

### Part 1

$$\text{a) } P_1(x) = \begin{cases} 0 & x < 0 \\ 1 & 0 < x < 1 \\ 0 & x \geq 1 \end{cases} \quad P_2(x) = \begin{cases} 0 & x < -1 \\ 1/2 & -1 \leq x < 0 \\ 8/2 & 0 < x < 1 \\ 0 & x \geq 1 \end{cases}$$

$$\text{b) PDF: } f(x) = \lambda e^{-\lambda x} = 8e^{-8x}, \quad x > 0$$

$\Rightarrow \text{CDF: } F(x) = 1 - e^{-8x}$

Poisson:  $P(X=k) = \frac{8^k e^{-8}}{k!}$

### Part 2

$$\text{a) } E(A) = \sum_x x P(x=a) + \sum_y y P(y=a) = 2 \sum_x x P(x=a)$$

$$= \frac{2}{6}(21) = 7 //$$

$$\text{STD}(A) = \sqrt{\text{VAR}(A)} = \sqrt{2 \sum_x \frac{1}{6} (x-3.5)^2} = 2.4(4) //$$

$$\text{b) } E(X) = np = 25/4 = 6.25$$

$$\text{VAR}(X) = np(1-p) = 11.68$$

$$\text{c) } E(X) = \frac{b+a}{2} = 15$$

$$E(X^3) = \int_{10}^{20} x^3 \frac{1}{10} dx = 3780 //$$

### Part 3

a)  $p=0.15$  defective  $\Rightarrow p^l = 0.85$

$$P = \binom{3}{2} 0.85^2 0.15 + 0.85^3 = \underline{\underline{0.946}}$$

b)  $P_{(X=k)} = \frac{3^k e^{-3}}{k!} \rightarrow P(X=3) = \frac{3^3 e^{-3}}{3!} = \underline{\underline{0.074}}$

c) a)  $E(X) = \int_0^\infty 3x e^{-3x} dx = 1/3$

b)  $\int_0^{5/60} 3 e^{-3x} dx = \underline{\underline{0.22}}$

### Part 4

$\Rightarrow$

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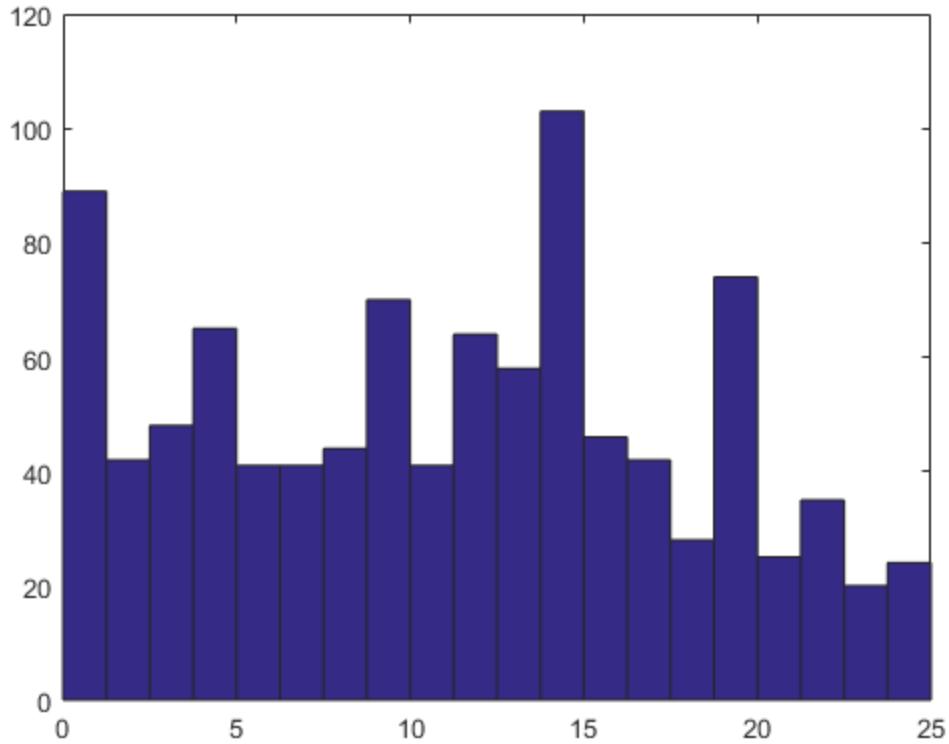
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### a) Probability that A wins

```
n=10000;  
B=randi([0 25],n);  
A=randi([12 30],n);  
p = sum(sum(A<B))/n^2  
  
p =  
0.1842
```

### b) Histogram

```
n=1000;  
B=randi([0 25],n,1);  
A=randi([12 30],n,1);  
  
times = A.*(A<B)+B.*(B<A);  
hist(times,20)
```



### c) 12 Horse Race

```

n=100000;
B=randi([0 25],n,1);
A=randi([12 30],n,1);
all = [A,B,normrnd(37,19,n,10)];

pA=sum(sum(repmat(A,1,11)<all(:,2:end),2)==11)/n
pB=sum(sum(repmat(B,1,11)<[all(:,1) all(:,3:end)],2)==11)/n

pA =
0.0461
pB =
0.3474

```

### d) Betting

```

takeA=1<8*pA
takeB=1<5*pB

takeA =
0
takeB =
1

```

