

MM217 : Assignment - 3

1. An urn contains 8 orange balls, 5 white balls and 7 green balls. Three balls are drawn with replacement. Probability that the balls will be drawn in order of orange, white and green is : _____
2. Industrial safety is of utmost importance. It is observed that there are two primary factors that may cause an accident, they are human and unsafe conditions. It is found that during day shift the chances of human error is 27% and chances of unsafe condition is 6%, during evening shift chances of human error is 35% and chances of unsafe conditions is 5% while in the night shift the chances of human error is 25% and chances of unsafe condition is 2%. If an accident occurs then probability that it has occurred during day shift is _____.
3. A dart board has radius of 6 inches. Three concentric circles have been drawn with equal increase in radii from the centre of the dartboard. What is the probability that the dart thrown will fall within middle circle?
4. If A and B are two independent events, then show that $P(A^c \cap B^c) = P(A^c)P(B^c)$
5. A production unit generates cylindrical products. The products are inspected and classified as "Acceptable", "Not Acceptable" and "Needs re-inspection". Which of the following are NOT random variable defined based on this system?
 - a. X belongs to set "Acceptable", "Not Acceptable", "Needs re-inspection"
 - b. $X(\text{Acceptable}) = 1$, $X(\text{Not Acceptable}) = 0$ and $X(\text{Needs re-inspection}) = -1$
 - c. $X(\text{Acceptable}) = A$, $X(\text{Not Acceptable}) = NA$ and $X(\text{Needs re-inspection}) = NR$
 - d. $X(\text{Acceptable}) = 1$, $X(\text{Not Acceptable}) = -1$ and $X(\text{Needs re-inspection}) = 0$
 - e. $X(\text{Acceptable}) = 1$, $X(\text{Not Acceptable}) = 2$ and $X(\text{Needs re-inspection}) = 3$

- f. $X(\text{Acceptable}) = A$, $X(\text{Not Acceptable}) = B$ and $X(\text{Needs re-inspection}) = C$
- g. $X(\text{Acceptable}) = \text{Yes}$, $X(\text{Not Acceptable}) = \text{NO}$ and $X(\text{Needs re-inspection}) = \text{Don't Know}$

6. In a certain powder metallurgical product, it is seen that the density function of particle size distribution is of the form

$$f_X(x) = \frac{k}{x^5}$$

Where k is a constant. In order for this function to be pdf, what should be the value of k ?

7. Two unbiased coins are tossed. The head is assigned value 1, and tail, value 2. Let X denote the result of the first coin and Y denote the value larger of the two coins. What is $E[2X+4Y]$?
8. Life of a product in terms of property X and property Y has joint density function as defined by:

$$f(x, y) = \begin{cases} 2e^{-x}e^{-2y} & 0 < x < \infty \text{ and } 0 < y < \infty \\ 1 & \text{otherwise} \end{cases}$$

Then, what is (i) $P(X>1, Y>1)$, (ii) X and (iii) Y ?

9. Let $f(x) = 4e^{-4x} \forall x > 0$, then the upper limit of $P[X > 10]$ can be given by _____ and is equal to _____.
10. Let $f(x) = 4e^{-4x} \forall x > 0$, then what is $\text{Var}(X)$?