

The following numbered questions should be split across your group and the solutions discussed during the next lecture period. These are all Monte Carlo class simulations (because **time** is not important to the system) for correctly generating random points within geometric regions.

- i. You may use a pRNG provided by your language of choice (provided it is **not** `rand(3)`).
- ii. You may need to implement your own *Uniform*(a, b) and *Equilikely*(a, b) routines (definitions 2.3.3 and 2.3.4).

Students should review the [learning goals for the day](#), determine which are applicable to their questions and provide answers or commentary to their group members.

1. Question 2.3.15 (§2.3.6). As in the recent [lga-monte-carlo-probs](#), use at least 5 seeds and generate a plot similar to Figure 2.3.2 that shows the initial “erratic” running averages of short circuit length up to a point where all 5 seeds are clearly converging to the same smaller interval.
2. (a) Given points $(x_1, y_1), (x_2, y_2), (x_3, y_3)$ that define a triangle, write an **accept-reject** Monte Carlo simulation to generate random (x, y) points within the interior of the triangle. Without loss of generality, you may assume the points define a triangle in the first quadrant.
(b) A picture is worth a thousand words, and a (good) plot is worth a novel. Generate two different 2d plots similar to Figure 2.3.4 of the text showing the distribution of 100 generated points and 5000 generated points (using your solution of course).
3. (a) Write a Monte Carlo simulation to generate random (x, y) points between the curve $y = \sin x$ and the x -axis for $0 < x < 2\pi$.
(b) A picture is worth a thousand words, and a (good) plot is worth a novel. Generate two different 2d plots similar to Figure 2.3.4 of the text showing the distribution of 100 generated points and 5000 generated points (using your solution of course).
4. Devise and implement an algorithm for question 2 that **does not use the general accept-reject method**. As in question 2, generate two spatial plots as well. Do your points look good?