marks: 40, Weightage: **15**
Date: 17 / 03 / 2022
Instructors: Osama Sohrab & Askar Ali

NOTE: ATTEMPT ALL PROBLEMS.

Problem # 01	**Marks =5*3=15**

(a) A new computer virus can enter the system through e-mail or through the internet. There is a 30% chance of receiving this virus through e-mail. There is a 40% chance of receiving it through the internet. Also, the virus enters the system simultaneously through e-mail and the internet with probability 0.15. What is the probability that the virus enter the system?

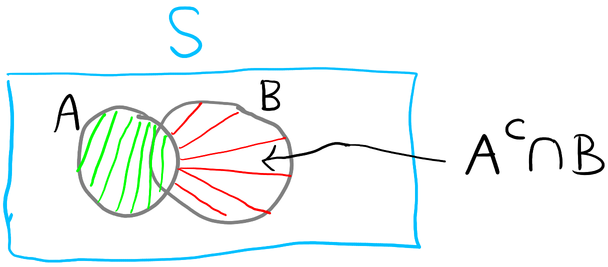
Sol: Let E is the event that the virus enter through the email & I is the event that the virus enter through internet then $P(E) = \frac{30}{100}$, $P(I) = \frac{40}{100}$, & $P(EI) = 0.15$.

Now the probability that the virus enter the system

$= P(E \cup I) = P(E) + P(I) - P(EI)$

$= 30/100 + 40/100 - 0.15 = 0.55$ Ans

(b) Use venn diagram and axioms of probability to show that $P(A \cup B) = P(A) + P(A^C \cap B)$.



From venn diagram we see that

$A \cup B = A \cup (A^c \cap B)$

$\Rightarrow P(A \cup B) = P[A \cup (A^c \cap B)]$

$\Rightarrow P(A \cup B) = P(A) + P(A^c \cap B)$ [By third Axiom $\because A$ & $A^c \cap B$ are disjoint

proved

(c) For what purpose we use the sample correlation coefficient ? Briefly explain.

Sol We use sample correlation coefficient to measure linearcy in our data. If $r = \pm 1$ this mean that there is a perfect linear relation b/w dependent & independent variable. The value of r is always b/w $-1 \le r \le 1$.

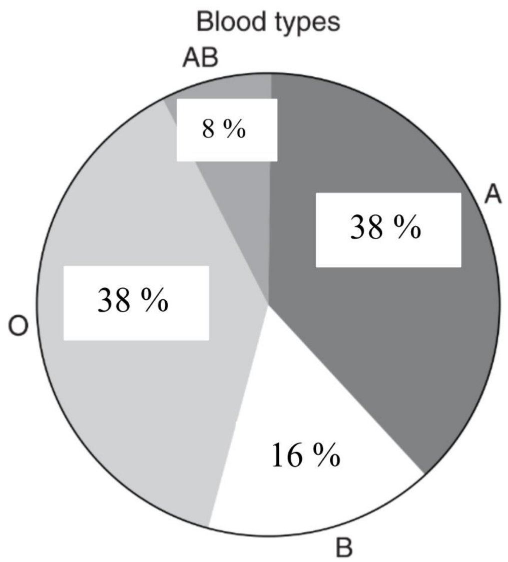
Problem # 02 **Marks =5*2=10**

(a) Sketch a pie chart to represent the following blood types of 50 volunteers at a blood plasma donation clinic:

O A O AB A A O O B A O A AB B O O O A B A A O A A O

B A O AB A O O A B A A A O B O O A O A B O AB A O B

Sol:



(b) A class in probability theory consists of 30 boys and 10 girls. An exam is given and the students are ranked according to their performance. If no two students obtain the same score and all rankings are considered equally likely then what is the probability that boys will receive the top 3 positions?

Sol Method 1

Probability that boys will recieve top 3 positions

$$= \frac{30 \times 29 \times 28}{40 \times 39 \times 38} = 0.4109 \quad \text{Ans}$$

Method 2

OR

it is given by $\frac{30 \times 29 \times 28 \times 37!}{40!} = 0.4109$

same as above

Problem # 03	**Marks =5+10=15**

(a) If A, B and D are three events such that $P(A \cup B \cup D) = 0.7$. Find $P(A^C \cap B^C \cap D^C)$.

Sol/

$$P(A^c \cap B^c \cap D^c) = P[(A \cup B \cup D)^c]$$ [By Demorgan's Law]

$$= 1 - P(A \cup B \cup D)$$ [$\because P(A^c) = 1 - P(A)$

$$= 1 - 0.7$$

$$= 0.3 \quad \text{Ans}$$

(b) Compute the sample standard deviation and interquartile range of the following data:

28.5	29.3	26.6	31.2	32.1
31.4	30.1	27.0	28.5	27.6
28.9	29.4	30.5	31.2	29.4
29.3	30.1	28.8	27.9	30.4
32.3	30.4	25.8	27.1	26.9

Sol We know that $S = \sqrt{\dfrac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}} = \sqrt{\dfrac{\sum_{i=1}^{n} x_i^2 - n\bar{x}^2}{n-1}}$

Here

$n = 25$, $\bar{x} = 29.2$, $\sum_{i=1}^{25} x_i^2 = 21432.4$

So $S = \sqrt{\dfrac{21432.4 - 25(29.2^2)}{24}} = \boxed{2.20}$ Ans

Next $IQR = Q_3 - Q_1$

For Q_1, $P = 1/4$, $np = 25 \cdot 1/4 = 6.25$, so $\boxed{Q_1 = 27.9}$ (7th value)

For Q_3, $P = 3/4$, $np = 25 \cdot 3/4$

$= 18.75$

So $\boxed{Q_3 = 30.4}$ (19th value)

So $IQR = Q_3 - Q_1 = 30.4 - 27.9$

$\Rightarrow IQR = 2.5$ Ans

THE END