Introduction
Psychophysics is a combination of two terminologies. Psycho is related to mind and physics is related to physical quantity. In psychophysics, physics refers to the measurement of some mental experience. We can measure physical quantities like length, height, weight, etc. of a particular physical object. Similarly, in psychophysics, we measure a quantity called percept. This is the perception of an individual corresponding to a physical quantity of some physical object. For example, length can be perceived as size, weight can be perceived as heaviness, intensity can be perceived as brightness volume can be perceived as loudness and so on. The perception of an individual makes difference in analyzing the physical objects in everyday life. For example, the same loudness of music can be low for one person, but for other it can be high. Another example can be the force of a push. One person can perceive it as a gentle push and other can perceive it as a harsh push.

Physical vs Perception
Physical methods can be measured by using some physical tools. For example, length can be measured by a scale, temperature can be measured by a thermometer, etc. Perception cannot be easily measured. There are no physical instruments which can measure a perception of an individual mind. Perception is analyzed by different psychophysical methods. These methods are used to quantify perception to make the analysis of perception easier. A thorough research is conducted for such analysis. For example, an instrument can be used to measure the intensity of sound of radio, which is physical analysis. 10 different persons are asked to listen to the radio and rate the loudness on a scale of 1 to 10, this research will help in psychophysical analysis of the sound of radio.

Fundamental Quantities of Psychophysics
1. **Threshold**: Threshold is the value of physical quantity at which some change occurs or is perceived to occur. If we are going from maximum value to minimum value, then it will be maximum value at which some change occurs. If we go from minimum value to maximum value, then it will be the minimum value at which some change occurs. For example, a person is given a radio playing some song and set at zero volume. He is asked to increase volume slowly. The volume at which he will perceive the sound as loud will be the threshold volume for the loudness according to that person.
2. **Scale**: Scale is a comparison between two different objects or two different conditions of same object. For example, an individual is asked to differentiate between two different sounds on the basis of loudness and then is asked to comment whether sound A is loud or
sound B is loud.

Weiber’s Law
In early 1800, Weiber studied perception of heaviness. He asked people to lift two weights and comment on the difference between the two weights. He noticed that, heavier the weight was given, more was the difference between two weights in order to notice some difference between them by that person. This will be clear by following formula:

\[ dP = k \cdot \left( \frac{dI}{I} \right) \]

where \( dP \) is the percept, \( dI \) is the difference between Intensity of two physical quantities and \( I \) is the given physical quantity.

Suppose, a person is already holding a weight and a weight of 2kg is given. Assume that \( k = 200 \). For \( dP \) to be 1, \( dI = I/k \).

So, \( dI = 2000/200 = 10 \).

Thus, the difference between the two weights must be 10 grams in order to notice the difference in two weights. This weight is considered as JND (Just noticeable difference).

According to Weiber’s experiment, JND is directly proportional to the weight observed. The heavier the weight is compared, the more JND is.

Weiber-Fechner Law
Fechner introduced the detection threshold. He incremented the observation from zero and analyzed the results to the threshold. This introduction of threshold led to Weiber-Fechner Law.

\[ dP = k \cdot \left( \frac{dI}{I} \right) \]

If we integrate this equation, we will get,

\[ P = k \cdot (\ln I) + c \]

When \( P = 0 \), \( c = -(k \cdot \ln I_0) \)

So, \( P = c \cdot (\ln I) - c \cdot (\ln I_0) \)

So, \( P = c \cdot (\ln(I/I_0)) \)
If we assume that $c = 1$, we can detect a noticeable difference at $P = 1$, if intensity $I = e \times I_0$.

**Methods for Psychophysical Analysis**
(The examples discussed in methods are my own examples)

1. **Method of Constant Stimuli:** In this method, experiments are conducted with random values. For example, an experiment is conducted with different volume levels for sound. Different volume levels are presented randomly to the participants and they are asked whether the sound is loud or not.
   Pros of this method are that we only have to conduct the experiments and plot the curve. Cons of this method are that we must have some idea about the threshold and we have to conduct lots of experiments.

2. **Method of limits:** In this method, the experiment is started from a specific level. Let us assume that the experiment is to detect the threshold of loudness of sound. The experiment will start from a specific sound level, let us say 10. Let us assume that the threshold intensity is 50. 10 is not loud enough, so the frequency is increased to 60. 60 is loud, so the frequency is decreased to 20 and so on. In this, the graph converges in the end. A question was asked whether the intensity goes back to zero, then changes. If the intensity is high, the test value is reduced. If the intensity is low, the test value is raised.
3. **Method of adjustments:** In this case, the subjects adjusts themselves till they think they have detected the stimulus. The participants can increase or decrease the value of the intensity. The participants are given an initial test value. They can use buttons or dial to increase or decrease the value of intensity. In these experiments, trials will be of two types, ascending trial and descending trial. Ascending trial is where the participant increase the level of intensity. Descending trial is the where the participant decreases the level of intensity. For example, participant is given a test intensity of 10. He increases it to 50. This will be an ascending trial. If he is given 70 as test intensity, he will reduce it to 50. This will be a descending trial.

After experiments, we will take mean of ascending trials and mean of descending trials. These means should not be too different. In the end, we will take a grand mean. This mean will be Point of Subjective equality.

Illusions are based on this kind of visual perception.