Q: A dart is thrown at the Gaussian curve. Let the location of the dart be (x,y). What is the expected value of the absolute value of x?

A: This is a very practical question. The more a gambler plays, the more the net sum of his results will fall along a bell curve. To restate your question, as the number of bets approaches infinity, what is the mean number of standard deviations the player's net result will be from expectations, in either direction. That said, let me answer your question.

Let's let x be a random variable distributed on a bell curve with mean 0 and standard deviation 1. In other words, the Gaussian curve.

As you should recall from statistics class, the density of any value of x will be proportional to $\exp(-x^2/2)$.

If we take the integral from $-\infty$ to $+\infty$ of $\exp(-x^2/2)$ we get $\sqrt{2\pi}$.

To get the exact density of x, we must divide by this total area of the bell curve of $\sqrt{2\pi}$.

Our task is to find the mean distance from 0 of x.

To do that we take the following integral:

$$\int_0^\infty 2x \cdot \frac{e^{-\frac{x^2}{2}}}{\sqrt{2\pi}} \, dx$$

The reason for multiplying by 2 is we are looking at only half the bell curve.

Using an integral calculator (I recommend the one at www.integral-calculator.com/), we get a value of this integral of $\sqrt{2/\pi}$ =~ 0.7978845608028653558798921198687637369517172623298693153318516593413158517986036770025046678146138728606051177252703653710219839091116744859924254612510154126905411654409986351290326916150611945072854641673391869565434059983728381269120656178667772134093073.