For release:

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From

IBM

IBM Pavilion
World's Fair, New York 11380

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Probability Machine

The Probability Machine, a giant, glass-enclosed device resembling a vertical pinball machine, demonstrates how a probability curve can be found by experiment.

A stream of 15,000 polyethylene balls pours down from the center top of the machine through a maze of hundreds of aluminum pins into 21 chutes at the bottom of the machine, forming a bell-shaped "curve of probability." The effect of the completely random action of the bouncing balls is to form almost exactly the same curve each time the balls are dropped. This curve is known as the "normal distribution curve" of science. The curve charts what is normal or average in a large number of test cases.

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If the sample, in this case the number of balls, is both large and random, the graphic curve always appears bell-shaped. The curve describes such things as I. Q. s in a large public school, the potential number of accidents in a large group of car insurance policy holders or the life span of a big quantity of light bulbs rolling off the assembly line.

The mathematician sees probability as a percentage: the frequency with which one phenomenon takes place in relation to possible alternatives. The probability of a ball dropping in any box can be found by counting the number of paths to that box, and comparing it with the total number of paths. A ball can land in any of the 21 chutes and yet any given chute fills to nearly the same height each time the experiment is repeated. The stability is due to the large number of balls, for according to probability theory, if a random event happens a great many times the average results are likely to be predictable.

The science of probability developed from the work of Blaise Pascal in 17th century France. Attempting to solve the problem of how to split the pot in a dice game that has to be discontinued, Pascal corresponded with the amateur mathematician, Pierre Fermat. They began by agreeing that the stakes on table should be divided according to the prospects each player has of winning. In trying to settle this gambler's argument, Pascal gave mathematics one of its most important tasks -- prediction.

In the 300 years since Pascal's work, mathematical laws of probability have helped establish the insurance business, enabled scientists to predict the molecular behavior of gases, forecast the results of cross-breeding animals or plants, or analyze the value of a new serum. The mathematical insight that made all this possible is now being applied to weather forecasting, psychological testing and public opinion research. Probability has become a science that calculates in advance the chances of an untold number of events for man's benefit.

In the Probability Machine, the balls are carried to the top in 48 buckets attached to 32 feet of chain. When all the balls have been dropped, the chain stops. A gong sounds for a minute when the curve is fully formed. The balls then fall through a hopper, where a conveyor belt feeds them back to the buckets on the chain to repeat the experiment. The experiment is completed in cycles of 14 to 18 minutes. The machine is 14 1/2 feet high, 8 feet 4 inches wide and 16 inches thick. It weighs 2, 800 pounds.

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