# CDF Random Variable

What does CDF stand for? → function.

⇒ Cummulative Distribution function

Given the table of the pmf for a random variable. Fill the table → expected value or mean

⇒ $E[x]$

| x | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| f(x) | .2 | .25 | .15 | .22 | .18 |
| F(x) | 0.2 | 0.45 | 0.6 | 0.82 | 1 |

CDF

$$\boxed{E[x] = \sum x f(x)}$$

✓ $F(x) = P(1) + P(2) \cdots + P(x)$

| x | F(x) |
|---|---|
| 1 | 0.1002 |
| 2 | 0.1268 |
| 3 | 0.6468 |
| 4 | 0.7598 |
| 5 | 0.7717 |
| 6 | 0.9001 |
| 7 | 0.9239 |
| 8 | 0.9496 |
| 9 | 0.9743 |
| 10 | 0.9880 |
| 11 | 0.9905 |
| 12 | 1.000 |

a. P(X = 4)

⇒ $F(4) - F(3)$

b. P (X < 9) ⇒ $P(1) + P(2) \cdots + P(8)$

⇒ $F(8)$

f. P (X ≥ 13)

⇒ 0

c. P (X ≤ 3) ⇒ $P(1) + P(2) + P(3)$

⇒ $F(3)$

g. P (5 < X < 9)

⇒ $F(10) - F(4)$

$F(10) - F(5)$

$\boxed{P(6) + P(7) + P(8)}$

$\boxed{F(8) - P(5)}$

g. P (8 ≤ X < 12)

$F(11) - F(7)$

h. P (7 ≤ X ≤ 11)

$F(11) - F(5)$

I. P (10 < X)

→ $1 - F(10)$

4.5

The CDF of a random variable is given below.

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| $F(x)$ | .08 | .15 | .26 | .43 | .78 | .82 | .88 | 1.00 |

Determine a) $P(X < 5)$ b) $P(X \le 3)$ c) $P(6 \le X)$

$\Rightarrow$ $F(4)$ $F(3)$ $1 - F(5)$

d) $P(2 \le X)$ e) $P(3 \le X < 7)$ f) $P(3 < X \le 7)$ g) $P(X \le 4.5)$

$1 - F(1)$ $F(6) - F(2)$ $F(7) - F(3)$ $F(4)$

20. Determine the value(s) of c that makes the table below a CDF.

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| $F(x)$ | .2 | .25 | .45 | .55 | c | .87 | .95 | 1.00 |

$\Rightarrow$ $P(1)+P(2)+P(3)+P(4)$ $\rightarrow$ ~~0.687~~ ~~0.87~~ $0.86$

$P(5)$ $> 0.0?2$

$0.55 < c < 0.87$

21. Determine the value(s) of c that makes the table below a CDF.

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| $F(x)$ | .1 | .25 | .46 | c | .71 | .72 | .86 | 1.00 |

$\Rightarrow$ $\boxed{0.46 < c < 0.71}$

CDF Notation

$P(7 \le x < 14) = F(13) - F(6)$

$\times\ P(8 \le x) = 1 - F(7)$

$\checkmark\ P(x \ge 8) = 1 - F(7)$

$P(x \le 7) = F(7)$

$P(x = 8) = F(8) - F(7)$

$P(x = (7, 8)) = \Rightarrow P(6 < x < 9) =$

$F(8) - F(6)$

$\downarrow$ $P(1)$ to $P(8)$

$\downarrow$ $P(1)$ to $P(6)$

$P(7) + P(8)$