

Statistical Methods for CS

Weekly Questions Week 4

Q1) (a) $Y=2 \Rightarrow \text{sum of dice} = 2$

\Rightarrow Only true for the outcome

$\{(1,1)\}$

(b) $Y=3 \Rightarrow \text{sum of dice} = 3$

\Rightarrow Only true for outcomes

$\{(1,2), (2,1)\}$

(c) $Y=4 \Rightarrow \text{sum of dice} = 4$

\Rightarrow True for outcomes

$\{(1,3), (3,1), (2,2)\}$

(d) $X=1 \Rightarrow 3 \text{ possible outcomes}$

$\Rightarrow 6^2 \text{ possibilities} = 36$

$\Rightarrow \frac{3}{36} =$ 0.083

Q2a) Getting a head = +1
Not getting a head = -1 (tail)

Possibilities of $x \Rightarrow$

- ① Not getting any heads
- ② Getting one head
- ③ Getting two heads
- ④ Getting three heads

$$\left. \begin{array}{l} \textcircled{1} -1 -1 -1 = -3 \\ \textcircled{2} +1 -1 -1 = -1 \\ \textcircled{3} +1 +1 -1 = +1 \\ \textcircled{4} +1 +1 +1 = +3 \end{array} \right\} \Rightarrow$$

Possible values of x
 $= \{-3, -1, 1, 3\}$

(b) Probability of $x = -3$?

\Rightarrow Probability of Flipping no heads

$\Rightarrow 2^3 = 8$ total outcomes

~~$\Rightarrow \frac{1}{8} = 0.125$~~ $\Rightarrow \frac{1}{8}$ for Flipping one head

$= \boxed{0.125}$

(c) Probability of $x = -1$?

\Rightarrow Probability of Flipping one head

3 Possibilities $\Rightarrow +1 -1 -1 = -1$

$-1 +1 -1 = -1$

$-1 -1 +1 = -1$

$\Rightarrow \frac{3}{8} = \boxed{0.375}$

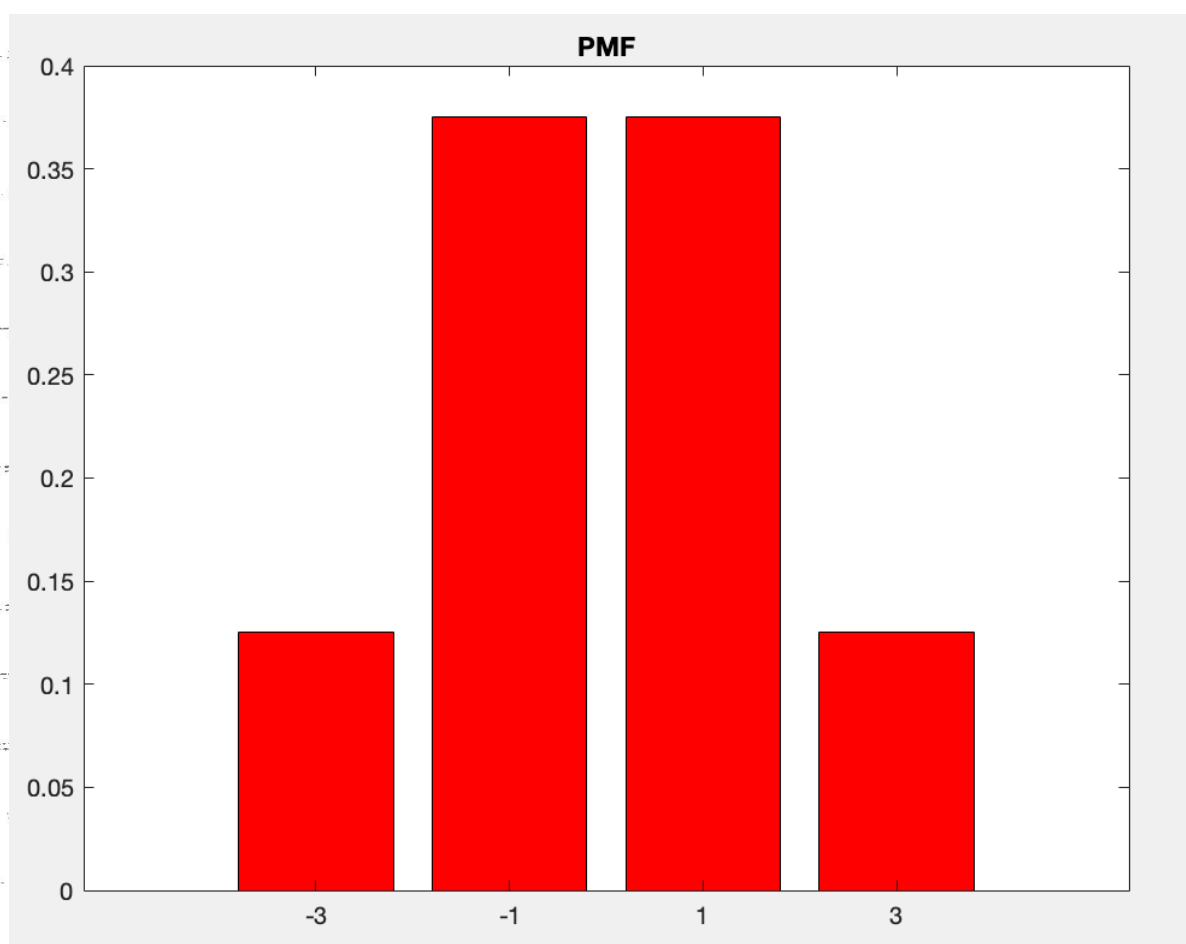
(d) PMF

① $P(X = -3) = 0.125$ ← (From prev. questions)

② $P(X = -1) = 0.375$ ←

③ $P(X = 1) = 0.375$ ($\frac{3}{8} = 0.375$)

④ $P(X = 3) = 0.125$ ($\frac{1}{8} = 0.125$)



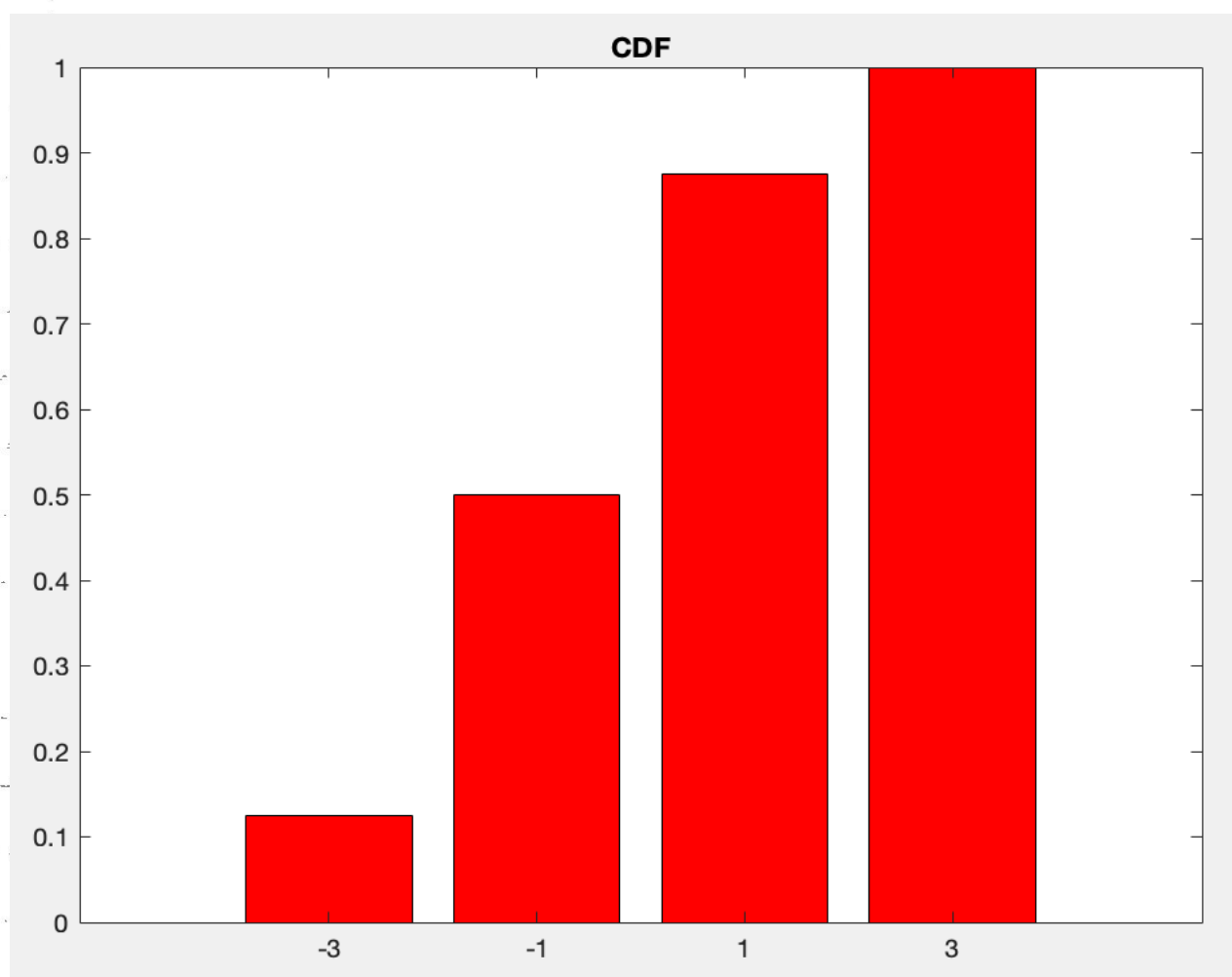
CDF

① $P(X \leq -3) = 0.125$

② $P(X \leq -1) = 0.5$

③ $P(X \leq 1) = 0.875$

④ $P(X \leq 3) = 1$



Q3 (a) Every possible outcome from rolling the dice is either 1 or greater
 $\Rightarrow P(X \geq 1) = 1$

(b) Total possible outcomes = $6^4 = 1296$

$P(X \geq 2)$ is the same as none of the rolls being 1.
 $\Rightarrow 5^4 = 625$

$$\Rightarrow \frac{625}{1296} \approx \boxed{0.4823}$$

(c) ~~XXXX~~

CDF of $P(X \leq k)$ for all values of k ($1 \rightarrow 6$)

$$P(X \leq k) = 1 - P(X \geq k+1)$$

$$\textcircled{1} P(X \leq 1) = 1 - P(X \geq 2) = 1 - \frac{5^4}{6^4} = 0.5177$$

$$\textcircled{2} P(X \leq 2) = 1 - P(X \geq 3) = 1 - \frac{4^4}{6^4} = 0.8025$$

$$\textcircled{3} P(X \leq 3) = 1 - P(X \geq 4) = 1 - \frac{3^4}{6^4} = 0.9375$$

$$\textcircled{4} P(X \leq 4) = 1 - P(X \geq 5) = 1 - \frac{2^4}{6^4} = 0.9877$$

$$\textcircled{5} P(X \leq 5) = 1 - P(X \geq 6) = 1 - \frac{1^4}{6^4} = 0.9992$$

$$\textcircled{6} P(X \leq 6) = 1$$

