

Assignment 5

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Download python code from

<https://github.com/v-samyuktha/AI1103/blob/Assignment-5/Assignment-5.py>

and latex-tikz code from

<https://github.com/v-samyuktha/AI1103/blob/Assignment-5/Assignment-5.tex>

2.2 OPTION 2

$$\Pr(X = 3) = {}^{11}C_3 \times \left(\frac{2}{3}\right)^{11} \times \left(\frac{1}{2}\right)^3 \quad (2.2.1)$$

$$= \frac{330}{16} \times \left(\frac{2}{3}\right)^{11} \quad (2.2.2)$$

2.3 OPTION 3

$$\Pr(X = 4) = {}^{11}C_4 \times \left(\frac{2}{3}\right)^{11} \times \left(\frac{1}{2}\right)^4 \quad (2.3.1)$$

$$= \frac{330}{16} \times \left(\frac{2}{3}\right)^{11} \quad (2.3.2)$$

2.4 OPTION 4

$$\Pr(X = 5) = {}^{11}C_5 \times \left(\frac{2}{3}\right)^{11} \times \left(\frac{1}{2}\right)^5 \quad (2.4.1)$$

$$= \frac{231}{16} \times \left(\frac{2}{3}\right)^{11} \quad (2.4.2)$$

1 QUESTION

Let X be a binomial random variable with parameters $(11, \frac{1}{3})$. At which value(s) of k is $\Pr(X = k)$ maximized?

- 1) $k=2$
- 2) $k=3$
- 3) $k=4$
- 4) $k=5$

2 SOLUTION

The binomial distribution is given by:

$$\Pr(X = k) = {}^nC_k \times p^k \times q^{n-k} \quad (2.0.1)$$

We are given $n = 11$, $p = \frac{1}{3}$ and hence $q = \frac{2}{3}$

$$\Pr(X = k) = {}^{11}C_k \times \left(\frac{1}{3}\right)^k \times \left(\frac{2}{3}\right)^{11-k} \quad (2.0.2)$$

$$= {}^{11}C_k \times \left(\frac{2}{3}\right)^{11} \times \left(\frac{1}{2}\right)^k \quad (2.0.3)$$

2.1 OPTION 1

$$\Pr(X = 2) = {}^{11}C_2 \times \left(\frac{2}{3}\right)^{11} \times \left(\frac{1}{2}\right)^2 \quad (2.1.1)$$

$$= \frac{220}{16} \times \left(\frac{2}{3}\right)^{11} \quad (2.1.2)$$

Comparing equations (2.1.2), (2.2.2), (2.3.2) and (2.4.2), we see that $\Pr(X = k)$ is maximized at $k = 3$ and $k = 4$.

Hence, options 2 and 3 are correct.

