Lesson 5.7 Instructor Guide

- Instructors are encouraged to give a brief overview of distributed memory but mainly focus on message passing concepts
- Brief review of MPI point-to-point communication
- Use global sum computation as an example scenario when you will need collective communication modes. When one process distributes work to the rest of the process in the communicator and gathers back partial sums from each process.
- Use the Tree and Butterfly Structures slides (diagram and pseudocode) to demonstrate how this could be achieved.
- Explain why it's better to use the MPI routines rather than developing your own
- Use example codes in the examples folder to explore each collective communication routines.
- Use π integration as a simple but scientific example scenario for using MPI_Bcast and MPI_Reduce functions.
- Students how could π integration be done with MPI_Scatter and MPI_Gather functions, and what's a more appropriate use case for MPI_Scatter and MPI_Gather.
- Walk through the exercise in the exercises folder. Encourage students to work in group or 2-3 for solving π using Monte Carlo method with MPI Collective communication routines.

Lesson 5.7 - Common pitfalls for students and instructors

- Depending on when this module is used for teaching or learning, OpenMPI library implementation might have changed. Most of the time main MPI communication routines will stay the same and have the same naming conventions. However, it's possible that the developers will modify some routines such as those for error handling or MPI data types. Therefore, both instructors and students are encouraged to check the [MPI library documentation](#) for updates.
- Deadlocks are the most common errors when using MPI caused by synchronous or blocking send/receive functions. One could either fix the issue by changing the order of operations, or use the non-blocking implementation of the same communication routines provided by MPI library.