221+155

__/__/____

26/09/22 **PROBABILITY & STATISTICS**

1. In probability distribution, the sum of all probabilities of $x = 1$

here,

$$k + 8k + 3k + k^2 = 1$$

$$\Rightarrow k^2 + 12k = 1$$

$$k^2 + 12k - 1 = 0 \quad -(1)$$

Solving the quadratic equation (1) we have,

$$k = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-12 \pm \sqrt{(12)^2 - 4(-1)(1)}}{2(1)}$$

$$= \frac{-12 \pm 2\sqrt{37}}{2} = -6 \pm \sqrt{37}$$

Since, the value of probability can't be negative ∴

$$k = -6 + \sqrt{37}$$

$$k = 0.0828$$

X	0	1	2	3
P(X)	0.0828	0.6624	0.2484	0.0069

To find the mean:

$$\bar{x} = \sum_{i=0}^{3} x_i f_i(x)$$

$$= (0 \times 0.0828) + (1 \times 0.6624) + (2 \times 0.2484) + (3 \times 0.0069)$$

$$\bar{x} = 1.1799$$

2. If x is binomal with ~~mean~~ $(4, 1/3)$ we find $P(x<3)$ & $P(2<x<5)$

$\Rightarrow$ $B(4, 1/2) \Rightarrow n=4, \; p = 1/3$ & $(1-p) = 2/3$

Hence, the probability distribution is.

x	0	1	2	3	4
$P(x)$	${}^4C_0 (1/3)^0 (2/3)^4$	${}^4C_1 (1/3)^1 (2/3)^3$	${}^4C_2 (1/3)^2 (2/3)^2$	${}^4C_3 (1/3)^3 (2/3)^1$	${}^4C_4 (1/3)^4$

x	0	1	2	3	4
$P(x)$	0.1975	0.3951	0.2963	0.0988	0.0123

$P(x<3) = P(x=0) + P(x=1) + P(x=2) = 0.8889$

$P(2<x<5) = P(x=3) + P(x=4)$
$= 0.0988 + 0.0123$
$= 0.1111$

27/09/22

1. If x is normal with mean 5 & variance 9, then find $P(x>3)$ & $(P\ 6>x>3)$

⇒ In this case,

$$\mu = 5, \quad \sigma = \sqrt{9} = 3$$

for any particular value of x

$$z = \frac{x-\mu}{\sigma}$$

for $x<3$

$$\Rightarrow x = 3, \ \mu = 5, \ \sigma = 3$$

Thus, $z = \frac{3-5}{3} = -0.6667$

Using a table of standard normal probability.

$$P(0.6667) = 0.2514$$

$$P(x<3) = 1 - P(x>3) = 0.7486$$

for $P(3<x<6)$

$$P(3<x) = 0.2514$$

$$P(x<6) = 1 - P(x>6)$$

$$= 1 - \phi(0.333)$$

$$= 0.3707$$

$$P(3<x<6) = P(x<6) - P(3<x)$$

$$= 0.3707 - 0.2514$$

$$= 0.1193$$

2. If $\bar{x}$ is normal with mean 10 & variance 100, then find $P(x<15)$ & $P(13<x<14)$.

$\Rightarrow$

In this case,

$$\mu = 10, \quad \sigma = \sqrt{100} = 10$$

for any x,

$$z = \frac{x-\mu}{\sigma}$$

for $P(x<15)$

$\Rightarrow x = 15, \quad \mu = 10, \sigma = 10$

$$z = \frac{15-10}{10} = \frac{1}{2} = 0.5$$

Using the table of standard normal probability; $\phi = 0.6915$

$P(x<15) = 0.6915$

for $P(13<x<14)$,

$$P(13<x) = 1 - \phi\left(\frac{13-10}{10}\right)$$

$$= 1 - \phi(0.3)$$

$$= 1 - 0.6179 = 0.3821$$

$$P(x<14) = \phi\left(\frac{14-10}{10}\right) = 0.6554$$

$$P(13<x<14) = P(x<14) - P(13<x)$$

$$= 0.6554 - 0.3821$$

$$= 0.2783$$