proba. function

الدالة الاحتمالية

discrete r.v

continuous r.v

prob. mass. func.

دالة التكتل الاحتمالي

الكتلة

p.m.f

p.m.f الرموز/

$P(x)$

$P(X=x)$

$f(x)$

$f_X(x)$

prob. density fun.

p.d.f

دالة الكثافة الاحتمالية

رموز p.d.f

$f(x)$

$f_X(x)$

Def. 2 : Discrete Random Variable.

A random variable x that takes an distinct values only is called a discrete random variable.

ex. suppose that our experiment is tossing a fair coin let x denote the number of heads in the experiment. The sample space in this case is $S = \{head(H), tail(T)\}$.

then the variable takes on either 0 or 1, thus x is a discrete random variable with,

$\{T\} \Rightarrow x = 0$

$\{H\} \Rightarrow x = 1$

Def. Probability Mass Function (p.m.f):

Let X be a discrete random variable and let $x_1, x_2, \dots$ be distinct values that X may assume, Then the function, $p(x)$ defined by:

$$p(x) = \begin{cases} P(X = x_i) & , \quad X = x_i \quad , i = 1, 2, \dots \\ 0 & , \quad X \neq x_i \end{cases}$$

is defined to be the probability mass function of the random variable X, $p(x_i)$ is called the probability mass at value x_i,

~~probability of~~

properties of the p.m.f.

1- $0 \leq p(x_i) \leq 1$, $i = 1, 2, \dots$

2- $\sum_{i=1}^{\infty} p(x_i) = 1$

ex (4) ~~for example~~ Find p.m.f and draw it

The r.v. X represint

a coince thrown once, X represint the r.v and represint the number of heads.

$X = 0, 1$

$S = \{H, T\}$. $\quad n(S) = 2$

$X = 0 \implies \{T\} \implies P(X=0) = \frac{1}{2}$

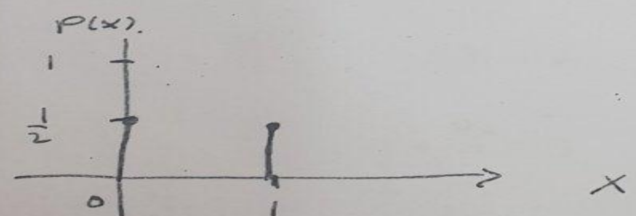
$X = 1 \implies \{H\} \implies P(X=1) = \frac{1}{2}$

$$P(X) = \begin{cases} \frac{1}{2} & X = 0 \\ \frac{1}{2} & X = 1 \\ 0 & , \text{o.w} \end{cases}$$

$$\sum_{x=0}^{1} P(x) = P(0) + P(1) = \frac{1}{2} + \frac{1}{2} = 1$$

$0 \leq P(0), P(1) \leq 1$

$\therefore$ $P(x)$ is p.m.f.



for example 2 Find p.m.f and draw

ex (8) Two coince are thrown once., the r.v. X represinte the number of heads. find the p.m.f.

$S = \{HH, HT, TH, TT\}$. $n(S) = 4$.

$X = 0, 1, 2$.

$$p(X) = \begin{cases} \frac{1}{4} & X = 0 \\ \frac{2}{4} & X = 1 \\ \frac{1}{4} & X = 2 \\ 0 & o.w \end{cases}$$

$X = 0 \longrightarrow [T]$. $P(X=0) = \frac{1}{4}$

$X = 1 \longrightarrow \{TH\} \; HT\}$, $P(X=1) = \frac{2}{4}$.

$X = 2 \longrightarrow \{HH\}$, $P(X=2) = \frac{1}{4}$

$$\sum_{x=0}^{2} p(x) = p(0) + p(1) + p(2)$$

$$= \frac{1}{4} + \frac{2}{4} + \frac{1}{4} = \boxed{1}$$

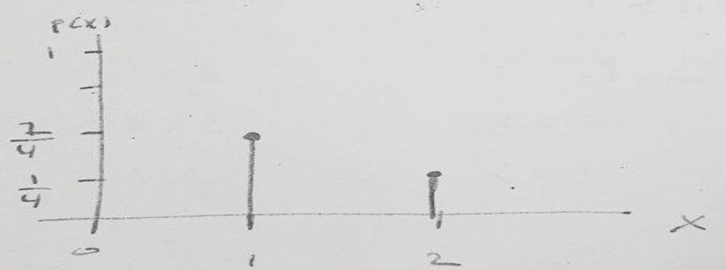
مجموع الاحتمالات يساوي ١

$$0 \leq p(0), p(1), p(2) \leq 1$$

محصورة

$\therefore$ $p(x)$ is the p.m.f.

the figure



		X	p(x)
TT	0	0	$p(X=0) = 1/4$
TH	1	1	$p(X=1)\; 2/4$
HT	1		
		2	$p(X=2) = \frac{1}{4}$

$n = 4$, r.v. $X = 0, 1, 2$

(1) for example (5) find the p.m.f.

ex. (9) ex. 2

Three coins are thrown once, let X be the number of heads obtained, then the values taken by X are $0, 1, 2, 3$, To find the p.m.f of X?

$S = 2^3 = \boxed{8}$

$S = \{HHH, HHT, HTH, THH, TTH, THT, HTT, TTT\}$

$X = 0 \Rightarrow \{TTT\} \Rightarrow p(X=0) = \frac{1}{8}$

$X = 1 \Rightarrow \{TTH, THT, HTT\} \Rightarrow p(X=1) = \frac{3}{8}$

$X = 2 \Rightarrow \{HHT, HTH, THH\} \Rightarrow p(X=2) = \frac{3}{8}$

$X = 3 \Rightarrow \{HHH\} \Longrightarrow p(X=3) = \frac{1}{8}$

الرقم	[illegible]	X	$p(x)$
1	TTT	0	$p(X=0) = \frac{1}{8}$
2	HTT THT TTH	1	$p(X=1) = \frac{3}{8}$
3	THH HTH HHT	2	$p(X=2) = \frac{3}{8}$
4	HHH	3	$p(X=3) = \frac{1}{8}$
	$n=8$		$\sum p(x) = 1$

$$p(X) = \begin{cases} \frac{1}{8} & , X = 0 \\ \frac{3}{8} & , X = 1 \\ \frac{3}{8} & , X = 2 \\ \frac{1}{8} & , X = 3 \\ 0 & , \text{otherwise} \end{cases}$$

Notes: (1.) $0 \leq p(x_i) \leq 1$

$\Rightarrow 0 \leq p(x_1), p(x_2), p(x_3), p(x_4) \leq 1$

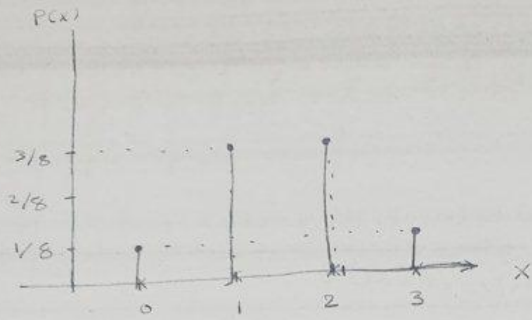
(2.) $\sum_{\text{all } x} p(x_i) = 1$

$$\sum_{x=0}^{3} p(x) = p(x=0) + p(x=1) + p(x=2) + p(x=3)$$

$$= \frac{1}{8} + \frac{3}{8} + \frac{3}{8} + \frac{1}{8} = \boxed{1}$$

Hence $p(x)$ is p.m.f.

figure of this function.



ex.p. 10 ~~ex.15~~ ex.10

Suppose that we throw one die, Let X be the number shown by this die, Find the probability Mass function of this experiment.

$X = 1, 2, 3, 4, 5, 6.$

$p(X=1) = 1/6$	$X=1$
$p(X=2) = 1/6$	$X=2$
$p(X=3) = 1/6$	$X=3$
$\vdots$	$\vdots$
$p(X=6) = 1/6$	$X=6$

in general. $p(X=x) = P(x) = \begin{cases} \frac{1}{6} & , x = 1,2,3,4,5,6 \\ 0 & \text{o.w.} \end{cases}$

$$\sum_{X=1}^{6} P(X) = P(1)+P(2)+P(3)+P(4)+P(5)+P(6)$$

$$= \frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}$$

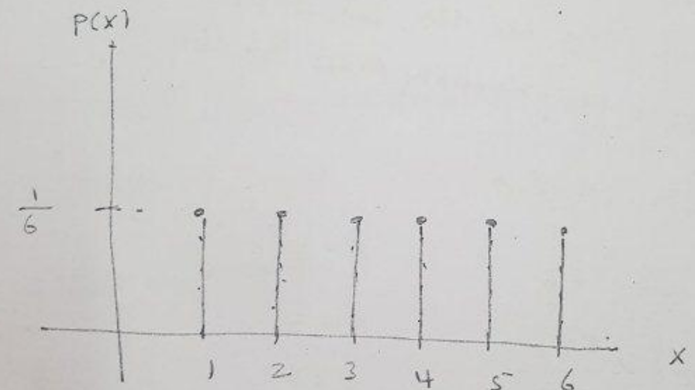
$$= \frac{6}{6}$$

$$\sum_{x=1}^{6} P(x) = 1$$

$$0 \leq P(x_i) \leq 1$$

$$0 \leq P(X_1), P(X_2), \ldots, P(X_6) \leq 1$$

$$\boxed{\therefore \quad P(X) \text{ is a p.m.f.}}$$



Ex (3). Two dice are thrown once. Define a r.v. X to be the sum of the two numbers shown by the two dice, To find the p.m.f of X we get the sample space as follows;

$$S = \begin{Bmatrix} (1,1), (1,2), (1,3), (1,4), (1,5), (1,6) \\ \vdots \quad \ddots \quad \vdots \\ (6,1), \cdots \cdots (6,6) \end{Bmatrix}, \quad n(S) = \boxed{36}$$

$X = 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12$

$\{(1,1)\} \Longrightarrow \quad X = 1+1 = 2 \qquad P(X=2) = \frac{1}{36}$

$\{(2,1), (1,2)\} \Longrightarrow \quad X = 2+1 = 1+2 = 3 \qquad P(X=3) = \frac{2}{36}$

$\{(1,3), (3,1), (2,2)\} \Longrightarrow \quad X = 1+3 = 3+1 = 2+2 = 4 \qquad P(X=4) = \frac{3}{36}$

$\{(1,4), (4,1), (2,3), (3,2)\} \Longrightarrow \quad X = \begin{matrix} 1+4 \\ 4+1 \\ 2+3 \\ 3+2 \end{matrix} = 5 \qquad P(X=5) = \frac{4}{36}$

$\{(1,5), (5,1), (2,4), (4,2), (3,3)\} \Longrightarrow \quad X = \begin{matrix} 1+5 \\ 5+1 \\ 2+4 \\ 4+2 \\ 3+3 \end{matrix} = 6 \qquad P(X=6) = \frac{5}{36}$

$\begin{Bmatrix} (1,6), (6,1), (4,3), (3,4) \\ (5,2), (2,5) \end{Bmatrix} \Longrightarrow \quad X = \begin{matrix} 1+6 \\ 6+1 \\ 4+3 \\ 3+4 \\ 5+2 \\ 2+5 \end{matrix} = 7 \qquad P(X=7) = \frac{6}{36}$

$\begin{Bmatrix} (2,6), (3,5), (4,4) \\ (6,2), (5,3), \end{Bmatrix} \Rightarrow \quad X = \begin{matrix} 2+6 \\ 6+2 \\ 5+3 \\ 3+5 \\ 4+4 \end{matrix} = 8 \qquad P(X=8) = \frac{5}{36}$

$\begin{Bmatrix} (3,6), (6,3) \\ (5,4), (4,5) \end{Bmatrix} \Rightarrow \quad X = \begin{matrix} 3+6 \\ 6+3 \\ 5+4 \\ 4+5 \end{matrix} = 9 \qquad P(X=9) = \frac{4}{36}$

$\begin{Bmatrix} (6,4), (4,6) \\ (5,5) \end{Bmatrix} \longrightarrow \quad X = \begin{matrix} 4+6 \\ 6+4 \\ 5+5 \end{matrix} = 10 \qquad P(X=10) = \frac{3}{36}$

$\{(5,6), (6,5)\} \longrightarrow \quad X = \begin{matrix} 5+6 \\ 6+5 \end{matrix} = 11 \qquad P(X=11) = \frac{2}{36}$

$\{(6,6)\} \longrightarrow \quad X = 6+6 = 12 \qquad P(X=12) = \frac{1}{36}$

In general.

$X = 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.$

$P(X=2) = 1/36 \quad , x=2$

$P(X=3) = 2/36 \quad , x=3$

$P(X=4) = 3/36 \quad , x=4$

$P(X=5) = 4/36$

$P(X=6) = 5/36$

$P(X=7) = 6/36$

$P(X=8) = 5/36$

$P(X=9) = 4/36$

$P(X=10) = 3/36$

$P(X=11) = 2/36$

$P(X=12) = 1/36 \quad , x=12$

In general.

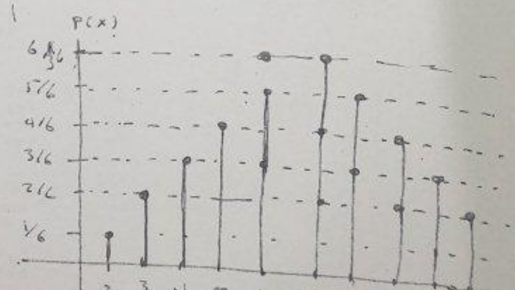
$$P(X) = \begin{cases} \frac{X-1}{36} & , x = 2,3,4,5,6,7 \\ \frac{13-X}{36} & , X = 8,9,10,11,12 \\ 0 & , o.w \end{cases}$$

$$\sum_{x=2}^{12} P(X) = \frac{1}{36} + \frac{2}{36} + \cdots + \frac{1}{36} = \boxed{1}$$

$0 \leq P(X_1), P(X_2), \ldots, P(X_{12}) \leq 1$

$\therefore$ P(X) is the p.m.f.

the figure



ex. (12)

Two dice are thrown, the r.v X represint the diference between the two number, find the p.m.f.

$S = 6^2 = \boxed{36}$

$X = 0 \rightarrow \{(5,5),(6,6),(4,4),(3,3),(2,2),(1,1)\} \rightarrow P(X=0) = \frac{6}{36}$

$X = 1 \rightarrow \{(6,5),(5,4),(4,3),(3,2),(2,1)\} \rightarrow P(X=1) = \frac{5}{36}$

$X = 2 \rightarrow \{(6,4),(5,3),(4,2),(3,1)\} \rightarrow P(X=2) = \frac{4}{36}$

$X = 3 \rightarrow \{(6,3),(5,2),(4,1)\} \rightarrow P(X=3) = \frac{3}{36}$

$X = 4 \rightarrow \{(6,2),(5,1)\} \rightarrow P(X=4) = \frac{2}{36}$

$X = 5 \rightarrow \{(6,1)\} \rightarrow P(X=5) = \frac{1}{36}$

$X = -1 \rightarrow \{(5,6),(4,5),(3,4),(2,3),(1,2)\} \rightarrow P(X=-1) = \frac{5}{36}$

$X = -2 \rightarrow \{(4,6),(3,5),(2,4),(1,3)\} \rightarrow P(X=-2) = \frac{4}{36}$

$X = -3 \rightarrow \{(3,6),(2,5),(1,4)\} \rightarrow P(X=-3) = \frac{3}{36}$

$X = -4 \rightarrow \{(2,6),(1,5)\} \rightarrow P(X=-4) = \frac{2}{36}$

$X = -5 \rightarrow \{(1,6)\} \rightarrow P(X=-5) = \frac{1}{36}$

the p.m.f is:

$$P(x) = \begin{cases} \frac{6}{36} & , X = 0, \\ \frac{5}{36} & , X = 1, -1 \\ \frac{4}{36} & , X = 2, -2 \\ \frac{3}{36} & , X = 3, -3 \\ \frac{2}{36} & , X = 4, -4 \\ \frac{1}{36} & , X = 5, -5 \\ 0 & , \text{o.w} \end{cases}$$

$1-1 \quad 1-2 \quad 1-3$

$$\begin{pmatrix} 0 & -1 & -2 & -3 & -4 & -5 \\ 1 & 0 & -1 & -2 & -3 & -4 \\ 2 & 1 & 0 & -1 & -2 & -3 \\ 3 & 2 & 1 & 0 & -1 & -2 \\ 4 & 3 & 2 & 1 & 0 & -1 \\ 5 & 4 & 3 & 2 & 1 & 0 \end{pmatrix}$$

$6-6$

$6-6=0$

$X = -5, -4, \ldots, 0, \ldots, 5$

① $\sum_{x=-5}^{5} p(x) = p(-5) + p(-4) + \dots + p(5)$

$= \frac{5}{36} + \frac{4}{36} + \frac{3}{36} + \frac{2}{36} + \frac{1}{36} + \frac{6}{36} + \frac{5}{36} + \frac{4}{36} + \frac{3}{36} + \frac{2}{36} + \frac{1}{36}$

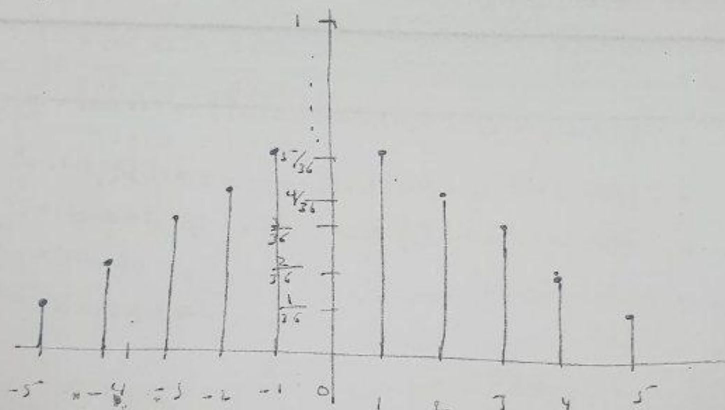
$= 1$

② $0 \le p(-5), p(-4), \dots, p(4), p(5) \le 1$

موجبة

$\therefore$ $p(x)$ is p.m.f.

the figure



Def. Cumulative Distribution function (C.d.f)

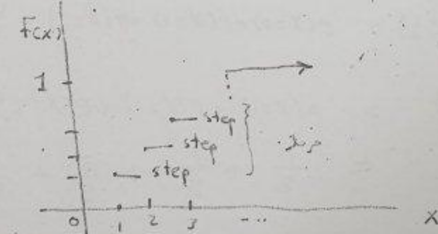
or Distribution function.

The Cumulative distribution function of a discrete random Variable is denoted by $F(x)$ and is defined by.

$$F(x) = P(X \le x) = \sum_{x_i \le x} p(x_i)$$

properties of c.d.f.

1. $\lim_{x \to +\infty} F(x) = 1$
2. $\lim_{x \to -\infty} F(x) = 0$ لانها دالة تراكمية فاكيد اكبر من القديم
3. $F(x_1) \le F(x_2)$ if $x_1 < x_2$
   $F(x_i) \le F(x_{i+1})$
4. $P(a < X \le b) = F(b) - F(a)$ if $(a \le b)$
   $\boxed{P(x_i) = F(x_i) - F(x_{i-1})}$
5. $0 \le F(x) \le 1$
6. $F(x)$ is step function دالة مرحلة
7. $F(x)$ is a non dicreasing function or monotonic increasing function.
   دالة التوزيع التراكمي هي دالة غير متناقصة اي دالة متزايدة
8. الرسم.



تكتب بعد صفحة (١٢)

خطوات إيجاد الصيغة F(x)

$X = a, b, c, d.$

$$F(x)=\begin{cases} \text{نبدأ بـ صفر} & X \text{ أقل من } a \\ P(X=a) & a \le X < b \\ P(X=a)+P(X=b) & b \le X < c \\ P(X=a)+P(X=b)+P(X=c) & c \le X < d \\ 1 & X \geq d \end{cases}$$

ويكون في الأخير دائماً واحد.

X أكبر من آخر قيمة

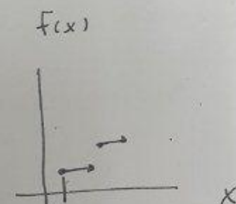
خطوات الرسم.

محور أفقي يمثل X. المتغير العشوائي

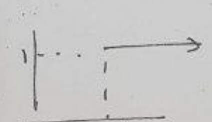
محور عمودي يمثل F(x) دالة التوزيع الاحتمالي

وبعد تعيين النقط ثابتات نرسم خط أفقي من النقطة التي تم تعيينها إلى التي بعدها.

خطوة خطوة.



حتى نصل إلى الواحد



دالة متزايدة باتجاه اليمين.

ممكن أن تبدأ من الموجب أو من السالب.

(ex.1) ... for example ...

ex. (7) For the following p.m.f , find the Cumulative dist. fun. and draw it.

$$P(X) = \begin{cases} 1/8 & X = 0 \\ 3/8 & X = 1 \\ 3/8 & X = 2 \\ 1/8 & X = 3 \\ 0 & o.w \end{cases}$$

sol

$$F(x) = P(X \le x) = \sum_{X \le x} P(X)$$

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{8} & 0 \le x < 1 \\ 4/8 & 1 \le x < 2 \\ 7/8 & 2 \le x < 3 \\ \frac{8}{8} = 1 & x \ge 3 \end{cases}$$

$$F(0 \le x < 1) = P(X = 0) = \boxed{\frac{1}{8}}$$

$$F(1 \le x < 2) = P(X = 0) + P(X = 1) = \frac{1}{8} + \frac{3}{8} = \boxed{\frac{4}{8}}$$

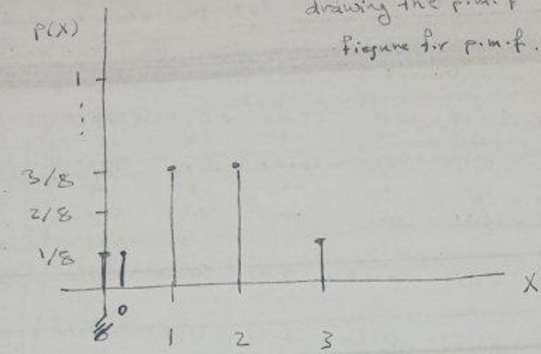
$$F(2 \le x \le 3) = P(X = 0) + P(X = 1) + P(X = 2) = \frac{1}{8} + \frac{3}{8} + \frac{3}{8} = \boxed{\frac{7}{8}}$$

$$F(3 \le x) = P(X = 0) + P(X = 1) + P(X = 2) + P(X = 3)$$

$$= \frac{1}{8} + \frac{3}{8} + \frac{3}{8} + \frac{1}{8} = \frac{8}{8} = \ldots$$

drawing the p.m.f

figure for p.m.f. ....



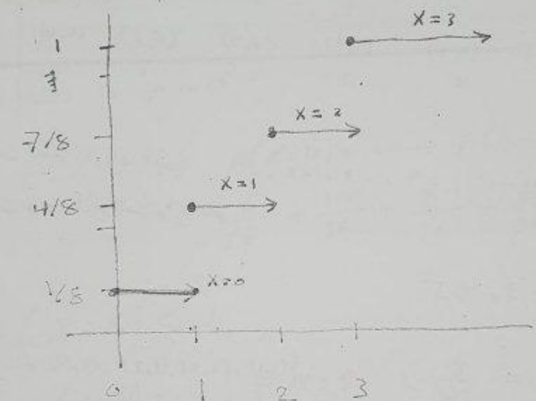


figure of c.d.f.

$\boxed{ex.12}$ For example 5. Find the C.D.F.

$X =$

$$p(x) = \begin{cases} \frac{1}{4} & x = 0 \\ \frac{2}{4} & x = 1 \\ \frac{1}{4} & x = 2 \\ 0 & ,o.w \end{cases}$$

$p(x)$ is p.m.f.

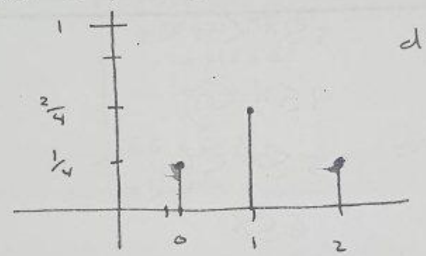


diagram. of p.m.f.

$\boxed{\text{To Find the C.D.F}}$

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{4} & 0 \leq x < 1 \\ 3/4 & 1 \leq x < 2 \\ 1 & 2 \leq x \end{cases}$$

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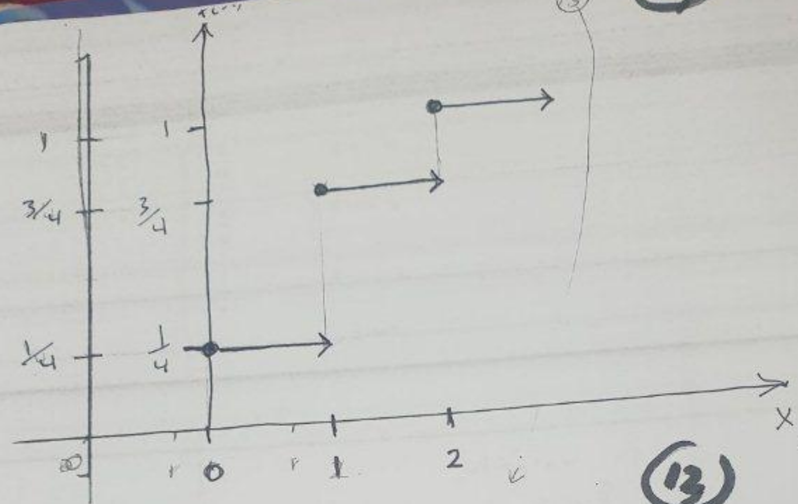


13

EX: 13

ex. 11 find the C.D.F. for the p(x) of example 2. (17)

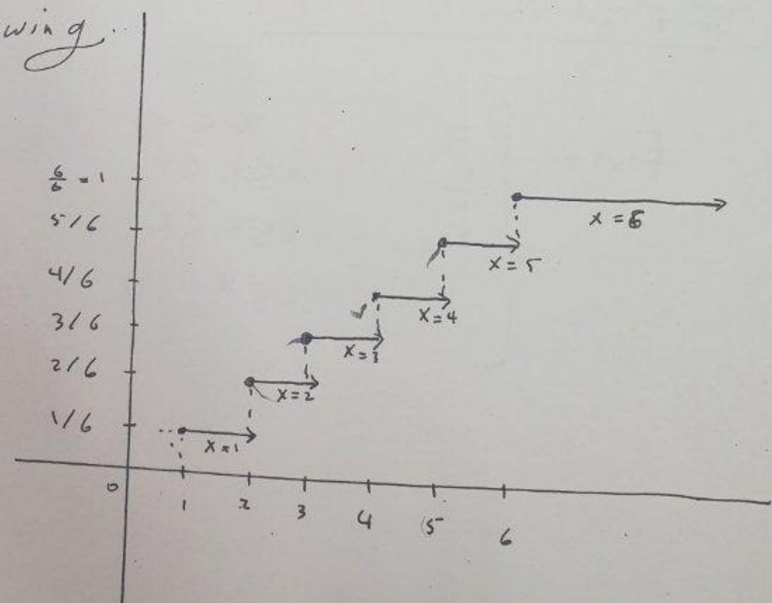
$x = 1, 2, 3, 4, 5, 6$

$$p(x) = \begin{cases} \frac{1}{6} & , x = 1,2,3,4,5,6 \\ 0 & , o.w \end{cases}$$

$\boxed{\text{The C.D.F}}$

$$F(x) = \begin{cases} 0 & x < 1 \\ 1/6 & 1 \le x < 2 \\ 2/6 & 2 \le x < 3 \\ 3/6 & 3 \le x < 4 \\ 4/6 & 4 \le x < 5 \\ 5/6 & 5 \le x < 6 \\ \frac{6}{6} = 1 & 6 \le x \end{cases}$$

The drawing.



ex. 14. from example 11. find the c.d.f. and draw it.

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ex. 9 two dice are thrown once, let X be the sum of the two dice, find C.D.F

from exampl. 3 we have. p.m.f.

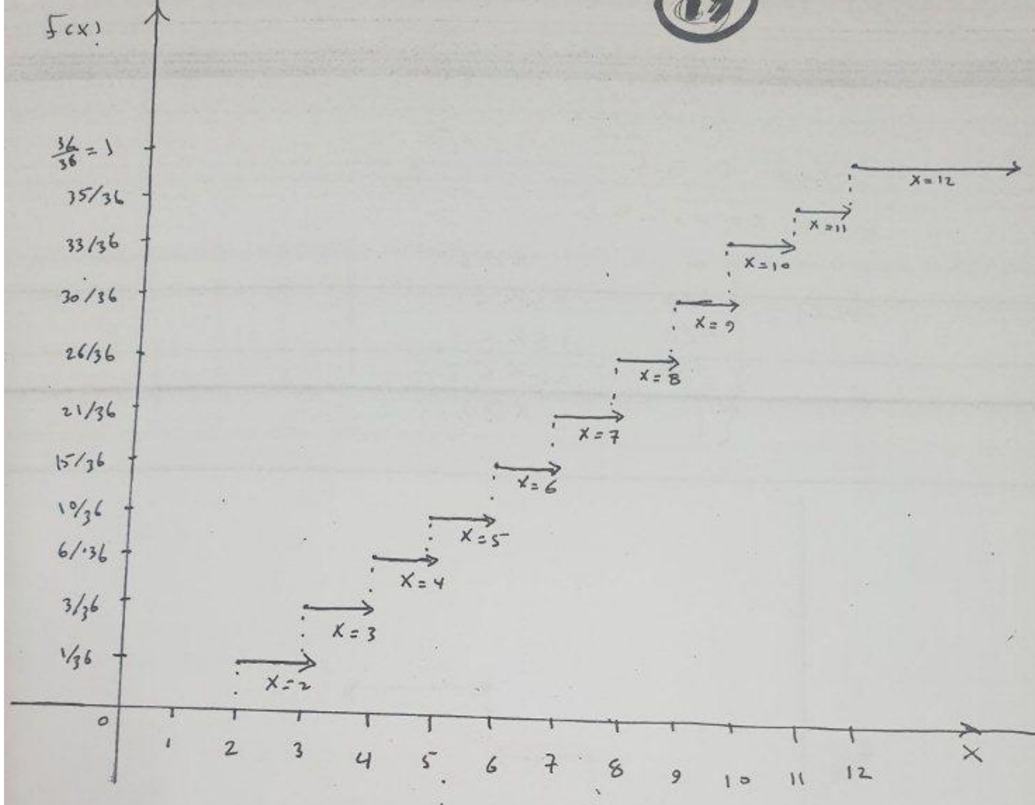
$$p(x) = \begin{cases} \frac{x-1}{36} & x = 2,3,4,5,6,7 \\ \frac{13-x}{36} & x = 8,9,10,11,12 \\ 0 & o.w \end{cases}$$

and we prove that $p(x)$ is p.m.f.

and drawing it.

No the c.d.f is.

$$F(x) = \begin{cases} 0 & , x < 2 \\ \frac{1}{36} & , 2 \leq x < 3 \\ 3/36 & , 3 \leq x < 4 \\ 6/36 & , 4 \leq x < 5 \\ 10/36 & , 5 \leq x < 6 \\ 15/36 & , 6 \leq x < 7 \\ 21/36 & , 7 \leq x < 8 \\ 26/36 & , 8 \leq x < 9 \\ 30/36 & , 9 \leq x < 10 \\ 33/36 & , 10 \leq x < 11 \\ 35/36 & , 11 \leq x < 12 \\ \frac{36}{36} = 1 & , 12 \leq x \end{cases}$$


f(x)
36/36 = 1
35/36
33/36
30/36
26/36
21/36
15/36
10/36
6/36
3/36
1/36
0
1
2
3
4
5
6
7
8
9
10
11
12
X
X = 2
X = 3
X = 4
X = 5
X = 6
X = 7
X = 8
X = 9
X = 10
X = 11
X = 12

C. D. F.

ex. 8

Two dice are thrown once, let the r.v. X represinte the absolute ~~absolute~~ difference between the two dice. Find the p.m.f and C.D.F. and draw it.

$S =$

(1,1) 0	(1,2) -1	(1,3) -2	(1,4) -3	(1,5) -4	(1,6) -5
(2,1) 1	(2,2) 0	(2,3) -1	(2,4) -2	(2,5) -3	(2,6) -4
(3,1) 2	(3,2) 1	(3,3) 0	(3,4) -1	(3,5) -2	(3,6) -3
(4,1) 3	(4,2) 2	(4,3) 1	(4,4) 0	(4,5) -1	(4,6) -2
(5,1) 4	(5,2) 3	(5,3) 2	(5,4) 1	(5,5) 0	(5,6) -1
(6,1) 5	(6,2) 4	(6,3) 3	(6,4) 2	(6,5) 1	(6,6) 0

$n(S) = \boxed{36}$

المطلق لجميع الارقام يعني -1، -2، -3، -4، -5 تصبح موجبة اي 1، 2، 3، 4، 5 على التوالي
وبذلك فان المتغير العشوائي هو

$X = 0, 1, 2, 3, 4, 5$

$P(X=0) = \frac{6}{36} \rightarrow \{(1,1), (2,2), (3,3), (4,4), (5,5), (6,6)\}$ $\boxed{n=6}$

$P(X=1) = \frac{10}{36} \rightarrow \{(1,2), (2,1), (3,2), (2,3), (4,3), (3,4), (4,5), (5,4), (5,6), (6,5)\}$ $n=10$

$P(X=2) = \frac{8}{36} \rightarrow \{(1,3), (3,1), (2,4), (4,2), (5,3), (3,5), (6,4), (4,6)\} \rightarrow n=8$

$P(X=3) = \frac{6}{36} \rightarrow \{(1,4), (4,1), (2,5), (5,2), (6,3), (3,6)\} \rightarrow n=6$

$P(X=4) = \frac{4}{36} \rightarrow \{(1,5), (5,1), (6,2), (2,6)\} \rightarrow n=4$

$P(X=5) = \frac{2}{36} \rightarrow \{(1,6), (6,1)\} \rightarrow n=2$

Ingeneral. p.m.f.

$$p(x) = \begin{cases} 6/36 & , X = 0 \\ 10/36 & , X = 1 \\ 8/36 & , X = 2 \\ 6/36 & , X = 3 \\ 4/36 & , X = 4 \\ 2/36 & , X = 5 \\ 0/36 & , o.w \end{cases}$$

~~proff~~ the $p(x)$ is p.m.f.

① $\sum_{x=0}^{5} p(X=x) = p(X=0) + \cdots + p(X=5)$

$$= \frac{6}{36} + \frac{10}{36} + \frac{8}{36} + \frac{6}{36} + \frac{4}{36} + \frac{2}{36} = \frac{36}{36} = 1$$

② $0 \leq p(X=x) \leq 1$

$0 \leq p(X=0), \ldots, p(X=5) \leq 1$.

$\therefore$ $p(x)$ is p.m.f.

Then the C.D.F

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{6}{36} & 0 \leq x < 1 \\ \frac{16}{36} & 1 \leq x < 2 \\ \frac{24}{36} & 2 \leq x < 3 \\ \frac{30}{36} & 3 \leq x < 4 \\ \frac{34}{36} & 4 \leq x < 5 \\ \frac{36}{36} = 1 & 5 \leq x \end{cases}$$

Where

$F(0 \leq x < 1) = P(X=0) = \frac{6}{36}$

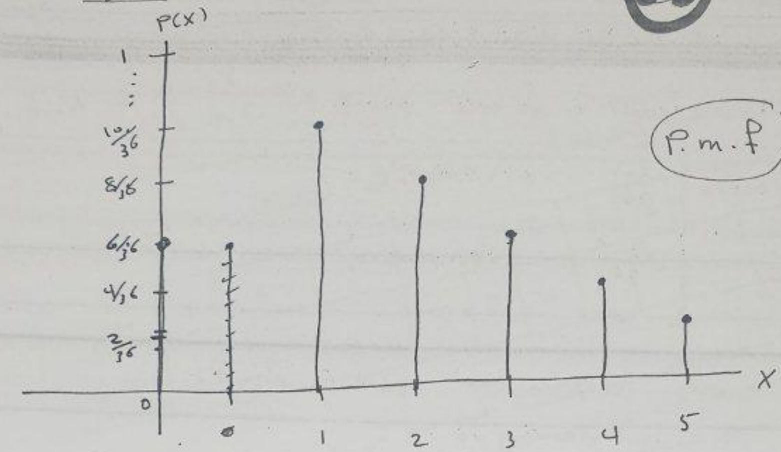
$F(1 \leq x < 2) = P(X=0) + P(X=1) = \frac{6}{36} + \frac{10}{36} = \frac{16}{36}$

$\vdots$

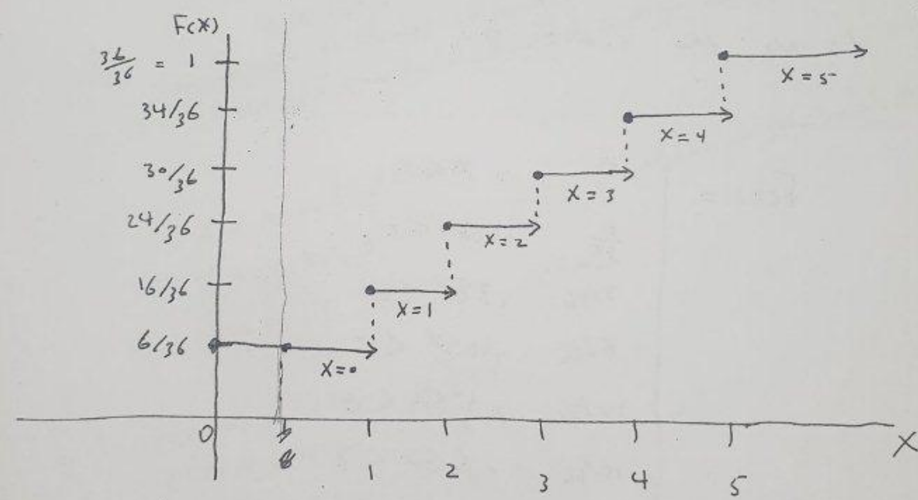
integers ... teger.

Figure.

(23)



P.m.f



(23) 291

Q[40] we select one integer from the integers 1 through 10, Let the r.v. X be the number of the divisor of each integer.

Find (1) p.m.f of X

(2) c.d.f of X

(3) draw it.

الارقام التي تقبل القسمة ...

X عدد مرات التي يقبل العدد القسمة.

To find the divisor we make the following table.

integer	1	2	3	4	5	6	7	8	9	10
X = n. of divisor	1	2	2	3	2	4	2	4	3	4

الرقم ① ← يعني العدد يقبل القسمة على نفسه فقط مثل ①.

الرقم ② ← يعني العدد يقبل القسمة على واحد وعلى نفسه مثل 2, 3, 5, 7

الرقم ③ ← يعني العدد يقبل القسمة على واحد وعلى نفسه وعلى عدد آخر مثل 4 و 9

الرقم ④ ← يعني العدد يقبل القسمة على واحد وعلى نفسه وعلى عددين آخرين مثل 6, 8, 10

وبذلك فان

X = عدد مرات يقبل منه العدد القسمة.

X = no. of divisor

$X = 1, 2, 3, 4$

$n = 10$ n = عدد الارقام.

$p(X = 1) = 1/10 \quad , X = 1$

$p(X = 2) = 4/10 \quad , X = 2$

$p(X = 3) = 2/10 \quad , X = 3$

$p(X = 4) = 3/10 \quad , X = 4$

0 o.w

∴ p.m.f is

$$p(x) = \begin{cases} 1/10 & , x = 1 \\ 4/10 & , x = 2 \\ 2/10 & , x = 3 \\ 3/10 & , x = 4 \\ 0 & , o.w \end{cases}$$

and also $p(x)$ is p.m.f of the r.v. x. where

① $0 \leq p(x) \leq 1$

② $\sum_{x=1}^{4} p(x) = p(X=1) + p(X=2) + p(X=3) + p(X=4)$

$= \frac{1}{10} + \frac{4}{10} + \frac{2}{10} + \frac{3}{10} = \frac{10}{10} = \boxed{1}$

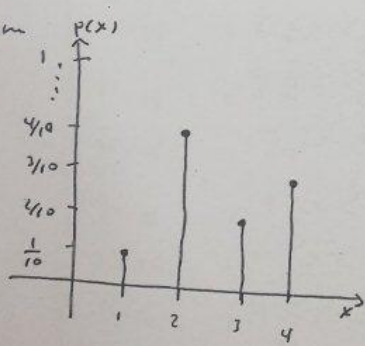
Hence $p(x)$ is p.m.f. of r.v. X.

The c.d.f.

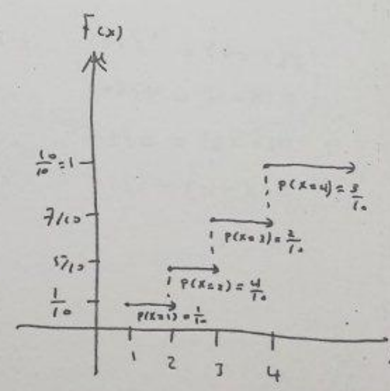
$X = 1, 2, 3, 4$

$$F(x) = \begin{cases} 0 & x < 1 \\ 1/10 & 1 \leq x < 2 \\ 5/10 & 2 \leq x < 3 \\ 7/10 & 3 \leq x < 4 \\ \frac{10}{10} = 1 & 4 \leq x \end{cases}$$

The Diagram



p.m.f of x.



C.d.f of x.

ex. 13 For the following function : $p(x) = \begin{cases} \frac{x}{k} & , x = 1,2,3,4,5 \\ 0 & , \text{o.w (otherwise)} \end{cases}$

① Find the value of k so that, $p(x)$ satisfies the condition of being a probability mass function for a r. v. X ?

② Find the c. d. f of X ?

①
$$\sum_{\text{all } x} p(x) = 1$$

$$\sum_{x=1}^{5} \frac{x}{k} = 1$$

$$\frac{1}{k} \sum_{x=1}^{5} x = 1 \quad \rightarrow \text{[illegible]}$$

$$k = \sum_{x=1}^{5} x$$

$$k = (1+2+3+4+5)$$

$$\boxed{k = 15}$$

$$\therefore p(x) = \begin{cases} \frac{x}{15} & ; x = 1,2,3,4,5 \\ 0 & \text{o.w} \end{cases}$$

$\therefore$ $p(x)$ is p.m.f.

②
$$p(x) = \begin{cases} 1/15 & x = 1 \\ 2/15 & , x = 2 \\ 3/15 & , x = 3 \\ 4/15 & , x = 4 \\ 5/15 & , x = 5 \\ 0 & \text{o.w} \end{cases}$$

$$F(x) = \begin{cases} 0 & x < 1 \\ 1/15 & 1 \le x < 2 \\ 3/15 & 2 \le x < 3 \\ 6/15 & 3 \le x < 4 \\ 10/15 & 4 \le x < 5 \\ 15/15 & 5 \le x \end{cases}$$

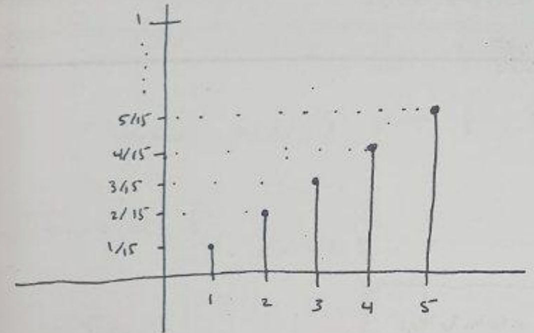


figure of p.m.f.

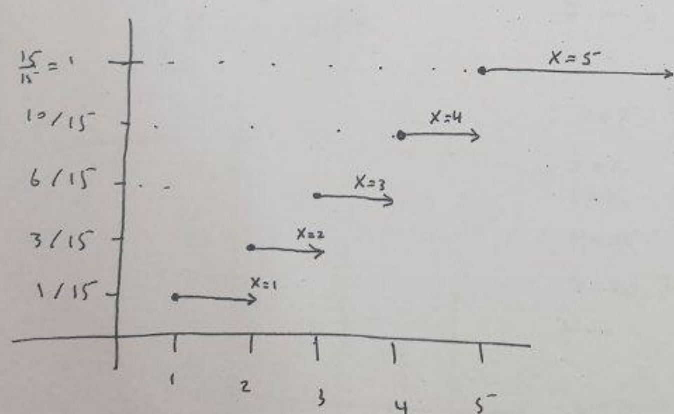


figure of C.D.F.

Q// A bowl contains three red chips and five blue chips, two are drawn at random from the bowl, Let X denote the number of red chips in the sample;

(1) Find the p.m.f of X and draw corresponding graph.

(2) Find the dist. fun. of X (c.d.f) and graph it.

(1) X = no. of red chips.

$X = 0, 1, 2.$

وحين نسحب (2) [illegible]
ولا واحدة حمراء او واحدة حمراء او اثنين.
X متغير عشوائي عدد اللون الأحمر

نوع الشريحتين	X عدد اللون الأحمر	X	$p(X=x_i)$
BB	ولا واحدة حمراء	0	$p(X=0)=\frac{C_2^5}{C_2^8}=\boxed{\frac{10}{28}}$
BR, RB	واحدة حمراء	1	$p(X=1)=\frac{C_1^5 C_1^3}{C_2^8}=\boxed{\frac{15}{28}}$
RR	اثنين حمراء	2	$p(X=2)=\frac{C_2^3}{C_2^8}=\boxed{\frac{3}{28}}$

$$p(X=0) = \frac{C_2^5}{C_2^8} = \frac{10}{28}$$

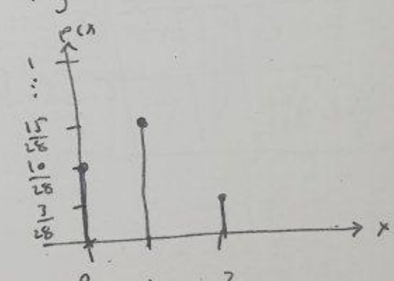
$$p(X=1) = \frac{C_1^5 C_1^3}{C_2^8} = \frac{15}{28}$$

$$p(X=2) = \frac{C_2^3}{C_2^8} = \frac{3}{28}$$

$$p(x) = 0 \qquad o.w$$

$$\therefore \quad p(x) = \begin{cases} \frac{10}{28} & , x=0 \\ \frac{15}{28} & , x=1 \\ \frac{3}{28} & , x=2 \\ 0 & , o.w \end{cases}$$

figure



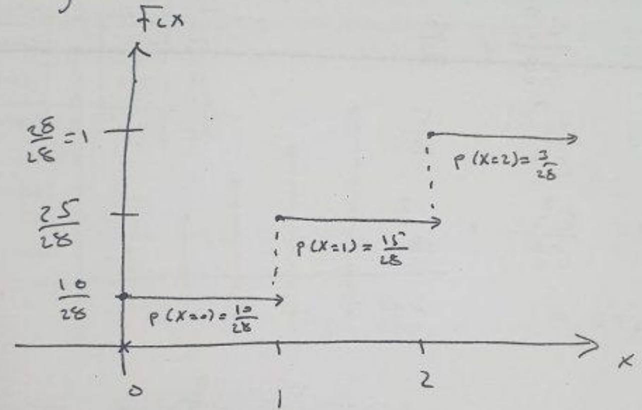
p.m.f of X.

c.d.f of X or
dist. fun. of X.

$X = 0, 1, 2$

$$F(x) = \begin{cases} 0 & X < 0 \\ \frac{10}{28} & 0 \leq X < 1 \\ \frac{25}{28} & 1 \leq X < 2 \\ \frac{28}{28} = 1 & 2 \leq X \end{cases}$$

The figure.



c.d.f of X.

Q) let the random variable X, be the number of white balls of asample of size 2 drawn without replacement from an Urn - Containing 6 balls of which 4 are white, in which the white balls have been numbered 1 to 4 and the remaining 2 balls 5 and 6, Find the p.m.f., c.d.f.

sol.

The sample space $P^6_2 = 30$ possible ways.

$$S = \begin{bmatrix} - & (1,2), & (1,3), \dots (1,6) \\ (2,1) & - & (2,3), \dots (2,6) \\ \vdots & & \\ (6,1) & (6,2) & (6,3) \dots (6,5) - \end{bmatrix}, \quad \boxed{n(S) = 30}$$

$X = 0, 1, 2, ~~3~~$

$P(X=0) = \frac{2}{30} = \frac{1}{15}$, $X = 0$ $\quad = \frac{C^2_2 C^4_0}{C^6_2} = \frac{1}{15}$

$P(X=1) = \frac{16}{30} = \frac{8}{15}$ $\quad \frac{C^4_1 C^2_1}{C^6_2} = \frac{8}{15}$, $X = 1$

$P(X=2) = \frac{12}{30}$, $X = 2$ $\quad \frac{C^4_2 C^2_0}{C^6_2} = \frac{6}{15}$

0.w

X = رقم عدد الكرات البيض.

ولكن العينة المسحوبة 2 فقط.

فلما تسحب كرة واحدة بيضاء،

او كرتين بيض.

او ولا واحدة بيضاء

$\boxed{X = 0, 1, 2}$

		$X=x$	$P(X=x)$
(6,5)(5,6)	ولا واحدة بيضاء	0	$P(X=0) = \frac{2}{30}$
(1,5)(2,5)(3,5)(4,5) (1,6)(2,6)(3,6)(4,6) (5,1)(5,2)(5,3)(5,4) (6,1)(6,2)(6,3)(6,4)	واحدة بيضاء	1	$P(X=1) = \frac{16}{30}$
(1,2)(1,3)(1,4) (2,1)(2,3)(2,4) (3,1)(3,2)(3,4) (4,1)(4,2)(4,3)	اثنين بيضاء	2	$P(X=2) = \frac{12}{30}$

$n(S) = 30$

Then p.m.f. is

$$p(x) = \begin{cases} 2/30 & , x = 0 \\ 16/30 & , x = 1 \\ 12/30 & , x = 2 \\ 0 & , \text{o.w} \end{cases}$$

Also $p(x)$ is p.m.f of r.v. x because

(1) $0 \leq p(x) \leq 1$

(2) $\sum_{x=0}^{2} p(x) = p(X=0) + p(X=1) + p(X=2) = \frac{2}{30} + \frac{16}{30} + \frac{12}{30} = \frac{30}{30} = \boxed{1}$

Hence $p(x)$ is p.m.f

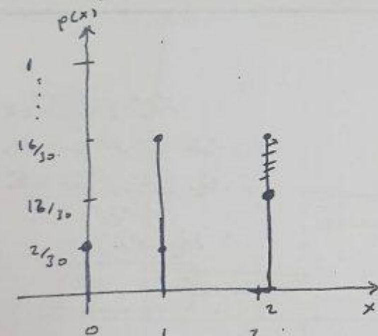
The c.d.f.

$X = 0, 1, 2.$

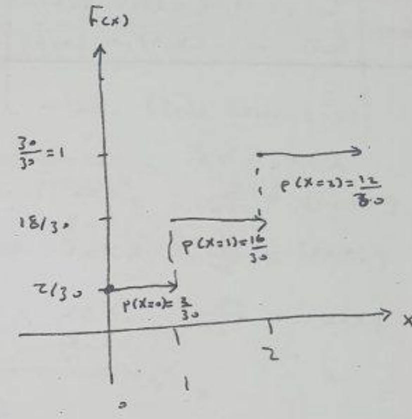
$$F(x) = \begin{cases} 0 & x < 0 \\ 2/30 & 0 \le x < 1 \\ 18/30 & 1 \le x < 2 \\ \frac{30}{30} = 1 & 2 \le x \end{cases}$$

The c.d.f of X.

The figure.



p.m.f of X.



c.d.F of X.

Q/ The r. v. X has the p. m. f $p(x) = \begin{cases} \frac{1}{3} & , x = 0, 1, 2 \\ 0 & , o.w \end{cases}$

what is the dist. fun. of x.?

The c. d. F. of x.?

we Know that.

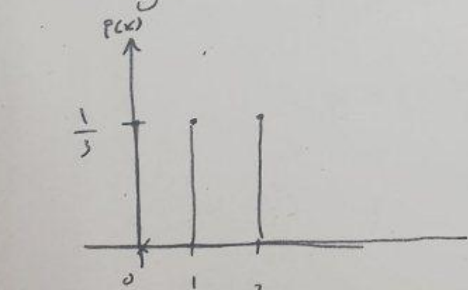
$$p(x) = \begin{cases} \frac{1}{3} & x = 0 \\ \frac{1}{3} & x = 1 \\ \frac{1}{3} & x = 2 \\ 0 & o.w \end{cases}$$

then $x = 0, 1, 2$

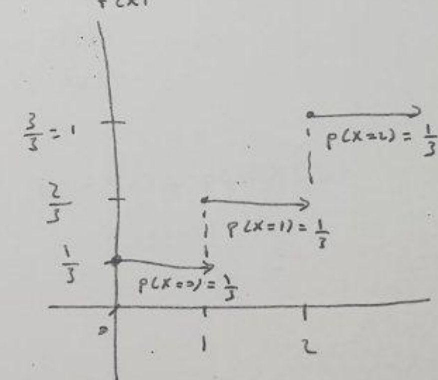
$$F(x) = \begin{cases} 0 & x < 0 \\ 1/3 & 0 \le x < 1 \\ 2/3 & 1 \le x < 2 \\ \frac{3}{3} = 1 & 2 \le x \end{cases}$$

$\Rightarrow$ اذا اعطانا c.d.F نجد p.m.f $\begin{cases} \frac{1}{3} - 0 = \frac{1}{3} & x = 0 \\ \frac{2}{3} - \frac{1}{3} = \frac{1}{3} & x = 1 \\ 1 - \frac{2}{3} = \frac{1}{3} & x = 2 \end{cases}$

The figure



p.m.f of x.



c.d.F of x.

حساب الفترات.

(1) $p(X \text{ exactly } a) = p(X = a)$ [illegible]

(2) $p(X \text{ more than } a) = p(X > a) = 1 - p(X \leq a)$

(3) $p(X \text{ less than } a) = p(X < a)$

(4) $p(X \text{ at least } a) = p(X \geq a) = 1 - p(X < a)$

(5) $p(X \text{ at most } a) = p(X \leq a)$

(6) $p(X \text{ greater than } a) = p(X > a) = 1 - p(X \leq a)$

(7) $p(a < x < b)$

(8) $p(a < x \leq b)$

(9) $p(a \leq x < b)$

(10) $p(a \leq x \leq b)$

c.d.f.

$$p(a < x \leq b) = F(b) - F(a)$$

$$p(X \leq b) = F(b)$$

$$p(X \leq a) = F(a)$$

$$p(X \leq b) = p(X \leq a) + p(a < X \leq b)$$

تابع ال ص 32

Note

$$\boxed{p(a < X \leq b) = F(b) - F(a).}$$

where

$$p(X \leq b) = p(X \leq a) + p(a < X \leq b)$$

$$F(b) = p(X \leq b)$$

$$F(a) = p(X \leq a).$$

$$F(1) = p(X \leq 1)$$

$$F(2) = p(X \leq 2)$$

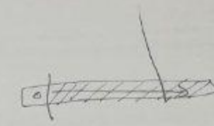
and so on.

The area compute.

By using p.m.f.

(1) $P(X \geq 0) = P$ 

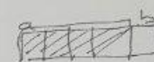
$$= \sum_{x=0}^{n} p(x)$$



(2) $P(X > 0) = 1 - P(X \leq 0)$

$$= 1 - P(0).$$

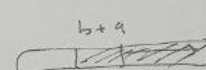
(3) $P(a < X < b) =$ مجموع كل القيم الاحتمالية المحصورة بين قيم a و b. ولكن لا نأخذ القيم (a, b). 



(4) $P(a \leq X < b) =$ " " " و من ضمنها القيمة الاحتمالية لـ a

(5) $P(a < X \leq b)$ ——— لـ b 

(6) $P(a \leq X \leq b)$ ——— لـ a و لـ b 

(7) $P(X - a \geq b) = P(X \geq b + a)$ 

(8) $P(X \leq b) = P(X \leq a) + P(a < X \leq b)$

By using c.d.f.

(1) $p(a < x \le b) = F(b) - F(a).$

(2) $p(x \le b) = F(b)$

$p(x \le a) = F(a).$

$p(x \le 1) = F(1)$

$p(x \le 2) = F(2)$

and so on.

(3) $p(x > b) = 1 - p(x \le b)$

$= 1 - F(b).$

(4)

for example (15) find from (1) to (4)

$$p(x) = \begin{cases} 1/8 & x = 0 \\ 3/8 & x = 1 \\ 3/8 & x = 2 \\ 1/8 & x = 3 \\ 0 & \text{o.w} \end{cases}$$

$$F(x) = \begin{cases} 0 & x < 0 \\ 1/8 & 0 \le x < 1 \\ 4/8 & 1 \le x < 2 \\ 7/8 & 2 \le x < 3 \\ 1 & 3 \le x \end{cases}$$

$$p(x > 0) = p(1) + p(2) + p(3) = \frac{3}{8} + \frac{3}{8} + \frac{1}{8} = \frac{7}{8}$$

$$p(x > 0) = p(0 \le x \le 3) = F(3) - F(0) = 1 - \frac{1}{8} = \frac{7}{8}$$

or → $p(x > 0) = 1 - p(x \le 0) = 1 - p(0) = 1 - \frac{1}{8} = \frac{7}{8}$

$$p(x > 0) = 1 - p(x \le 0) = 1 - F(0) = 1 - \frac{1}{8} = \frac{7}{8}$$

$$p(x > 2) = p(3) = \frac{1}{8}$$

$$p(x > 2) = p(2 < x \le 3) = F(3) - F(2) = 1 - \frac{7}{8} = \frac{1}{8}$$

or $p(x > 2) = 1 - p(x \le 2) = 1 - (p(2) + p(1) + p(0)) = 1 - \left(\frac{3}{8} + \frac{3}{8} + \frac{1}{8}\right) = 1 - \frac{7}{8} = \frac{1}{8}$

$$p(x > 2) = 1 - p(x \le 2) = 1 - F(2) = 1 - \frac{7}{8} = \frac{1}{8}$$

$$P(X > b) = \cancel{p}\; P(X \le b) = 1 - F(b)$$

$$P(X < b) = P(X \le a) + P(a < X \le b)$$
$$= F(a) + F(b) - F(a)$$
$$= F(b)$$

$$F(2) - F(0)$$
$$\frac{4}{8} - \frac{1}{8} = \frac{3}{8}$$

$$P(0 \le X < 2) = \underline{P(0 \le X < 1)} + \underline{P(1 \le X < 2)}$$
$$= \cancel{F(1)} - F(0) + F(2) - \cancel{F(1)}$$
$$= F(2) - F(0)$$

$$P(0 \le X < 2) = P(X \le 0) + P(0 \le X \le 2)$$
$$= F(0) + F(2) - F(0)$$
$$= \frac{4}{8}$$

$$P(0 < x \leq 2) = P(1) + P(2)$$
$$= \frac{3}{8} + \frac{3}{8}$$
$$= \frac{6}{8}$$

$$P(0 \leq x < 2) = P(0) + P(1)$$
$$= \frac{1}{8} + \frac{3}{8}$$
$$= \frac{4}{8}$$

$$P(0 < x \leq 2) = F(2) - F(0)$$
$$= \frac{7}{8} - \frac{1}{8}$$
$$= \frac{6}{8}$$

$$P(0 \leq x \leq 2) = F(1) - F(0)$$
$$= \frac{1}{8} - \frac{3}{8}$$
$$= P(x \leq 0) + P(0 < x \leq 2)$$
$$= F(0) + F(2) - F(0)$$
$$= \frac{1}{8} + \frac{7}{8} - \frac{1}{8}$$
$$= \frac{7}{8}$$

$$P(0 \leq x < 1) +$$
$$F(1) - F(0)$$

$x = ⓪, ①, 2, \dots, \infty$ (25)

بالضبط واحد $= 1$

(1) $P(\text{exactly } 1) = P(X=1)$ $\qquad P(x>1)$

(2) $P(\text{more than } 1) = P(X>1) = P(X=2) + P(X=3) + \dots$

أكبر من واحد
الواحد لا يدخل

$=$

أقل وما يساوي واحد

(3) $P(x>1) = P(X>1) = 1 - P(X \leq 1)$

الواحد يدخل

$= 1 - (P(\underset{X=0}{0}) + P(\underset{(X=1)}{1}))$

أكبر

at least

على الأقل واحد

(4) $P(\text{at least } 1) = P(X \geq 1)$

واحد فأكثر

x

على الأكثر واحد

(5) $P(\text{at most } 1) = P(X \leq 1)$

واحد وأقل

x أقل من واحد

(6) $P(x \text{ less than } 1) = P(X < 1)$

صفر من الواحد

milan

Problem for discret r.v.

Q1 : An urn contains 4balls numbered 1,2,3,4 respectively Let X be the number that occurs if one ball is drawn at random from the urn . Write the p.m.f. and C.d.F of X and draw it ? Find : $P(1<X\leq 4)$, $P(X\geq 2)$?

Q2 : Verify the following functions are propbability mass function :

(I) : $f(x)=\begin{cases}\left(\frac{1}{2}\right)^{x} & , X=1,2,3,\ldots\\ 0 & ,O.W\end{cases}$ (II) : $f(x)=\begin{cases}\left(\frac{1}{4}\right)^{x} & , X=1,2,3,\ldots\\ 0 & ,O.W\end{cases}$

Q3 : Determine the constant C so that p(x) satisfies the conditions of being a p.m.f. of X :

$$p(x)=\begin{cases}C\ (X+1)^{2} & , X=0,1,2,3\\ 0 & ,O.W\end{cases}$$

Q4 : Let p(x) be the p.m.f. of arandom variable X Find the distribution function F(x) and sketch it s graph Where :
(I) p(x)=1 , x=3
(II) p(x)=1/2 , x=1,2
(III) p(x)=X/15 , x=1,2,3,4,5
(IV) $p(x)=\begin{cases}\frac{1}{4}\left(\frac{3}{4}\right)^{x} & , X=0,1,2,\ldots\\ 0 & ,O.W\end{cases}$

Q5 : The random variable u has the propbability mass function:
(I) p(u)=1/2 , u= -3
(II) p(u)=1/6 , u=0
(III) p(u)=1/3 , u=4
What is the distribution function F(u) and sketch its graph?

Q6 : Let x be a r. v. with following distribution : Find the C.d.F. of x and draw the diagram ?

$$p(x)=\begin{cases}1/4 & x=-2\\ 1/8 & x=1\\ 1/2 & x=2\\ 1/8 & x=4\\ 0 & o.w.\end{cases}$$

Q7: Abowl contains three red chips and five blue chips , Two chips are drawn at random from the bowl . Let X denote the number of red chips in the sample:Find the p.m.f. and the C.d.F. of x and draw it

Q8 : Two dice are thrown once , Let the r.v.X represent the absolute difference between the Two number shown by the dice : (I) Find the p.m.f. and the C.d.F. of x and draw it ? (II) Find the $p(-1 < x < 3)$, p(x more than 2) , p(x at least 4)?

Q9 : The random variable u has the propbability mass function : $p(x)=\begin{cases}\frac{1}{3} & , x = \cancel{1,2,3,4}\ \text{٠,١,٢} \\ 0 & , O.W\end{cases}$

(I) Show that p(x) is a propbability mass function ?
(II) What is the distribution function F(x) and sketch its graph?

Q10 : For the following function : $p(x)=\begin{cases}C\,X & , X = 1,2,3,4 \\ 0 & , O.W\end{cases}$

Find (I) ~~Find~~ the value of the constant (C) so that p(x) satisfies the conditions of being a p.m.f. for a r. v. X ?
(II) C.d.F. of X and draw it?
(III) E(2X-3) ?
(IV) Var(3X+1)?

Q11: For the following function : $p(x)=\begin{cases}a\left(\frac{1}{3}\right)^{x} & , X = 1,2,3,\ldots\ldots \\ 0 & , O.W\end{cases}$

(I) Find the value of the constant a so that p(x) satisfies the conditions of being a p.m.f. for a r. v. X ?

Q12: Let x is a r. v. having the p.m.f:

x	-2	-1	0	2	3	5
$p(x)$	C	2C	3C	2C	C	4C

(I) Find the value of C ?
(II) Find C.d.F. of x and draw it?
(III) Find : $p(x > -2)$, $p(x < -2)$. $p(x > 0)$, p(x more than 2) , p(x at least 2) ,
$P(-1 < X \le 3)$, $P(-1 < X \le 3)$, $P(X \ge -2)$, $P(X \le 5)$?

Q13 : If the C.d.F of x is : $F(x)=\begin{cases}0 & X < 0 \\ 10/28 & 0 \le X < 1 \\ 25/28 & 1 \le X < 2 \\ 1 & X \ge 2\end{cases}$

(I) Find the p.m.f. of x ? (II) Find $P(-1 < X < 2)$? (II) Find $P(X - 3 \ge -1)$?

Q14: If x is a r. v. having the following p.m.f. :

x	-2	1	3	4
$p(x)$	a^2	$2a^2$	a	a

(I) Showthat a=1/3 ?
(II) Find the C.d.F. of x and draw it ?
(III) Find : $p(x>4)$, $p(x<2)$, $p(x=2)$, $p(x=-2)$, $p(x=1)$, p(x more than 2) , p(x at least 2) , $P(0 \le X \le 2)$, p(x at least one)? $p(|x|>1)$, $p(|x-1|>2)$

Q15 : Adie is thrown once. Define a r.v. X is the number shown by the die. (I) Find the p.m.f. and C.d.F of X and draw it ? (II) Find : $p(x>4)$?

Q16: If the integer from 10 to 20 and we selecte one at random , and x be the number of divisor of each integer , (I) Find the p.m.f. and the C.d.F. of x and draw it?
(II) Find the $p(1<x<5)$, p(x more than 2) , p(x at least 5)?

Q17: If the integer from 1 to 15 and we selecte one at random , and x be the number of divisor of each integer , (I) Find the p.m.f.and the C.d.F. of x and draw it?
(II) Find the $p(1<x<4)$, p(x more than 2) , p(x at least 3)?

Q18: If the integer from 1 to 12 and we selecte one at random , and x be the number of divisor of each integer , (I) Find the p.m.f. and the C.d.F. of x and draw it?
(II) Find the p1< x <4) , p(x more than 2) , p(x at least 5)?

Q19 : Let x be a r. v. having the p.m.f.:

$$f(x) = \begin{cases} K\left(\frac{3}{4}\right)^{X} & , X = 0,1,2,3,\ldots \\ 0 & , O.W \end{cases}$$

(I) Find the value of the constant (K) ? (II) C.d.F. of X ?

Q20 : Let Z be a r. v. giving the number of heads minus the number of tails in two tosses of afair coin . Find the probability function of X ? find the distribution function of X ?

Q21 : Adie is tossed 100 times . the following table list sex numbers and frequency with Which each number appeared :

no.	1	2	3	4	5	6
frequency	14	17	20	18	15	16

(I) Find the relative frequency of the table ?
(II) Find the relative frequency of the events ? (i) a 3 appears . (ii) a 5 appears .
(iii) an even number appears . (iv) aprime number appears .
(III) Find the mode of the X .
(IV) Find the C.d.F. of x and sketch the graph of f (x) and F(x)

Q22 : If x is a r. v. having the p.m.f. : $p(x)=\begin{cases} 3KX-2 & , X=3,4 \\ 0 & ,O.W \end{cases}$

(I) Find the value of K ?
(II) Find C.d.F. of x and draw it?
(III) Find the p(x least than 2) ?

the

Q23 : If x is a r. v. having the p.m.f. : $p(x)=\begin{cases} KX-[illegible] & , X=3,4,5 \\ 0 & ,O.W \end{cases}$

the

(I) Find the value of K ?
(II) Find C.d.F. of x and draw it?
(III) Find the $P(1 \le X \le 3)$?

Q24: (A): If x is a r. v. having the p.m.f. : $p(x)=\begin{cases} KX^2 & , X=1,2,3,4,5 \\ 0 & ,O.W \end{cases}$

the

(I) Find the value of K ?
(II) Find C.d.F. of x and draw it?
(III) Find the $P(3 \le X)$?

Q25: Let : $p(x)=\begin{cases} \frac{(KX+1)}{6} & , X=-2,-1,0,1 \\ 0 & ,O.W \end{cases}$

(i) Find the value of K Such that P(X) is a p.m.f. ?
(ii) Find the c.d.f. of X.

Q26 : Find the values of the random variable of each of the following : (I) The absolute difference of the two numbers on the two dice . (II) The number of times that acoin is tossed until ahead appears .

Q27: Apair of fair die is tossed , Let x be arandom variable defined as followes : X(a,b) =Max(a,b),(a,b)ϵS
What is the p.m.f. of x ? Derive the C.d.F. of x ?

Q28 : Let x be a r.v. having the C.d.F: $F(x)=\begin{cases} 0 & X<-1 \\ 1/9 & -1 \le X < 0 \\ 3/9 & 0 \le X < 1 \\ 1 & 1 \le X \end{cases}$

(I) Find the p.m.f. of x ? (II) Find $P(X \ge 0)$, $P(-1 < X < 2)$, $P(-5 \le X < 1)$, $P(X-3 \ge -1)$?
$P(|X-1| > 0)$