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

**Unit 7: CUDA**

**Lesson 9: Heat Diffusion in 1-2 D**

**Sample Assessment**

*Developed by David A. Joiner for the Shodor Education Foundation, Inc.*

Consider 3 different problems, solution of the heat equation in 1D with 100 points, solution of the heat equation in 1D with 10000 points, or solution of the heat equation in 2D with 1000 points. Rank them in what you would expect to be parallel efficiency with run on a GPU, assuming the most efficient possible solution.

Given a nested loop over i and j representing x and y, how would you set up your index structure in a GPU kernel (e.g. in 1D you might write i = threadIdx.x + blockDim.x\*blockIdx.x)? Include any additional considerations you will need to make (number/dimension of blocks and threads to start the kernel, any if or while statements inside the kernel).



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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)