

Probability

Probability Mass Function | Random Variable

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| Intro

- It is common for the possible values of a discrete random variable to be a set of integers.
- For any discrete random variable, if we specify the **list of its possible values along with the probability** that the random variable takes on each of these values, then we have **completely described** the **population** from which the random variable is sampled

| Example - 01

- Suppose, for example, that a business has just purchased **four laser printers**, and let X be the number among these that **require service during the warranty period**.

| Example - 02

- **The number of flaws in a 1-inch length of copper wire** manufactured by a certain process varies from wire to wire. Overall, **48%** of the wires produced have **no flaws**, **39%** have **one flaw**, **12%** have **two flaws**, and **1%** have **three flaws**.

| Probability Mass Function

- The **probability mass function** of a discrete random variable X is the function $p(x) = P(X = x)$.
- The probability mass function is sometimes called the **probability distribution**.

| Probability Mass Function

- Note that if the **values of the probability mass function are added over all the possible values of X** , the sum is equal to 1.

| Example - 03

- A certain gas station has **six pumps**. Let X denote the **number of pumps that are in use** at a particular time of day. Suppose that the **probability distribution of X** is as given in the following table

x	0	1	2	3	4	5	6
$p(x)$	.05	.10	.15	.25	.20	.15	.10

| Example - 03

- The probability that at most 2 pumps are in use?
- $p(x \geq 3)$?
- The probability that between 2 and 5 pumps inclusive are in use ?

x	0	1	2	3	4	5	6
$p(x)$	.05	.10	.15	.25	.20	.15	.10

| Example - 04

- The experiment of **tossing a coin twice**. Let X represent number of heads appearing

| Example - 05

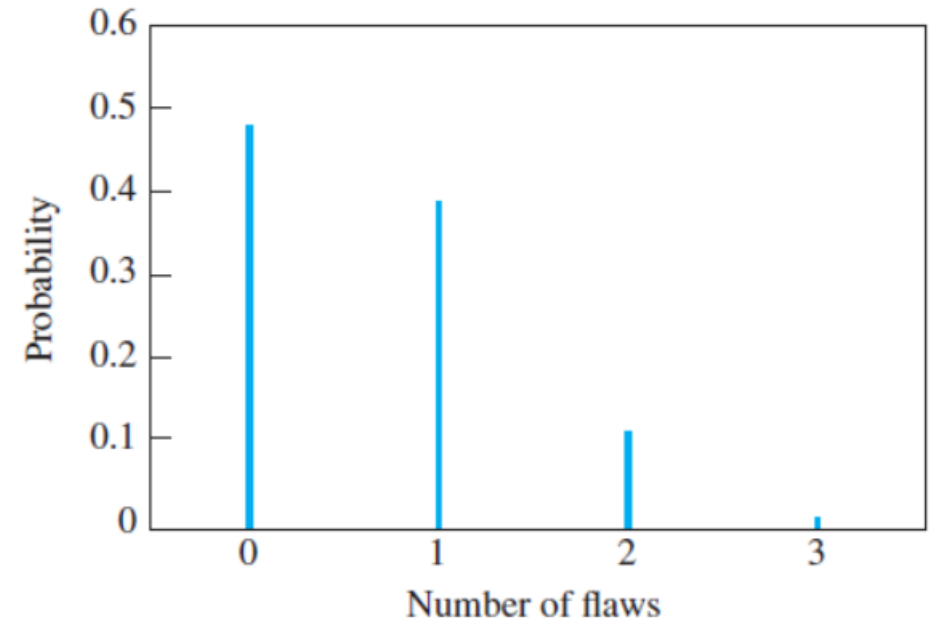
- Considering the experiment of tossing two dice. The random variable X represents the sum of the two numbers. Find the probability distribution $p(X)$

| Probability Mass Function - Graph

- The **probability mass function** can be represented by a graph in which a **vertical line** is drawn at each of the **possible values** of the random variable. The **heights** of the lines are **equal to the probabilities of the corresponding values**.

| Probability Mass Function - Graph

- The **probability mass function** can be **represented by a graph** in which a **vertical line** is drawn **at each of the possible values** of the random variable. The **heights** of the lines are **equal to the probabilities of the corresponding values**.
- The physical interpretation of this graph is that **each line** represents a **mass equal to its height**



| References

- Statistics for Engineers and Scientists, Fourth Edition, William Navidi
Colorado School of Mines
- Khan Academy