

1. (a) Find  $EX$

Given:

$$P(X=n) = \begin{cases} 0.3 & n = -2 \\ 0.6 & n = -1 \\ 0.1 & n = 12 \\ 0 & \text{otherwise} \end{cases}$$

$$E(n) = \sum n_i \cdot P(n_i)$$

$$\Rightarrow (-2 \times 0.3) + (-1 \times 0.6) + (12 \times 0.1)$$

$$\Rightarrow -0.6 - 0.6 + 1.2$$

$$E(n) = 0$$

(b)  $\text{Var}(n)$

$$V(n) = E(X^2) - [E(X)]^2$$

$$E(X^2) = \sum n_i^2 \cdot P(n_i)$$

$$\Rightarrow (-2^2 \times 0.3) + (-1^2 \times 0.6) + (12^2 \times 0.1)$$

$$\Rightarrow 1.2 + 0.6 + 14.4$$

$$E(X^2) = 16.2$$

$$V(X) = E(X^2) - [E(X)]^2 = 16.2$$

$$(c) E(\bar{X})$$

$E(\bar{X})$  is equal to  $E(X)$

$$\therefore, E(\bar{X}) = 0$$

$$(d) \text{Var}(\bar{X})$$

$$\Rightarrow \frac{\sigma^2}{n}$$

We know  $n=3$  because there are possible values  $x$  can take.

$$V(\bar{X}) = 5.4$$

$$\sigma = \sqrt{5.4} = 2.323$$

(e) Please refer to the markdown file

2. (a) Before we can check whether the distribution is normal or not, let's calculate the IQR.

IQR is given by  $1.349 \times \text{standard deviation}$

Given variance = 565.2476

$$\sigma = \sqrt{565.2476} = 23.77494$$

$$\begin{aligned} \text{IQR} &= 1.349 \times \text{sd} = 1.349 \times 23.77 \\ &= 32.07 \end{aligned}$$

Now let's also calculate the IQR from the summary information in the code:

$$Q_3 = 7.25$$

$$Q_1 = 0.00$$

$$\text{IQR} = Q_3 - Q_1 = 7.25$$

We have two points to examine

- 1 The given mean and median are not equal but in a normal distribution they are. mean = 9.06 and median = 1

Mean > Median, so the distribution is positively skewed.

2. The IQR 32.07239 and calculated IQR 7.25 are also not equal. Hence, the distribution cannot be normal.

For Questions 2b and 2c please refer to the R markdown file.