# PROBABILITY

## DIVYA SAI - FWC22094

**16.4.10** [1] The random variable $X$ has a probability distribution $\Pr(X)$ of the following form.Where $k$ is some number:

$$\Pr(X) = \begin{cases} k, & \text{x=0} \\ 2k, & \text{x=1} \\ 3k, & \text{x=2} \\ 0, & \text{otherwise} \end{cases} \tag{16.4.10.1}$$

a) Determine the value of $k$

b) Find $\Pr(X < 2)$,$\Pr(X \leq 2)$,$\Pr(X \geq 2)$

**Solution:**

we know that, Sum of Probabilities $= 1$.

$$k + 2k + 3k = 1 \tag{16.4.10.2}$$
$$6k = 1 \tag{16.4.10.3}$$
$$k = \frac{1}{6} \tag{16.4.10.4}$$

Using CDF,

$$F_X(k) = \begin{cases} 0, & \text{x<0} \\ \frac{1}{6}, & 0 \leq \text{x} < 1 \\ \frac{1}{2}, & 1 \leq \text{x} < 2 \\ 1, & \text{x} \geq 2 \end{cases} \tag{16.4.10.5}$$

**(a)** $\Pr(X < 2)$

$$\Pr(0 < X \leq 1) = F(1) \tag{16.4.1.6}$$
$$= \frac{1}{2} \tag{16.4.1.7}$$

**(a)** $\Pr(X \leq 2)$

$$\Pr(X \leq 2) = F(2) \tag{16.4.1.8}$$
$$= 1 \tag{16.4.1.9}$$

---

[1]Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)

**(a)** $\Pr\left(X \geq 2\right)$

$$\begin{aligned}
\Pr\left(X \geq 2\right) &= 1 - \Pr\left(X < 2\right) & (16.4.1.10)\\
&= 1 - F(1) & (16.4.1.11)\\
&= 1 - \frac{1}{2} & (16.4.1.12)\\
&= \frac{1}{2} & (16.4.1.13)
\end{aligned}$$