Name: _____

Directions: **Work only on this sheet** (on both sides, if needed); do not turn in any supplementary sheets of paper. There is actually plenty of room for your answers, as long as you organize yourself BEFORE starting writing.

Unless otherwise stated, give numerical answers as expressions, e.g. $\frac{2}{3} \times 6 - 1.8$. Do NOT use calculators.

1. Consider a six-dimensional hypercube D, subdivided into two five-dimensional hypercubes D_0 and D_1.

(a) () What is the node number of the partner of node 23?

(b) () What is the node number of the root in D_1?

(c) () Suppose our algorithm requires partners in the two 5-cubes to exchange their values of an **int** variable **x**. What would be the best MPI function for this purpose?

2. Consider the program on pp.85-87.

(a) () Suppose that while running the program, someone runs the shell commands **ps** and **gdb**. At this point, the likely line number on which the program is running (at all nodes) is _____.

(b) () Fill in the table regarding the actions of lines 107 and 108 and the array **overallmin**, at a given node. Mark an entry R if the array is read, W if it is RW if both, and N if neither:

node number	107	108
0		
$\neq 0$		

(c) () This example program is somewhat artificial, in that each node generates its data matrix **ohd**. Instead, say that node 0 has the matrix, say by reading it from disk, and wishes to distribute it to the other nodes. Give a single line of code that would replace lines 57-64, that would accomplish this distribution.

Solutions:

1a. $23 + 32 = 55$

1b. 100000, i.e. 32

1c. MPI_Sendrecv()

2a. 70

2b.

node number	107	108
0	W	R
$\neq 0$	N	W

2c.

```
MPI_Bcast(ohd,nv*nv,MPI_INT,0,MPI_COMM_WORLD);
```

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