```c
#include <stdlib.h>
#include <stdio.h>
#include <math.h>
#include "common.h"


int main(int argc, char** argv)
{
    //maximum size of vector - 2^14 for Exercise 4
    int maxN = pow(2,14);

    //value of sum as n->infinity
    double exactsum=pow((4.0*atan(1.0)),2)/6.0;

    //initialize some variables
    double sum=0;
    int k=4;
    int nextN=pow(2,k);

    //make the vector
    Vector v = createVector(maxN);

    //fill the vector
    for (int i=0;i<maxN;++i) {
        v->data[i] = 1.0/((double)(i+1)*(double)(i+1));

        //calculate the sum on the fly - saves a second for loop
        sum += v->data[i];

        //print difference at 2^k, k=4...14
        //for the price of a logical every i, only have to run through vector
        //once instead of length(k) times
        if (i+1==nextN) {
            printf("difference at i=2^%2i: %1.16f\n", k, exactsum-sum);
            k++;
            nextN=pow(2,k);
        }
    }
}
```