

# PREFERRED NUMBERS AND THE NORMAL DISTRIBUTION

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The frequency ratio for the individuals coming up to any given sizes of a parameter like foot or neck size, or height, weight etc. commonly called anthropometric measures is given by what is known as the Gaussian or Normal Distribution. Recently an excellent account of this was given by Dr. \*Jagjit Singh<sup>[1]</sup> a well-known science writer, a Mathematician-cum-Statistician and a professional Manager.

In the normal distribution the frequency ratio of the individuals coming up to any given size of any anthropometric measure as above is of course evident. But one thing is not clear even in this normal distribution and it is the actual sizes that a professional Manager have really to take into account. In the normal distribution, it may be noted, that the sizes vary continuously about the mean, whereas, a professional Manager needs to know only the discrete values of the sizes which will suit actual needs. In the formula given below for the normal distribution it is the value of  $X$  that is of importance and that is what is not clarified by the normal distribution alone.

$$y = \frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{1}{2} \left( \frac{x-a}{\sigma} \right)^2}$$

( $y$ =frequency ratio,  $\sigma$  the standard deviation, ' $a$ ' arithmetic mean of the sizes for the population considered and  $X$  is any particular value of such a size.)

One knows about what is called the Preferred Numbers. These numbers cater to the sizes of any commodity that are generally satisfactory with regard to the consumers' requirements. In addition to many daily necessary items even sizes of machines, machine parts and tools etc. are nearly always determined by these numbers. The range of sizes in the preferred numbers follow more or less closely a geometrical progression. Several countries in the world have adopted

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\*This author privately communicated to Dr. Jagjit Singh about the idea presented in this paper *i.e.* the application of the Preferred Numbers within the normal distribution.

as standard the use of one or the other of the following ranges of preferred numbers :

- (a) The largest size 10 times the smallest in 5 steps.
- (b) The largest size 10 times the smallest in 10 steps.
- (c) The largest size 10 times the smallest in 20 steps.
- (d) The largest size 10 times the smallest in 40 steps.
- (e) The largest size 10 times the smallest in 80 steps.

The theoretical numbers based on this and suitably rounded off for practical convenience are really known as the actual preferred numbers. In the range cited above the common ratios between the successive numbers of a range will be respectively

$$\sqrt[5]{10}, \sqrt[10]{10}, \sqrt[20]{10}, \sqrt[40]{10}, \text{ and } \sqrt[80]{10}$$

equalling 1.58, 1.26, 1.12, 1.06 and 1.03. These common ratios would mean that the successive terms in the respective series increase by approximately 58%, 26%, 12%, 6% and 3%. The series can be extended further also. The series ranges as above are designated as R5, R10, R20, R40, etc. where R stands for Renard (Charles Renard of France who adopted this first).

We had talked about the discrete values of  $X$  in Eq. (1) that have to be actually tried in the normal distribution so as to ensure good semblance with the actual consumers' demands. Since the preferred numbers as already stated meet the consumers requirements in many cases, the numbers of the different series (a particular series may suit best any particular anthropometric measure) should therefore be not out of proportion with the numbers that one may like to choose for the values of  $X$  in the Eq. (1). The value of ' $a$ ' will however come near the middle of a series. Thus, the frequency ratios for the various values of  $X$  suitable to the sizes according to consumer demands can be obtained from the Eq. (1) and with such information a professional Manager can plan his production of the items economically.

#### SUMMARY

In this paper the importance of the Preferred Numbers along with Gaussian distribution have been emphasized in determining the sizes of various anthropometric measures as suitable for consumers thus giving a very economical production schedule for the professional Manager.

#### REFERENCE

- [1] "Managers should note some Maths." by Jagjit Singh, Science Today, p. 30, June, 1975.