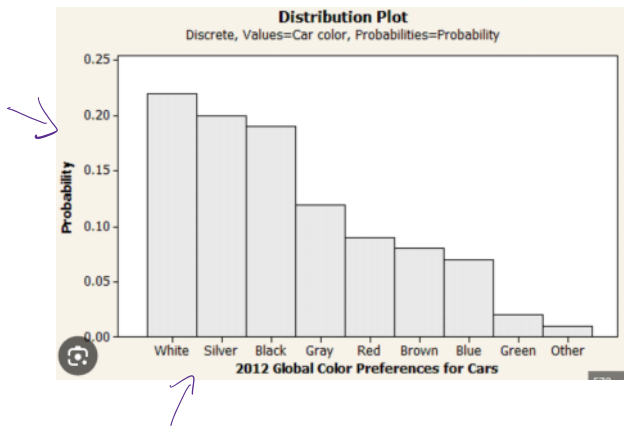


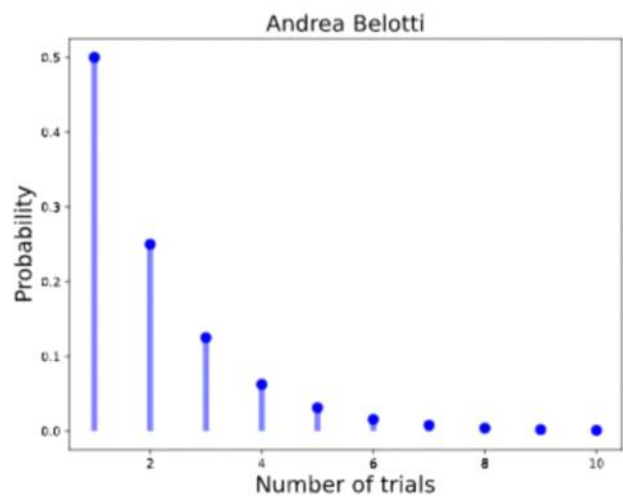
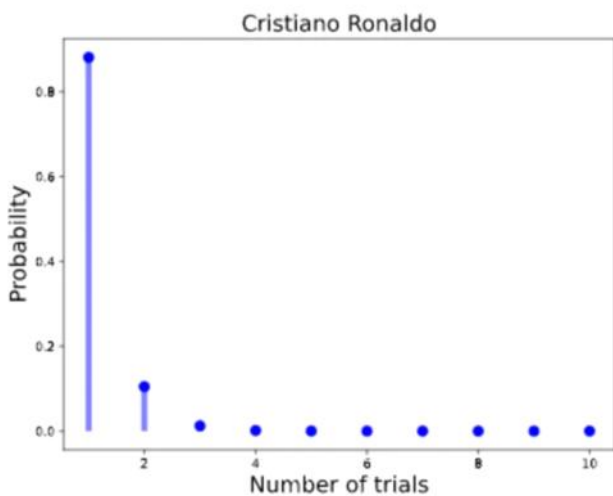
I. Probability Distribution ← discrete (Simple)

The probability distribution is a display of the list of events and each event's probability. Usually, it is a table. (It can be form a graph.)



← a graph

compare



random variable : It is a variable that has a single and a numerical value, determined by chance of the event.

ex roll a die ← not come up

a numerical value, determined by chance of the event.

eg rolling a die. $\leftarrow$ spot comes up

eg drawing a poker-hand $\leftarrow$ 5-cards ranking

eg the weather

eg your grade

eg height

eg winning chance

:

eg all events that were not purposely altered.

eg

<u>E1 score</u>	<u>Probability</u>
0 - 49	0.02
50 - 59	0.03
60 - 69	0.10
70 - 79	0.20
80 - 89	0.30
90 - 100	0.35

Note: It is for finding the expected value, parameters, and for binomial distribution.

Requirement : 1. The random variable x has a probability P

- Requirement :
1. The random variable x has a probability, $P(x)$.
 2. Each $P(x)$ is within $[0, 1]$.
 3. Sum of $P(x)$, which is $\sum P(x)$, that $\sum P(x) = 1$.

eg Determine which, if any, of the following distributions is a Discrete Probability Distribution. For any that are not Discrete Probability Distributions, state why they are not.

A)

x	P(x)
0	.24
1	.46
2	.40

B)

x	P(x)
2	.38
3	.40
4	.22

C)

x	P(x)
1	-.20
2	.70
3	.50

D)

x	P(x)
7	.34
8	?
9	.26

$$S: \sum P(x)$$

$$= .24 + .46 + .40$$

$$= 1.1 \neq 1$$

No

$$1. \checkmark \quad 2. \checkmark \quad 3. \checkmark$$

Yes

$$-2.0 \times$$

No

? doesn't mean
"1 - others"

No

eg. Given the probability distribution below:

x	P(x)
0	.05
1	.10
2	.30
3	.25
4	.20

Find: a. $P(x \geq 4)$

b. $P(x < 3)$

c. $P(1 \leq x < 3)$

don't forget 0

4	.20
5	.10

$$\begin{aligned}
 \text{5: a. } P(X \geq 4) &= P(4 \text{ or } 5) \\
 &= P(4) + P(5) - P(4 \text{ and } 5) \\
 &= .20 + 0.10 - 0 \\
 &= \boxed{0.30}
 \end{aligned}$$

← may skip
↓

$$\begin{aligned}
 X &\geq 4 \\
 4 &\geq 4 \checkmark \\
 5 &\geq 4 \checkmark
 \end{aligned}$$

$$\begin{aligned}
 \text{b. } P(X < 3) &= P(0 \text{ or } 1 \text{ or } 2) \\
 &= P(0) + P(1) + P(2) \\
 &= 0.05 + 0.10 + 0.30 \\
 &= \boxed{0.45}
 \end{aligned}$$

x	P(x)
0	.05
1	.10
2	.30
3	.25
4	.20
5	.10

$$\begin{aligned}
 X &< 3 \\
 \uparrow \\
 0, 1, 2, \cancel{3} \\
 \cancel{3} &< 3
 \end{aligned}$$

$$\begin{aligned}
 \text{c. } P(1 \leq X < 3) &= P(1 \text{ or } 2) \\
 &= P(1) + P(2) \\
 &= 0.10 + 0.30 \\
 &= \boxed{0.40}
 \end{aligned}$$

$$\begin{aligned}
 1 &\leq X < 3 \\
 1 &\leq 1 < 3 \checkmark \\
 1 &\leq 2 < 3 \checkmark \\
 1 &\leq 3 < 3 \times
 \end{aligned}$$

eg. Given the probability distribution below:

x	P(x)
0	.05
1	.10
2	.30
3	.25
4	.20
5	.10

Find: a. $P(x \text{ is no less than } 4)$

b. $P(x \text{ is no greater than } 2)$

c. $P(x \text{ is more than } 4)$

S: a. $P(x \text{ is no less than } 4)$

$$= P(4 \text{ or } 5)$$

$$= P(4) + P(5)$$

$$= 0.20 + 0.10$$

$$= \boxed{0.30}$$

no less than 4?

1st: less than 4
~~*~~ 3, 2, 1, 0

2nd: no less than 4
 4, 5

b. $P(x \text{ is no greater than } 2)$

$$S: = P(0 \text{ or } 1 \text{ or } 2)$$

$$= P(0) + P(1) + P(2)$$

$$= 0.05 + 0.10 + 0.30$$

$$= \boxed{0.45}$$

greater than 2:
~~*~~ 3, 4, 5

no greater than 2:
 0, 1, 2

x	P(x)
0	.05
1	.10
2	.30
3	.25
4	.20
5	.10

c. $P(x \text{ is more than } 4)$

S: 4 more than 4? No

$$= P(5)$$

$$= \boxed{0.10}$$

eg. Here is a probability distribution of rolling a die:

x	1	2	3	4	5	6
$P(x)$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

eg Here is a probability distribution of the sum of two dice.

S: 2 - 12

Sum | $P(\text{sum})$ ↖ 6x6 sample space

2	$\frac{1}{36}$
3	$\frac{2}{36}$
4	$\frac{3}{36}$
5	$\frac{4}{36}$
6	$\frac{5}{36}$
7	$\frac{6}{36}$
8	$\frac{5}{36}$
9	$\frac{4}{36}$
10	$\frac{3}{36}$

		Die 1					
		1	2	3	4	5	6
Die 2	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

36 of them

1	$\frac{1}{36}$
10	$\frac{3}{36}$
11	$\frac{2}{36}$
12	$\frac{1}{36}$

