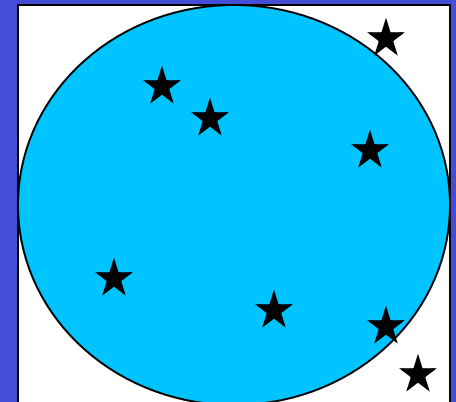# MPI: Homework

<u>Write the following MPI programs:</u> Make sure you print stuff out to prove it works in each case!

1. Hello World: A program that starts MPI running on a number of processors, and then writes out "Hello" from each processor, stating the processor rank and the size of the comm world.

2. Simple send-receive: A program that simply sends some data from one processor to another, using the standard MPI send and receive.   Send an array of real data.

3. Ping-pong: A program that sends data backwards and forwards between two processors.

SAVE FOR LATER!!! 4. Latency: A program to time message transfers of various size messages. Put a loop around your ping-pong and use MPI_WTIME to time the message transfers. From this data, figure out what the constants are for the formula $T_{comm}=t_{startup}+t_{perdata}L$

5. Ring: A program where each processor sends some data (e.g. its processor number) around a ring of N processors -- shift all data to the left (N times) or shift all data to the right. or both (bonus!)

6. Pi: A program to figure out π by the "dartboard method" in parallel:
A circular dartboard on square background has a ratio of the areas
$= \pi r^2/(2r)^2 = \pi/4$
If we throw darts randomly at the dartboard, and examine whether they fall in the circle or not, we can figure out this ratio and therefore estimate π (as 4 times the ratio).
(Hint: don't forget to begin by thinking about what are the tasks for each processor, and what is the communication needed)

MPI: Homework

Submit a tar file containing the following:

1.   Your .f90 files for each of the tasks (use the obvious names!)

2.   A README.TEXT file that gives the command necessary to compile each one and the mpirun command that is used to run each one.

3.   A sample output file from each showing that it has worked