**Blue Waters Petascale Semester Curriculum v1.0**

**Unit 5: MPI**

**Lesson 3: Collective vs. Point-to-Point Communication**

**Exercise Instructions for Students**

*Developed by Mobeen Ludin for the Shodor Education Foundation, Inc.*



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*Browse and search the full curriculum at*[*http://shodor.org/petascale/materials/semester-curriculum*](http://shodor.org/petascale/materials/semester-curriculum)

*We welcome your improvements! You can submit your proposed changes to this material and the rest of the curriculum in our GitHub repository at*[*https://github.com/shodor-education/petascale-semester-curriculum*](https://github.com/shodor-education/petascale-semester-curriculum)

*We want to hear from you! Please let us know your experiences using this material by sending email to* [*petascale@shodor.org*](mailto:petascale@shodor.org)

In the exercise folder, please see the Pi approximation using Monte Carlo’s method documentation for description of the problem and instructions for implementing it with MPI collective communication routines.