

Name_____

Please circle your section number:

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Answer the multiple choice questions on a “Scantron Form”

Bubble in ONLY your Unix userid and your answers

DO NOT bubble in your id number or section

If you bubble in your SSN, the computer will **reject your form!!!**

Answer the remaining questions directly on the exam paper.

General Instructions

- The exam is 50% multiple choice, and 50% programming.
- The programming questions start with number 15. You may want to tackle them first, since they may take more time.
- DO NOT WRITE YOUR NAME ON ANY PAGE EXCEPT THIS ONE!
- You have 50 minutes. **Pace yourself**, and pay attention to the point values.
- Read *all* the directions *carefully* on each problem.
- Good luck.

Questions 1 through 3 deal with number conversions.

1. (3 pts) Convert 103 from decimal to binary:

- (a) 0110 1101
- (b) 0110 0111
- (c) 1101 1010
- (d) 1110 1110
- (e) 0111 0111

2. (3 pts) Convert 103 from decimal to octal (hint: refer back to question 1).

- (a) 125
- (b) 155
- (c) 332
- (d) 147
- (e) 167

3. (3 pts) Convert 103 from decimal to hex (hint: refer back to question 1).

- (a) EE
- (b) 6D
- (c) 67
- (d) DA
- (e) 77

Questions 4 through 6 deal with Unix Commands. Suppose your current working directory is `~/cisc181/lab03`.

4. (4 pts) Which of the following Unix commands will copy all files ending in `.cc` from a directory `~/cisc181/lab02` into your current working directory?
 - (a) `cp ../lab02/*.cc .`
 - (b) `cp lab02/*.cc ..`
 - (c) `cp ../lab02/*.cc ..`
 - (d) `cp ./lab02/*.cc .`
 - (e) `cp ../lab02 *.cc`

5. (4 pts) Which of the following will create a subdirectory called `~/cisc181/lab03/backup`?
 - (a) `cd backup`
 - (b) `chmod -R a+rx backup`
 - (c) `mkdir backup`
 - (d) `mkdir ../backup`
 - (e) `mkdir ~/backup`

6. (4 pts) Which of the following Unix commands will change your current working directory to your home directory?
 - (a) `cd ..`
 - (b) `cd`
 - (c) `cd ~/cisc181`
 - (d) `pwd`
 - (e) `pwd ..`

Questions 7 through 11 deal with code in q5.cpp, shown here:

```
// q5.cpp for CISC181 exam E01, Fall 2005
// P. Conrad, 10/07/2005

#include <iostream>
using std::cout;
using std::endl;

void incl(int n, int m)
{
    n++;
    m++;
    cout << "incl: " << m << endl;
}

int main()
{
    int a = 3;
    int b = 4;
    int c = 5;

    cout << "main1: " << a << " " << b << endl;
    incl(a,b);
    cout << "main2: " << a << " " << b << endl;

    return 0;
}
```

7. (3 pts) Which of the following are the *names* of the *formal parameters* of function `incl()` ?
- (a) a and b
 - (b) n and m
 - (c) int and int
 - (d) `std::cout` and `std::endl`
 - (e) `n++` and `m++`
8. (3 pts) Which of the following are the *names* of the *actual parameters* of function `incl()` ?
- (a) a and b
 - (b) n and m
 - (c) int and int
 - (d) `std::cout` and `std::endl`
 - (e) `n++` and `m++`

9. (4 pts) Which of the following would be the *first* line of output from this program?

- (a) `incl: 4`
- (b) `incl: 5`
- (c) `main1: 3 4`
- (d) `main2: 3 4`
- (e) `main2: 4 5`

10. (4 pts) Which of the following would be the *last* line of output from this program?

- (a) `incl: 4`
- (b) `incl: 5`
- (c) `main1: 3 4`
- (d) `main2: 3 4`
- (e) `main2: 4 5`

11. (3 pts) Which of the following are the *types* of the *actual parameters* of function `incl()` ?

- (a) `a` and `b`
- (b) `m` and `n`
- (c) `int` and `int`
- (d) `std::cout` and `std::endl`
- (e) `n++` and `m++`

Questions 12 through 14 deal with the following program called reverseDigits1.cc

```
// reverseDigits1.cc P. Conrad
// Three functions to print digits; which ones reverse them?

#include <iostream>
using namespace std;

void printDigits(int x)
{
    if ( x <= 9)
        cout << x;
    else
    {
        printDigits(x / 10);
        cout << (x % 10);
    }
}

void printTheDigits(int x)
{
    while (x > 0)
    {
        cout << x % 10;
        x /= 10;
    }

    return;
}

void printThoseDarnDigits(int x)
{
    if ( x <= 9)
        cout << x;
    else
    {
        cout << (x % 10);
        printThoseDarnDigits(x / 10);
    }
}

int main(void)
{
    int x;

    // prompt for input

    cout << "Enter a number" << endl;
    cin >> x;
    x = (x < 0) ? -x : x ; // take absolute value of x

    // print output from three different functions, separated by newlines

    printDigits(x);
    cout << endl;
    printTheDigits(x);
    cout << endl;
    printThoseDarnDigits(x);
    cout << endl;

    return 0;
}
```

12. (4 pts) Excluding the definition of `main()`, this program contains three function definitions. Which of them defines a recursive function?
- (a) only `printDigits()`
 - (b) only `printTheDigits()`
 - (c) only `printThoseDarnDigits()`
 - (d) `printDigits()` and `printTheDigits()`
 - (e) `printDigits()` and `printThoseDarnDigits()`
13. (4 pts) Which of these functions prints the digits in reverse order?
- (a) only `printTheDigits()`
 - (b) only `printThoseDarnDigits()`
 - (c) `printDigits()` and `printTheDigits()`
 - (d) `printDigits()` and `printThoseDarnDigits()`
 - (e) `printTheDigits()` and `printThoseDarnDigits()`
14. (4 pts) There are many operators used in this program, but only one of them is used as a *unary* operator. Which one?
- (a) `-`
 - (b) `<<`
 - (c) `>>`
 - (d) `/`
 - (e) `%`

Section 2. Short Answer (answer on this sheet)

15. (30 pts) Write a complete C++ program to solve the following problem, including

- an opening comment (*don't* put your name in the comment! -2 pts if you do!)
- all necessary “stuff” that goes before the main program
- a full main program complete with comments

Problem Statement: Ask the user of the program to input two integers. Determine whether the larger of the two numbers is the square of the smaller, and print a message.

Check for one error condition: if either number or both are negative, print an error message and end the program immediately.

Your program should provide appropriate prompts to the user, and should also label the output appropriately and neatly.

Example output:

```
stimp[8:22pm]> ./e01question
Enter an integer : 4
Enter another integer: 16
16 is the square of 4
stimp[8:22pm]> ./e01question
Enter an integer : 16
Enter another integer: 4
16 is the square of 4
stimp[8:23pm]> ./e01question
Enter an integer : 5
Enter another integer: 5
5 is not the square of 5
stimp[8:23pm]> ./e01question
Enter an integer : -3
Enter another integer: 6
Neither number may be negative
stimp[8:23pm]> ./e01question
Enter an integer : 2
Enter another integer: 9
9 is not the square of 2
stimp[8:23pm]> ./e01question
Enter an integer : 9
Enter another integer: 2
9 is not the square of 2
stimp[8:23pm]>
```

Space for your answer.

There is more space on the next two pages in case you need it.

Extra space in case you need it

Extra space in case you need it

16. (20 pts) In lab3, you wrote a function called “outlineBox” that took three parameters, and produced boxes such as the following:

The function `drawPlus` in the program listed below should operate in a similar manner.

The function should draw a picture on standard output in the shape of the plus sign of the given width, followed by a blank line. Example output is on the next page.

Restrictions:

- Width must be odd, and greater than or equal to 3. If these conditions are not met the function should just return without printing anything. No error message should be produced.
- Height will be assumed to be the same as width.

Sample output appears below.

The complete program appears on the next page (with the body of function `drawPlus` omitted), with sample output on the following page. You may fill in the function in the space provided, or rewrite the complete function in the blank space (beside or below the sample output.)

There is also a `helper()` function that you may use to factor out duplicate code; you are not required to do this, but it will save you time if you do.

```
stimp[8:56pm]> ./drawPlus
  a
  a
aaaaa
  a
  a
  b
  b
  b
bbbbbb
  b
  b
  b
  e
  e
  e
stimp[8:56pm]>
```

```
// drawPlus.cc Exam question for CISC181
// P. Conrad, 10/06/05

#include <iostream>
using namespace std;

void helper(int width, char c)
{
    // this function draws part of the plus
    // and is called more than once from inside drawPlus

}

void drawPlus(int width, char c)
{

}

int main(void)
{
    drawPlus(5, 'a');
    drawPlus(7, 'b');
    drawPlus(4, 'c');
    drawPlus(1, 'd');
    drawPlus(3, 'e');
    return 0;
}
```

Extra space in case you need it

End of Exam. Total Points: 100

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- Good luck.

1. (b)
2. (d)
3. (c)
4. (a)
5. (c)
6. (b)
7. (b)
8. (a)
9. (c)
10. (d)
11. (c)
12. (e)
13. (e)
14. (a)

Section 2. Short Answer (answer on this sheet)

```
15. // e01question.cc P. Conrad Fall 2005
// is the larger square of the smaller?

#include <iostream>
using namespace std;

int main(void)
{
    int num1, num2;

    int smaller, larger;

    // prompt user for input

    cout << "Enter an integer : ";
    cin >> num1;

    cout << "Enter another integer: ";
    cin >> num2;

    // check for error condition

    if (num1 < 0 || num2 < 0)
    {
        cerr << "Neither number may be negative" << endl;
        exit(1);
    }

    // determine which is larger

    if (num1 <= num2)
    {
        smaller = num1; larger = num2;
    }
    else
    {
        smaller = num2; larger = num1;
    }

    // produce output

    cout << larger << " is ";
    cout << ( (smaller * smaller == larger) ? "" : "not " );
    cout << "the square of " << smaller << endl;

    return 0;
}
```

```
16. // drawPlus.cc Exam question for CISC181
// P. Conrad, 10/06/05

#include <iostream>
using namespace std;

void helper(int width, char c)
{
    // this function draws part of the plus
    // and is called more than once from inside drawPlus

    int i, j;

    for (i = 0; i < width/2; i++)
        {
            for (j = 0; j < width/2; j++)
                cout << ' ';
            cout << c << endl;
        }
}

void drawPlus(int width, char c)
{
    if (width % 2 == 0 || width < 3) // if width is even or less than 3
        return;

    int i, j;

    helper(width, c); // top of plus sign

    // crossbar

    for (i = 0; i < width; i++)
        cout << c;
    cout << endl;

    helper(width, c); // top of plus sign

    return;
}

int main(void)
{
    drawPlus(5, 'a');
    drawPlus(7, 'b');
    drawPlus(4, 'c');
    drawPlus(1, 'd');
    drawPlus(3, 'e');
    return 0;
}
```

End of Key, version **A**
Total Points: 0

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- Good luck.

Questions 1 through 5 deal with code in q5 . cpp, shown here:

```
// q5.cpp for CISC181 exam E01, Fall 2005
// P. Conrad, 10/07/2005

#include <iostream>
using std::cout;
using std::endl;

void incl(int n, int m)
{
    n++;
    m++;
    cout << "incl: " << m << endl;
}

int main()
{
    int a = 3;
    int b = 4;
    int c = 5;

    cout << "main1: " << a << " " << b << endl;
    incl(a,b);
    cout << "main2: " << a << " " << b << endl;

    return 0;
}
```

1. (3 pts) Which of the following are the *names* of the *formal parameters* of function `incl()` ?
 - (a) a and b
 - (b) n and m
 - (c) int and int
 - (d) `std::cout` and `std::endl`
 - (e) `n++` and `m++`
2. (3 pts) Which of the following are the *names* of the *actual parameters* of function `incl()` ?
 - (a) a and b
 - (b) n and m
 - (c) int and int
 - (d) `std::cout` and `std::endl`
 - (e) `n++` and `m++`

3. (4 pts) Which of the following would be the *first* line of output from this program?
- (a) `incl: 4`
 - (b) `incl: 5`
 - (c) `main1: 3 4`
 - (d) `main2: 3 4`
 - (e) `main2: 4 5`
4. (4 pts) Which of the following would be the *last* line of output from this program?
- (a) `incl: 4`
 - (b) `incl: 5`
 - (c) `main1: 3 4`
 - (d) `main2: 3 4`
 - (e) `main2: 4 5`
5. (3 pts) Which of the following are the *types* of the *actual parameters* of function `incl()` ?
- (a) `a` and `b`
 - (b) `m` and `n`
 - (c) `int` and `int`
 - (d) `std::cout` and `std::endl`
 - (e) `n++` and `m++`

Questions 6 through 8 deal with the following program called reverseDigits1.cc

```
// reverseDigits1.cc P. Conrad
// Three functions to print digits; which ones reverse them?

#include <iostream>
using namespace std;

void printDigits(int x)
{
    if ( x <= 9)
        cout << x;
    else
    {
        printDigits(x / 10);
        cout << (x % 10);
    }
}

void printTheDigits(int x)
{
    while (x > 0)
    {
        cout << x % 10;
        x /= 10;
    }

    return;
}

void printThoseDarnDigits(int x)
{
    if ( x <= 9)
        cout << x;
    else
    {
        cout << (x % 10);
        printThoseDarnDigits(x / 10);
    }
}

int main(void)
{
    int x;

    // prompt for input

    cout << "Enter a number" << endl;
    cin >> x;
    x = (x < 0) ? -x : x ; // take absolute value of x

    // print output from three different functions, separated by newlines

    printDigits(x);
    cout << endl;
    printTheDigits(x);
    cout << endl;
    printThoseDarnDigits(x);
    cout << endl;

    return 0;
}
```

6. (4 pts) Excluding the definition of `main()`, this program contains three function definitions. Which of them defines a recursive function?
- (a) only `printDigits()`
 - (b) only `printTheDigits()`
 - (c) only `printThoseDarnDigits()`
 - (d) `printDigits()` and `printTheDigits()`
 - (e) `printDigits()` and `printThoseDarnDigits()`
7. (4 pts) Which of these functions prints the digits in reverse order?
- (a) only `printTheDigits()`
 - (b) only `printThoseDarnDigits()`
 - (c) `printDigits()` and `printTheDigits()`
 - (d) `printDigits()` and `printThoseDarnDigits()`
 - (e) `printTheDigits()` and `printThoseDarnDigits()`
8. (4 pts) There are many operators used in this program, but only one of them is used as a *unary* operator. Which one?
- (a) `-`
 - (b) `<<`
 - (c) `>>`
 - (d) `/`
 - (e) `%`

Questions 9 through 11 deal with number conversions.

9. (3 pts) Convert 103 from decimal to binary:

- (a) 0110 1101
- (b) 0110 0111
- (c) 1101 1010
- (d) 1110 1110
- (e) 0111 0111

10. (3 pts) Convert 103 from decimal to octal (hint: refer back to question 9).

- (a) 125
- (b) 155
- (c) 332
- (d) 147
- (e) 167

11. (3 pts) Convert 103 from decimal to hex (hint: refer back to question 9).

- (a) EE
- (b) 6D
- (c) 67
- (d) DA
- (e) 77

Questions 12 through 14 deal with Unix Commands. Suppose your current working directory is `~/cisc181/lab03`.

12. (4 pts) Which of the following Unix commands will copy all files ending in `.cc` from a directory `~/cisc181/lab02` into your current working directory?
 - (a) `cp ../lab02/*.cc .`
 - (b) `cp lab02/*.cc ..`
 - (c) `cp ../lab02/*.cc ..`
 - (d) `cp ./lab02/*.cc .`
 - (e) `cp ../lab02 *.cc`

13. (4 pts) Which of the following will create a subdirectory called `~/cisc181/lab03/backup`?
 - (a) `cd backup`
 - (b) `chmod -R a+rx backup`
 - (c) `mkdir backup`
 - (d) `mkdir ../backup`
 - (e) `mkdir ~/backup`

14. (4 pts) Which of the following Unix commands will change your current working directory to your home directory?
 - (a) `cd ..`
 - (b) `cd`
 - (c) `cd ~/cisc181`
 - (d) `pwd`
 - (e) `pwd ..`

Section 2. Short Answer (answer on this sheet)

15. (30 pts) Write a complete C++ program to solve the following problem, including

- an opening comment (*don't* put your name in the comment! -2 pts if you do!)
- all necessary “stuff” that goes before the main program
- a full main program complete with comments

Problem Statement: Ask the user of the program to input two integers. Determine whether the larger of the two numbers is the square of the smaller, and print a message.

Check for one error condition: if either number or both are negative, print an error message and end the program immediately.

Your program should provide appropriate prompts to the user, and should also label the output appropriately and neatly.

Example output:

```
stimp[8:22pm]> ./e01question
Enter an integer : 4
Enter another integer: 16
16 is the square of 4
stimp[8:22pm]> ./e01question
Enter an integer : 16
Enter another integer: 4
16 is the square of 4
stimp[8:23pm]> ./e01question
Enter an integer : 5
Enter another integer: 5
5 is not the square of 5
stimp[8:23pm]> ./e01question
Enter an integer : -3
Enter another integer: 6
Neither number may be negative
stimp[8:23pm]> ./e01question
Enter an integer : 2
Enter another integer: 9
9 is not the square of 2
stimp[8:23pm]> ./e01question
Enter an integer : 9
Enter another integer: 2
9 is not the square of 2
stimp[8:23pm]>
```

Space for your answer.

There is more space on the next two pages in case you need it.

Extra space in case you need it

Extra space in case you need it

16. (20 pts) In lab3, you wrote a function called “outlineBox” that took three parameters, and produced boxes such as the following:

The function `drawPlus` in the program listed below should operate in a similar manner.

The function should draw a picture on standard output in the shape of the plus sign of the given width, followed by a blank line. Example output is on the next page.

Restrictions:

- Width must be odd, and greater than or equal to 3. If these conditions are not met the function should just return without printing anything. No error message should be produced.
- Height will be assumed to be the same as width.

Sample output appears below.

The complete program appears on the next page (with the body of function `drawPlus` omitted), with sample output on the following page. You may fill in the function in the space provided, or rewrite the complete function in the blank space (beside or below the sample output.)

There is also a `helper()` function that you may use to factor out duplicate code; you are not required to do this, but it will save you time if you do.

```
stimp[8:56pm]> ./drawPlus
  a
  a
aaaaa
  a
  a
  b
  b
  b
bbbbbb
  b
  b
  b
  e
  e
  e
  e
stimp[8:56pm]>
```

```
// drawPlus.cc Exam question for CISC181
// P. Conrad, 10/06/05

#include <iostream>
using namespace std;

void helper(int width, char c)
{
    // this function draws part of the plus
    // and is called more than once from inside drawPlus

}

void drawPlus(int width, char c)
{

}

int main(void)
{
    drawPlus(5, 'a');
    drawPlus(7, 'b');
    drawPlus(4, 'c');
    drawPlus(1, 'd');
    drawPlus(3, 'e');
    return 0;
}
```

Extra space in case you need it

End of Exam. Total Points: 100

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- Good luck.

1. (b)
2. (a)
3. (c)
4. (d)
5. (c)
6. (e)
7. (e)
8. (a)
9. (b)
10. (d)
11. (c)
12. (a)
13. (c)
14. (b)

Section 2. Short Answer (answer on this sheet)

```
15. // e01question.cc P. Conrad Fall 2005
// is the larger square of the smaller?

#include <iostream>
using namespace std;

int main(void)
{
    int num1, num2;

    int smaller, larger;

    // prompt user for input

    cout << "Enter an integer : ";
    cin >> num1;

    cout << "Enter another integer: ";
    cin >> num2;

    // check for error condition

    if (num1 < 0 || num2 < 0)
    {
        cerr << "Neither number may be negative" << endl;
        exit(1);
    }

    // determine which is larger

    if (num1 <= num2)
    {
        smaller = num1; larger = num2;
    }
    else
    {
        smaller = num2; larger = num1;
    }

    // produce output

    cout << larger << " is ";
    cout << ( (smaller * smaller == larger) ? "" : "not " );
    cout << "the square of " << smaller << endl;

    return 0;
}
```

```
16. // drawPlus.cc Exam question for CISC181
// P. Conrad, 10/06/05

#include <iostream>
using namespace std;

void helper(int width, char c)
{
    // this function draws part of the plus
    // and is called more than once from inside drawPlus

    int i, j;

    for (i = 0; i < width/2; i++)
    {
        for (j = 0; j < width/2; j++)
            cout << ' ';
        cout << c << endl;
    }
}

void drawPlus(int width, char c)
{
    if (width % 2 == 0 || width < 3) // if width is even or less than 3
        return;

    int i, j;

    helper(width, c); // top of plus sign

    // crossbar

    for (i = 0; i < width; i++)
        cout << c;
    cout << endl;

    helper(width, c); // top of plus sign

    return;
}

int main(void)
{
    drawPlus(5, 'a');
    drawPlus(7, 'b');
    drawPlus(4, 'c');
    drawPlus(1, 'd');
    drawPlus(3, 'e');
    return 0;
}
```

End of Key, version **B**
Total Points: 0

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Answer the multiple choice questions on a “Scantron Form”

Bubble in ONLY your Unix userid and your answers

DO NOT bubble in your id number or section

If you bubble in your SSN, the computer will **reject your form!!!**

Answer the remaining questions directly on the exam paper.

General Instructions

- The exam is 50% multiple choice, and 50% programming.
- The programming questions start with number 15. You may want to tackle them first, since they may take more time.
- DO NOT WRITE YOUR NAME ON ANY PAGE EXCEPT THIS ONE!
- You have 50 minutes. **Pace yourself**, and pay attention to the point values.
- Read *all* the directions *carefully* on each problem.
- Good luck.

Questions 1 through 3 deal with the following program called reverseDigits1.cc

```
// reverseDigits1.cc P. Conrad
// Three functions to print digits; which ones reverse them?

#include <iostream>
using namespace std;

void printDigits(int x)
{
    if ( x <= 9)
        cout << x;
    else
    {
        printDigits(x / 10);
        cout << (x % 10);
    }
}

void printTheDigits(int x)
{
    while (x > 0)
    {
        cout << x % 10;
        x /= 10;
    }

    return;
}

void printThoseDarnDigits(int x)
{
    if ( x <= 9)
        cout << x;
    else
    {
        cout << (x % 10);
        printThoseDarnDigits(x / 10);
    }
}

int main(void)
{
    int x;

    // prompt for input

    cout << "Enter a number" << endl;
    cin >> x;
    x = (x < 0) ? -x : x ; // take absolute value of x

    // print output from three different functions, separated by newlines

    printDigits(x);
    cout << endl;
    printTheDigits(x);
    cout << endl;
    printThoseDarnDigits(x);
    cout << endl;

    return 0;
}
```

1. (4 pts) Excluding the definition of `main()`, this program contains three function definitions. Which of them defines a recursive function?
 - (a) only `printDigits()`
 - (b) only `printTheDigits()`
 - (c) only `printThoseDarnDigits()`
 - (d) `printDigits()` and `printTheDigits()`
 - (e) `printDigits()` and `printThoseDarnDigits()`

2. (4 pts) Which of these functions prints the digits in reverse order?
 - (a) only `printTheDigits()`
 - (b) only `printThoseDarnDigits()`
 - (c) `printDigits()` and `printTheDigits()`
 - (d) `printDigits()` and `printThoseDarnDigits()`
 - (e) `printTheDigits()` and `printThoseDarnDigits()`

3. (4 pts) There are many operators used in this program, but only one of them is used as a *unary* operator. Which one?
 - (a) `-`
 - (b) `<<`
 - (c) `>>`
 - (d) `/`
 - (e) `%`

Questions 4 through 8 deal with code in q5 . cpp, shown here:

```
// q5.cpp for CISC181 exam E01, Fall 2005
// P. Conrad, 10/07/2005

#include <iostream>
using std::cout;
using std::endl;

void incl(int n, int m)
{
    n++;
    m++;
    cout << "incl: " << m << endl;
}

int main()
{
    int a = 3;
    int b = 4;
    int c = 5;

    cout << "main1: " << a << " " << b << endl;
    incl(a,b);
    cout << "main2: " << a << " " << b << endl;

    return 0;
}
```

4. (3 pts) Which of the following are the *names* of the *formal parameters* of function `incl()` ?
- (a) a and b
 - (b) n and m
 - (c) int and int
 - (d) `std::cout` and `std::endl`
 - (e) `n++` and `m++`
5. (3 pts) Which of the following are the *names* of the *actual parameters* of function `incl()` ?
- (a) a and b
 - (b) n and m
 - (c) int and int
 - (d) `std::cout` and `std::endl`
 - (e) `n++` and `m++`

6. (4 pts) Which of the following would be the *first* line of output from this program?
- (a) `incl: 4`
 - (b) `incl: 5`
 - (c) `main1: 3 4`
 - (d) `main2: 3 4`
 - (e) `main2: 4 5`
7. (4 pts) Which of the following would be the *last* line of output from this program?
- (a) `incl: 4`
 - (b) `incl: 5`
 - (c) `main1: 3 4`
 - (d) `main2: 3 4`
 - (e) `main2: 4 5`
8. (3 pts) Which of the following are the *types* of the *actual parameters* of function `incl()` ?
- (a) `a` and `b`
 - (b) `m` and `n`
 - (c) `int` and `int`
 - (d) `std::cout` and `std::endl`
 - (e) `n++` and `m++`

Questions 9 through 11 deal with number conversions.

9. (3 pts) Convert 103 from decimal to binary:

- (a) 0110 1101
- (b) 0110 0111
- (c) 1101 1010
- (d) 1110 1110
- (e) 0111 0111

10. (3 pts) Convert 103 from decimal to octal (hint: refer back to question 9).

- (a) 125
- (b) 155
- (c) 332
- (d) 147
- (e) 167

11. (3 pts) Convert 103 from decimal to hex (hint: refer back to question 9).

- (a) EE
- (b) 6D
- (c) 67
- (d) DA
- (e) 77

Questions 12 through 14 deal with Unix Commands. Suppose your current working directory is `~/cisc181/lab03`.

12. (4 pts) Which of the following Unix commands will copy all files ending in `.cc` from a directory `~/cisc181/lab02` into your current working directory?
- (a) `cp ../lab02/*.cc .`
 - (b) `cp lab02/*.cc ..`
 - (c) `cp ../lab02/*.cc ..`
 - (d) `cp ./lab02/*.cc .`
 - (e) `cp ../lab02 *.cc`
13. (4 pts) Which of the following will create a subdirectory called `~/cisc181/lab03/backup`?
- (a) `cd backup`
 - (b) `chmod -R a+rx backup`
 - (c) `mkdir backup`
 - (d) `mkdir ../backup`
 - (e) `mkdir ~/backup`
14. (4 pts) Which of the following Unix commands will change your current working directory to your home directory?
- (a) `cd ..`
 - (b) `cd`
 - (c) `cd ~/cisc181`
 - (d) `pwd`
 - (e) `pwd ..`

Section 2. Short Answer (answer on this sheet)

15. (30 pts) Write a complete C++ program to solve the following problem, including

- an opening comment (*don't* put your name in the comment! -2 pts if you do!)
- all necessary “stuff” that goes before the main program
- a full main program complete with comments

Problem Statement: Ask the user of the program to input two integers. Determine whether the larger of the two numbers is the square of the smaller, and print a message.

Check for one error condition: if either number or both are negative, print an error message and end the program immediately.

Your program should provide appropriate prompts to the user, and should also label the output appropriately and neatly.

Example output:

```
stimp[8:22pm]> ./e01question
Enter an integer : 4
Enter another integer: 16
16 is the square of 4
stimp[8:22pm]> ./e01question
Enter an integer : 16
Enter another integer: 4
16 is the square of 4
stimp[8:23pm]> ./e01question
Enter an integer : 5
Enter another integer: 5
5 is not the square of 5
stimp[8:23pm]> ./e01question
Enter an integer : -3
Enter another integer: 6
Neither number may be negative
stimp[8:23pm]> ./e01question
Enter an integer : 2
Enter another integer: 9
9 is not the square of 2
stimp[8:23pm]> ./e01question
Enter an integer : 9
Enter another integer: 2
9 is not the square of 2
stimp[8:23pm]>
```

Space for your answer.

There is more space on the next two pages in case you need it.

Extra space in case you need it

Extra space in case you need it

16. (20 pts) In lab3, you wrote a function called “outlineBox” that took three parameters, and produced boxes such as the following:

The function `drawPlus` in the program listed below should operate in a similar manner.

The function should draw a picture on standard output in the shape of the plus sign of the given width, followed by a blank line. Example output is on the next page.

Restrictions:

- Width must be odd, and greater than or equal to 3. If these conditions are not met the function should just return without printing anything. No error message should be produced.
- Height will be assumed to be the same as width.

Sample output appears below.

The complete program appears on the next page (with the body of function `drawPlus` omitted), with sample output on the following page. You may fill in the function in the space provided, or rewrite the complete function in the blank space (beside or below the sample output.)

There is also a `helper()` function that you may use to factor out duplicate code; you are not required to do this, but it will save you time if you do.

```
stimpypy[8:56pm]> ./drawPlus
  a
  a
aaaaa
  a
  a
  b
  b
  b
bbbbbbb
  b
  b
  b
  e
  eee
  e
stimpypy[8:56pm]>
```

```
// drawPlus.cc Exam question for CISC181
// P. Conrad, 10/06/05

#include <iostream>
using namespace std;

void helper(int width, char c)
{
    // this function draws part of the plus
    // and is called more than once from inside drawPlus

}

void drawPlus(int width, char c)
{

}

int main(void)
{
    drawPlus(5, 'a');
    drawPlus(7, 'b');
    drawPlus(4, 'c');
    drawPlus(1, 'd');
    drawPlus(3, 'e');
    return 0;
}
```

Extra space in case you need it

End of Exam. Total Points: 100

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Name_____

Please circle your section number:

010

011

012

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Answer the remaining questions directly on the exam paper.

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- Good luck.

1. (e)
2. (e)
3. (a)
4. (b)
5. (a)
6. (c)
7. (d)
8. (c)
9. (b)
10. (d)
11. (c)
12. (a)
13. (c)
14. (b)

Section 2. Short Answer (answer on this sheet)

```
15. // e01question.cc P. Conrad Fall 2005
// is the larger square of the smaller?

#include <iostream>
using namespace std;

int main(void)
{
    int num1, num2;

    int smaller, larger;

    // prompt user for input

    cout << "Enter an integer : ";
    cin >> num1;

    cout << "Enter another integer: ";
    cin >> num2;

    // check for error condition

    if (num1 < 0 || num2 < 0)
    {
        cerr << "Neither number may be negative" << endl;
        exit(1);
    }

    // determine which is larger

    if (num1 <= num2)
    {
        smaller = num1; larger = num2;
    }
    else
    {
        smaller = num2; larger = num1;
    }

    // produce output

    cout << larger << " is ";
    cout << ( (smaller * smaller == larger) ? "" : "not " );
    cout << "the square of " << smaller << endl;

    return 0;
}
```

```
16. // drawPlus.cc Exam question for CISC181
// P. Conrad, 10/06/05

#include <iostream>
using namespace std;

void helper(int width, char c)
{
    // this function draws part of the plus
    // and is called more than once from inside drawPlus

    int i, j;

    for (i = 0; i < width/2; i++)
    {
        for (j = 0; j < width/2; j++)
            cout << ' ';
        cout << c << endl;
    }
}

void drawPlus(int width, char c)
{
    if (width % 2 == 0 || width < 3) // if width is even or less than 3
        return;

    int i, j;

    helper(width, c); // top of plus sign

    // crossbar

    for (i = 0; i < width; i++)
        cout << c;
    cout << endl;

    helper(width, c); // top of plus sign

    return;
}

int main(void)
{
    drawPlus(5, 'a');
    drawPlus(7, 'b');
    drawPlus(4, 'c');
    drawPlus(1, 'd');
    drawPlus(3, 'e');
    return 0;
}
```

End of Key, version **C**
Total Points: 0