Code	**MONTE_CARLO_SIMULATION.PY**
Author	Nathaniel Heatwole (heatwolen@gmail.com) (GitHub) (LinkedIn)
Summary	Uses Monte Carlo simulation to test the central limit theorem, by generating and averaging random draws from several constituent distributions (triangular).
Methods/ process	Monte Carlo simulation: - Method for evaluating complex probability spaces, where the output depends on several constituent probability distributions. - Can evaluate probabilistic quantities for which closed-form analytic solutions do not exist. - Constituent distributions can be of any type/family, discrete or continuous. Central limit theorem: - States that the average value of a sequence of random variables, each independently sampled, is normally distributed. - Asymptotically correct, as the number of distributions (and observations) increases. - Holds regardless of the types/parameters of the constituent distributions. Steps: 1. Define the constituent distributions. 2. Generate one random sample from each of those distributions (sampling them independently, with replacement). 3. Compute the average value of those random samples (unweighted). 4. Repeat this process for many sets of random draws (enough to sufficiently cover the sample space and generate a reasonably stable output distribution). 5. Assess the distribution of the average value across all trials.
Training data	Constituent distributions: - 10 triangular distributions (each with three parameters: minimum, mode, and maximum). - Fixed-width, non-overlapping, and abutting (no space between). - Mode value alternating between minimum and maximum values. - Each distribution is highly non-normal (skewed, with linear density segments). - Resembles a sawtooth wave, when all of the distributions are viewed together. - 1 million observations randomly generated from each distribution.
Output	Plots: - Scatter matrix (univariate histograms, 2D relationships) - Constituent distributions (sawtooth-like shape) - Average value distribution (histogram, cumulative probability)
Result	Although the constituent distributions are highly non-normal, the distribution of their average value is a smooth bell-shaped curve, as the central limit theorem predicts.