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

**Unit 9: Optimization**

**Lesson 2: Code Optimization Patterns**

**Sample Assessment**

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



*Except where otherwise noted, this work by The Shodor Education Foundation, Inc. is licensed under CC BY-SA 4.0. To view a copy of this license, visit*[*https://creativecommons.org/licenses/by-sa/4.0*](https://creativecommons.org/licenses/by-sa/4.0)

*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)

**Given the following code fragment identify all areas in which the loop may be optimized. For each optimization, describe the principle of optimization being used.**

#include <stdio.h>

#include <stdlib.h>

#include <math.h>

double f(double x) {

return 1/(x+0.5);

}

int main(int argc, char \*\* argv) {

int n = 100000;

int i;

double \* x;

double \* y;

x = (double \*) malloc(sizeof(double)\*n);

y = (double \*) malloc(sizeof(double)\*n);

for(i=0;i<n;i++) {

if(i==0||i=n-1) {

x[i]=0.0;

y[i]=0.0;

}

x[i] = pow((double)i\*0.001,2.0);

y[i] = f(x[i])+2.0\*sin(3.0);

}

free(x);

free(y);

}