A

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# CMPSC 16 F21

# Midterm Exam

# E01

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- **When finished, DO NOT GET UP.** Stay quietly in your seat until you are invited to come up and turn in your exam.
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## Section 1. Multiple Choice (25 points)

Please clearly indicate your choice by circling the appropriate letter. If you make a mistake and have to correct your initial choice, be sure that your intent is clear. (5 pts each)

1. Suppose we want to compute the quantity $a^2 + b^2$ with a call such as this one:

   ```
   result = sumOfSquares(x,y);
   ```

   Consider the following definition of `sumOfSquares`:

   ```
   1  int sumSquares(int a, int b) {
   2    int sum;
   3    sum = (a * a) + (b * b);
   4    return;
   5  }
   ```

   Which statement is true?

   (a) There are no errors
   (b) There is an error on line 1
   (c) There is an error on line 2
   (d) There is an error on line 3
   (e) There is an error on line 4
   (f) There is an error on line 5
   (g) There are errors on lines 1 and 3
   (h) There are errors on lines 2 and 4
   (i) There are errors on lines 3 and 5

2. A restaurant gives a discount for children under 10 (children age 9 get the discount, but children age 10 don't). They also give the discount for adults 55 and over. Which expression evaluates to true if a discount should be given?

   (a) `(age < 10) && (age > 55)`
   (b) `(age < 10) && (age >= 55)`
   (c) `(age >= 10) && (age < 55)`
   (d) `(age >= 10) || (age <= 55)`
   (e) `(age < 10) || (age >= 55)`

3. Assume that `scorePerQuiz` is an array of `int` values with 10 elements. Which of the following lines of C++ code assigns the value 8 to the element of `scorePerQuiz` at index 7?

   (a) `scorePerQuiz = 8;`

   (b) `scorePerQuiz[0] = 8;`

   (c) `scorePerQuiz[7] = 8;`

   (d) `scorePerQuiz[8] = 7;`

4. Given this declaration:

   ```
   int numList[50];
   ```

   What is the index of the last element in the array `numList`?

   (a) 0

   (b) 49

   (c) 50

   (d) 51

   (e) It is impossible to say, since `numList` has not been initialized

5. What is the final value of `y` after this C++ code executes?

```
int x = 77;
int y = 4;
if (x == 77) {
  y = y + 1;
}
if (x < 100) {
  y = y + 1;
}
if (x > 77) {
  y = y + 1;
}
y = y + 1;
```

(a) 4

(b) 5

(c) 6

(d) 7

(e) 8

(f) 9

(g) none of these values

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## Section 2. About sbTemp.cpp, Multiple Choice (15 points)

Consider the program **sbTemp.cpp** shown below.

```
1  #include <iostream>
2  using namespace std;
3
4  void sbTemp(int temp) {
5     if (temp < 65) {
6        cout << "Too cold.";
7     }
8     else if ((temp >= 65) && (temp <= 75)) {
9        cout << "Perfect.";
10    }
11    else {
12       cout << "Too hot.";
13    }
14 }
15
16 int main() {
17    sbTemp(60);
18    sbTemp(80);
19    sbTemp(75);
20    return 0;
21 }
```

6. How many function calls appear in the **sbTemp.cpp** listing? (Do **not** count invocations of the << operator, or the invocation of main.)

   (a) None

   (b) 1

   (c) 2

   (d) 3

   (e) 4

   (f) More than 4

7. How many function definitions appear in the `sbTemp.cpp` listing, including the definition of `main`?
   (a) None
   (b) 1
   (c) 2
   (d) 3
   (e) 4
   (f) More than 4

8. What is the output of the `sbTemp.cpp` program when run?
   (a) The program produces no output
   (b) `Too cold.Too hot.Perfect.`
   (c) `Too cold.Perfect.Too hot.`
   (d) `Too hot.Perfect.Too cold.`
   (e) `Too hot.Too cold.Perfect.`
   (f) None of these choices

## Section 3. Number Conversions (20 pts)

(5 pts each)
Please perform the following number conversions. You do not need to show your work; just put your final answer in the box indicated.

9. Convert the binary number 00001001 to a decimal number.

10. Convert the binary number 00100100 to a decimal number.

11. Convert the decimal number 12 to an 8-bit binary number.

12. Convert the decimal number 129 to an 8-bit binary number.

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## Section 4. The `linear.cpp` program (25 pts)

Consider a C++ program called `linear.cpp` to evaluate the value of a linear function of the form $y = mx+b$ for values of $m$,$x$ and $b$ given on the command line, as in these examples runs:

```
$ ./linear 5 7 2
y=37
$ ./linear 2 5 9
y=19
$ ./linear 3 2 1
y=7
$
```

An incomplete C++ program to calculate this result appears on the next page.

Please complete the program by **filling in the blanks at these places on the next page.**

**AGAIN: LEAVE THIS PAGE BLANK. ANSWER ON THE NEXT PAGE.**

13. Lines 7-8. (Note that you may be able to answer in a single line; I've provided two lines so you have plenty of space for your answer.)

14. On line 13, complete the if statement.

15. On lines 18-20, fill in the three blanks, i.e. the arguments to the function calls to `atoi()`.

16. Fill in the blank on line 22. If the space is too small, you can write your answer near the blank and use an arrow (e.g. ↗) to show where your answer is.

**Put your answers to questions about `linear.cpp` in the spaces below, directly inside the program code.**

```
1  #include <iostream>
2  #include <cstdlib>
3
4  using namespace std;
5
6  int linear(int m, int x, int b) {
7
8
9  }
10
11 int main(int argc, char *argv[]) {
12
13   if (               ) {
14     cerr << "Usage: ./linear m x b" << endl;
15     exit(1);
16   }
17
18   int m = atoi(       );
19   int x = atoi(       );
20   int b = atoi(       );
21
22   cout << "y=" <<                              << endl;
23
24   return 0;
25 }
```

17. To compile and run the program in the file `linear.cpp` on the CSIL systems (or any similar Unix system), you'd need two commands, one to compile the code, and another to run it on the specific values 1, 2 and 3 for $m$, $x$ and $b$.

    Write these two commands, just as you would type them on CSIL, on two separate lines in the box below.

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## Section 5. What is the output? (10 pts)

Consider this program:

```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5    int x;
6    cin >> x;
7    if (x < 10) {
8      cout << "Live ";
9    }
10   else if (x < 20) {
11     cout << "long ";
12   }
13   else if (x < 30) {
14     cout << "and ";
15   }
16   cout << "prosper!";
17   return 0;
18 }
```

18. When the input is 5 what is the output? Write it this box $\Longrightarrow$ [ ]

19. When the input is 25 what is the output? Write it this box $\Longrightarrow$ [ ]

## Section 6. True/False (5 points)

20. Assuming that these variables are declared and initialized with these values:

```
int x=0;
int y=10;
```

Indicate whether each of the following C++ expressions evaluates to true or false. You may simply put **T** or **F** in the blank beside each expression.

_____ `(x == 0) && (y == 10)`

_____ `(x == 0) || (y == 10)`

_____ `(x == 0) && (y == 20)`

_____ `(x < 0) || (y > 20)`

_____ `(x == 0) || (y == 20)`

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# Answer Key for Exam A

## Section 1. Multiple Choice (25 points)

1. (e)

2. (e)

3. (c)

4. (b)

5. (d)

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## Section 2. About `sbTemp.cpp`, Multiple Choice (15 points)

6. (d)

7. (c)

8. (b)

## Section 3. Number Conversions (20 pts)

9. 9

10. 36

11. 00001100

12. 10000001

4 A

## Section 4. The `linear.cpp` program (25 pts)

13. The following code should be put in the blank:

```
return m * x + b ;
```

14. The following code should be put in the blank:

```
13    if (argc != 4) {
```

15. The code should be completed as follows:

```
18    int m = atoi(argv[1]);
19    int x = atoi(argv[2]);
20    int b = atoi(argv[3]);
```

16. The following code should be put in the blank:

```
22    cout << "y=" << linear(m, x, b)                    << endl;
```

17. 
```
make linear
./linear 1 2 3
```

    OR

```
g++ linear.cpp -o linear
./linear 1 2 3
```

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Section 5. What is the output? (10 pts)

18. `Live prosper!`

19. `and prosper!`

Section 6. True/False (5 points)

__T__ `(x == 0) && (y == 10)`

__T__ `(x == 0) || (y == 10)`

__F__ `(x == 0) && (y == 20)`

__F__ `(x < 0) || (y > 20)`

__T__ `(x == 0) || (y == 20)`

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# Midterm Exam
# E01

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2 B

## Section 1. Multiple Choice (25 points)

Please clearly indicate your choice by circling the appropriate letter. If you make a mistake and have to correct your initial choice, be sure that your intent is clear. (5 pts each)

1. What is the final value of `y` after this C++ code executes?

```
int x = 77;
int y = 4;
if (x == 77) {
  y = y + 1;
}
if (x < 100) {
  y = y + 1;
}
if (x > 77) {
  y = y + 1;
}
y = y + 1;
```

(a) 4
(b) 5
(c) 6
(d) 7
(e) 8
(f) 9
(g) none of these values

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2. Suppose we want to compute the quantity $a^2 + b^2$ with a call such as this one:

```
result = sumOfSquares(x,y);
```

Consider the following definition of `sumOfSquares`:

```
1  int sumSquares(int a, int b) {
2    int sum;
3    sum = (a * a) + (b * b);
4    return;
5  }
```

Which statement is true?

(a) There are no errors
(b) There is an error on line 1
(c) There is an error on line 2
(d) There is an error on line 3
(e) There is an error on line 4
(f) There is an error on line 5
(g) There are errors on lines 1 and 3
(h) There are errors on lines 2 and 4
(i) There are errors on lines 3 and 5

3. Given this declaration:

```
int numList[50];
```

What is the index of the last element in the array `numList`?

(a) 0
(b) 49
(c) 50
(d) 51
(e) It is impossible to say, since `numList` has not been initialized

4. Assume that `scorePerQuiz` is an array of `int` values with 10 elements. Which of the following lines of C++ code assigns the value 8 to the element of `scorePerQuiz` at index 7?

   (a) `scorePerQuiz = 8;`

   (b) `scorePerQuiz[0] = 8;`

   (c) `scorePerQuiz[7] = 8;`

   (d) `scorePerQuiz[8] = 7;`

5. A restaurant gives a discount for children under 10 (children age 9 get the discount, but children age 10 don't). They also give the discount for adults 55 and over. Which expression evaluates to true if a discount should be given?

   (a) `(age < 10) && (age > 55)`

   (b) `(age < 10) && (age >= 55)`

   (c) `(age >= 10) && (age < 55)`

   (d) `(age >= 10) || (age <= 55)`

   (e) `(age < 10) || (age >= 55)`

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## Section 2. About `sbTemp.cpp`, Multiple Choice (15 points)

Consider the program `sbTemp.cpp` shown below.

```
1  #include <iostream>
2  using namespace std;
3
4  void sbTemp(int temp) {
5     if (temp < 65) {
6        cout << "Too cold.";
7     }
8     else if ((temp >= 65) && (temp <= 75)) {
9        cout << "Perfect.";
10    }
11    else {
12       cout << "Too hot.";
13    }
14 }
15
16 int main() {
17    sbTemp(60);
18    sbTemp(80);
19    sbTemp(75);
20    return 0;
21 }
```

6. How many function definitions appear in the `sbTemp.cpp` listing, including the definition of `main`?
   (a) None
   (b) 1
   (c) 2
   (d) 3
   (e) 4
   (f) More than 4

7. What is the output of the `sbTemp.cpp` program when run?
   (a) The program produces no output
   (b) `Too cold.Too hot.Perfect.`
   (c) `Too cold.Perfect.Too hot.`
   (d) `Too hot.Perfect.Too cold.`
   (e) `Too hot.Too cold.Perfect.`
   (f) None of these choices

8. How many function calls appear in the `sbTemp.cpp` listing? (Do **not** count invocations of the `<<` operator, or the invocation of `main`.)
   (a) None
   (b) 1
   (c) 2
   (d) 3
   (e) 4
   (f) More than 4

## Section 3. Number Conversions (20 pts)

(5 pts each)

Please perform the following number conversions. You do not need to show your work; just put your final answer in the box indicated.

9. Convert the decimal number 129 to an 8-bit binary number.

10. Convert the binary number 00100100 to a decimal number.

11. Convert the decimal number 12 to an 8-bit binary number.

12. Convert the binary number 00001001 to a decimal number.

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## Section 4. The `linear.cpp` program (25 pts)

Consider a C++ program called `linear.cpp` to evaluate the value of a linear function of the form $y = mx+b$ for values of $m$,$x$ and $b$ given on the command line, as in these examples runs:

```
$ ./linear 5 7 2
y=37
$ ./linear 2 5 9
y=19
$ ./linear 3 2 1
y=7
$
```

An incomplete C++ program to calculate this result appears on the next page.

Please complete the program by **filling in the blanks at these places on the next page.**

**AGAIN: LEAVE THIS PAGE BLANK. ANSWER ON THE NEXT PAGE.**

13. Lines 7-8. (Note that you may be able to answer in a single line; I've provided two lines so you have plenty of space for your answer.)

14. On line 13, complete the if statement.

15. On lines 18-20, fill in the three blanks, i.e. the arguments to the function calls to `atoi()`.

16. Fill in the blank on line 22. If the space is too small, you can write your answer near the blank and use an arrow (e.g. ↗) to show where your answer is.

**Put your answers to questions about `linear.cpp` in the spaces below, directly inside the program code.**

```
1  #include <iostream>
2  #include <cstdlib>
3
4  using namespace std;
5
6  int linear(int m, int x, int b) {
7
8
9  }
10
11 int main(int argc, char *argv[]) {
12
13   if (               ) {
14     cerr << "Usage: ./linear m x b" << endl;
15     exit(1);
16   }
17
18   int m = atoi(       );
19   int x = atoi(       );
20   int b = atoi(       );
21
22   cout << "y=" <<                              << endl;
23
24   return 0;
25 }
```

17. To compile and run the program in the file `linear.cpp` on the CSIL systems (or any similar Unix system), you'd need two commands, one to compile the code, and another to run it on the specific values 1, 2 and 3 for $m$, $x$ and $b$.

    Write these two commands, just as you would type them on CSIL, on two separate lines in the box below.

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## Section 5. What is the output? (10 pts)

Consider this program:

```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5    int x;
6    cin >> x;
7    if (x < 10) {
8      cout << "Live ";
9    }
10   else if (x < 20) {
11     cout << "long ";
12   }
13   else if (x < 30) {
14     cout << "and ";
15   }
16   cout << "prosper!";
17   return 0;
18 }
```

18. When the input is `35` what is the output? Write it this box $\Longrightarrow$ [ ]

19. When the input is `15` what is the output? Write it this box $\Longrightarrow$ [ ]

## Section 6. True/False (5 points)

20. Assuming that these variables are declared and initialized with these values:

```
int x=0;
int y=10;
```

Indicate whether each of the following C++ expressions evaluates to true or false. You may simply put **T** or **F** in the blank beside each expression.

_____ `(x == 0) || (y == 20)`

_____ `(x < 0) || (y > 20)`

_____ `(x == 0) || (y == 10)`

_____ `(x == 0) && (y == 10)`

_____ `(x == 0) && (y == 20)`

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# Answer Key for Exam B

## Section 1. Multiple Choice (25 points)

1. (d)

2. (e)

3. (b)

4. (c)

5. (e)

B

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3

## Section 2. About `sbTemp.cpp`, Multiple Choice (15 points)

6. (c)

7. (b)

8. (d)

## Section 3. Number Conversions (20 pts)

9. 10000001

10. 36

11. 00001100

12. 9

4 B

## Section 4. The `linear.cpp` program (25 pts)

13. The following code should be put in the blank:

```
return m * x + b ;
```

14. The following code should be put in the blank:

```
13    if (argc != 4) {
```

15. The code should be completed as follows:

```
18    int m = atoi(argv[1]);
19    int x = atoi(argv[2]);
20    int b = atoi(argv[3]);
```

16. The following code should be put in the blank:

```
22    cout << "y=" << linear(m, x, b)                    << endl;
```

17. 
```
make linear
./linear 1 2 3
```

    OR

```
g++ linear.cpp -o linear
./linear 1 2 3
```

Section 5. What is the output? (10 pts)

18. `prosper!`

19. `long prosper!`

Section 6. True/False (5 points)

__T__ `(x == 0) || (y == 20)`

__F__ `(x < 0) || (y > 20)`

__T__ `(x == 0) || (y == 10)`

__T__ `(x == 0) && (y == 10)`

__F__ `(x == 0) && (y == 20)`

C

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2 C

## Section 1. Multiple Choice (25 points)

Please clearly indicate your choice by circling the appropriate letter. If you make a mistake and have to correct your initial choice, be sure that your intent is clear. (5 pts each)

1. Given this declaration:

   ```
   int numList[50];
   ```

   What is the index of the last element in the array `numList`?

   (a) 0
   (b) 49
   (c) 50
   (d) 51
   (e) It is impossible to say, since `numList` has not been initialized

2. What is the final value of `y` after this C++ code executes?

   ```
   int x = 77;
   int y = 4;
   if (x == 77) {
     y = y + 1;
   }
   if (x < 100) {
     y = y + 1;
   }
   if (x > 77) {
     y = y + 1;
   }
   y = y + 1;
   ```

   (a) 4
   (b) 5
   (c) 6
   (d) 7
   (e) 8
   (f) 9
   (g) none of these values

C

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3. Suppose we want to compute the quantity $a^2 + b^2$ with a call such as this one:

```
result = sumOfSquares(x,y);
```

Consider the following definition of `sumOfSquares`:

```
1  int sumSquares(int a, int b) {
2    int sum;
3    sum = (a * a) + (b * b);
4    return;
5  }
```

Which statement is true?

(a) There are no errors

(b) There is an error on line 1

(c) There is an error on line 2

(d) There is an error on line 3

(e) There is an error on line 4

(f) There is an error on line 5

(g) There are errors on lines 1 and 3

(h) There are errors on lines 2 and 4

(i) There are errors on lines 3 and 5

4. A restaurant gives a discount for children under 10 (children age 9 get the discount, but children age 10 don't). They also give the discount for adults 55 and over. Which expression evaluates to true if a discount should be given?

(a) `(age < 10) && (age > 55)`

(b) `(age < 10) && (age >= 55)`

(c) `(age >= 10) && (age < 55)`

(d) `(age >= 10) || (age <= 55)`

(e) `(age < 10) || (age >= 55)`

5. Assume that `scorePerQuiz` is an array of `int` values with 10 elements. Which of the following lines of C++ code assigns the value 8 to the element of `scorePerQuiz` at index 7?

(a) `scorePerQuiz = 8;`

(b) `scorePerQuiz[0] = 8;`

(c) `scorePerQuiz[7] = 8;`

(d) `scorePerQuiz[8] = 7;`

4 C

## Section 2. About sbTemp.cpp, Multiple Choice (15 points)

Consider the program sbTemp.cpp shown below.

```
1  #include <iostream>
2  using namespace std;
3
4  void sbTemp(int temp) {
5     if (temp < 65) {
6        cout << "Too cold.";
7     }
8     else if ((temp >= 65) && (temp <= 75)) {
9        cout << "Perfect.";
10    }
11    else {
12       cout << "Too hot.";
13    }
14 }
15
16 int main() {
17    sbTemp(60);
18    sbTemp(80);
19    sbTemp(75);
20    return 0;
21 }
```

6. What is the output of the sbTemp.cpp program when run?
   (a) The program produces no output
   (b) `Too cold.Too hot.Perfect.`
   (c) `Too cold.Perfect.Too hot.`
   (d) `Too hot.Perfect.Too cold.`
   (e) `Too hot.Too cold.Perfect.`
   (f) None of these choices

7. How many function calls appear in the `sbTemp.cpp` listing? (Do **not** count invocations of the `<<` operator, or the invocation of `main`.)
   (a) None
   (b) 1
   (c) 2
   (d) 3
   (e) 4
   (f) More than 4

8. How many function definitions appear in the `sbTemp.cpp` listing, including the definition of `main`?
   (a) None
   (b) 1
   (c) 2
   (d) 3
   (e) 4
   (f) More than 4

## Section 3. Number Conversions (20 pts)

(5 pts each)
Please perform the following number conversions. You do not need to show your work; just put your final answer in the box indicated.

9. Convert the binary number 00100100 to a decimal number.

10. Convert the decimal number 12 to an 8-bit binary number.

11. Convert the binary number 00001001 to a decimal number.

12. Convert the decimal number 129 to an 8-bit binary number.

6 C

## Section 4. The `linear.cpp` program (25 pts)

Consider a C++ program called `linear.cpp` to evaluate the value of a linear function of the form $y = mx+b$ for values of $m$,$x$ and $b$ given on the command line, as in these examples runs:

```
$ ./linear 5 7 2
y=37
$ ./linear 2 5 9
y=19
$ ./linear 3 2 1
y=7
$
```

An incomplete C++ program to calculate this result appears on the next page.

Please complete the program by **filling in the blanks at these places on the next page.**

**AGAIN: LEAVE THIS PAGE BLANK. ANSWER ON THE NEXT PAGE.**

13. Lines 7-8. (Note that you may be able to answer in a single line; I've provided two lines so you have plenty of space for your answer.)

14. On line 13, complete the if statement.

15. On lines 18-20, fill in the three blanks, i.e. the arguments to the function calls to `atoi()`.

16. Fill in the blank on line 22. If the space is too small, you can write your answer near the blank and use an arrow (e.g. ↗) to show where your answer is.

C

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**Put your answers to questions about `linear.cpp` in the spaces below, directly inside the program code.**

```
1  #include <iostream>
2  #include <cstdlib>
3
4  using namespace std;
5
6  int linear(int m, int x, int b) {
7
8
9  }
10
11 int main(int argc, char *argv[]) {
12
13   if (               ) {
14     cerr << "Usage: ./linear m x b" << endl;
15     exit(1);
16   }
17
18   int m = atoi(       );
19   int x = atoi(       );
20   int b = atoi(       );
21
22   cout << "y=" <<                              << endl;
23
24   return 0;
25 }
```

17. To compile and run the program in the file `linear.cpp` on the CSIL systems (or any similar Unix system), you'd need two commands, one to compile the code, and another to run it on the specific values 1, 2 and 3 for $m$, $x$ and $b$.

    Write these two commands, just as you would type them on CSIL, on two separate lines in the box below.

8 C

## Section 5. What is the output? (10 pts)

Consider this program:

```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5    int x;
6    cin >> x;
7    if (x < 10) {
8      cout << "Live ";
9    }
10   else if (x < 20) {
11     cout << "long ";
12   }
13   else if (x < 30) {
14     cout << "and ";
15   }
16   cout << "prosper!";
17   return 0;
18 }
```

18. When the input is 5 what is the output? Write it this box ⟹

19. When the input is 25 what is the output? Write it this box ⟹

## Section 6. True/False (5 points)

20. Assuming that these variables are declared and initialized with these values:

```
int x=0;
int y=10;
```

Indicate whether each of the following C++ expressions evaluates to true or false. You may simply put **T** or **F** in the blank beside each expression.

_____ `(x == 0) || (y == 10)`

_____ `(x == 0) || (y == 20)`

_____ `(x == 0) && (y == 10)`

_____ `(x < 0) || (y > 20)`

_____ `(x == 0) && (y == 20)`

C

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# Answer Key for Exam C

## Section 1. Multiple Choice (25 points)

1. (b)

2. (d)

3. (e)

4. (e)

5. (c)

C

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3

## Section 2. About `sbTemp.cpp`, Multiple Choice (15 points)

6. (b)

7. (d)

8. (c)

## Section 3. Number Conversions (20 pts)

9. 36

10. 00001100

11. 9

12. 10000001

4 C

## Section 4. The `linear.cpp` program (25 pts)

13. The following code should be put in the blank:

```
return m * x + b ;
```

14. The following code should be put in the blank:

```
13    if (argc != 4) {
```

15. The code should be completed as follows:

```
18    int m = atoi(argv[1]);
19    int x = atoi(argv[2]);
20    int b = atoi(argv[3]);
```

16. The following code should be put in the blank:

```
22    cout << "y=" << linear(m, x, b)                    << endl;
```

17. 
```
make linear
./linear 1 2 3
```

    OR

```
g++ linear.cpp -o linear
./linear 1 2 3
```

C

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Section 5. What is the output? (10 pts)

18. `Live prosper!`

19. `and prosper!`

Section 6. True/False (5 points)

__T__ `(x == 0) || (y == 10)`

__T__ `(x == 0) || (y == 20)`

__T__ `(x == 0) && (y == 10)`

__F__ `(x < 0) || (y > 20)`

__F__ `(x == 0) && (y == 20)`

D

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# Midterm Exam
# E01

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## Section 1. Multiple Choice (25 points)

Please clearly indicate your choice by circling the appropriate letter. If you make a mistake and have to correct your initial choice, be sure that your intent is clear. (5 pts each)

1. Assume that `scorePerQuiz` is an array of `int` values with 10 elements. Which of the following lines of C++ code assigns the value 8 to the element of `scorePerQuiz` at index 7?

   (a) `scorePerQuiz = 8;`

   (b) `scorePerQuiz[0] = 8;`

   (c) `scorePerQuiz[7] = 8;`

   (d) `scorePerQuiz[8] = 7;`

2. What is the final value of `y` after this C++ code executes?

```
int x = 77;
int y = 4;
if (x == 77) {
  y = y + 1;
}
if (x < 100) {
  y = y + 1;
}
if (x > 77) {
  y = y + 1;
}
y = y + 1;
```

   (a) 4

   (b) 5

   (c) 6

   (d) 7

   (e) 8

   (f) 9

   (g) none of these values

D

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3

3. Suppose we want to compute the quantity $a^2 + b^2$ with a call such as this one:

```
result = sumOfSquares(x,y);
```

Consider the following definition of `sumOfSquares`:

```
1  int sumSquares(int a, int b) {
2    int sum;
3    sum = (a * a) + (b * b);
4    return;
5  }
```

Which statement is true?

(a) There are no errors
(b) There is an error on line 1
(c) There is an error on line 2
(d) There is an error on line 3
(e) There is an error on line 4
(f) There is an error on line 5
(g) There are errors on lines 1 and 3
(h) There are errors on lines 2 and 4
(i) There are errors on lines 3 and 5

4. Given this declaration:

```
int numList[50];
```

What is the index of the last element in the array `numList`?

(a) 0
(b) 49
(c) 50
(d) 51
(e) It is impossible to say, since `numList` has not been initialized

4 D

---

5. A restaurant gives a discount for children under 10 (children age 9 get the discount, but children age 10 don't). They also give the discount for adults 55 and over. Which expression evaluates to true if a discount should be given?

   (a) `(age < 10) && (age > 55)`

   (b) `(age < 10) && (age >= 55)`

   (c) `(age >= 10) && (age < 55)`

   (d) `(age >= 10) || (age <= 55)`

   (e) `(age < 10) || (age >= 55)`

D

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5

## Section 2. About sbTemp.cpp, Multiple Choice (15 points)

Consider the program `sbTemp.cpp` shown below.

```
1  #include <iostream>
2  using namespace std;
3
4  void sbTemp(int temp) {
5     if (temp < 65) {
6        cout << "Too cold.";
7     }
8     else if ((temp >= 65) && (temp <= 75)) {
9        cout << "Perfect.";
10    }
11    else {
12       cout << "Too hot.";
13    }
14 }
15
16 int main() {
17    sbTemp(60);
18    sbTemp(80);
19    sbTemp(75);
20    return 0;
21 }
```

6. What is the output of the `sbTemp.cpp` program when run?

   (a) The program produces no output

   (b) `Too cold.Too hot.Perfect.`

   (c) `Too cold.Perfect.Too hot.`

   (d) `Too hot.Perfect.Too cold.`

   (e) `Too hot.Too cold.Perfect.`

   (f) None of these choices

7. How many function definitions appear in the `sbTemp.cpp` listing, including the definition of `main`?

   (a) None

   (b) 1

   (c) 2

   (d) 3

   (e) 4

   (f) More than 4

8. How many function calls appear in the `sbTemp.cpp` listing? (Do **not** count invocations of the `<<` operator, or the invocation of `main`.)
   (a) None
   (b) 1
   (c) 2
   (d) 3
   (e) 4
   (f) More than 4

## Section 3. Number Conversions (20 pts)

(5 pts each)

Please perform the following number conversions. You do not need to show your work; just put your final answer in the box indicated.

9. Convert the binary number 00100100 to a decimal number.

10. Convert the binary number 00001001 to a decimal number.

11. Convert the decimal number 12 to an 8-bit binary number.

12. Convert the decimal number 129 to an 8-bit binary number.

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## Section 4. The `linear.cpp` program (25 pts)

Consider a C++ program called `linear.cpp` to evaluate the value of a linear function of the form $y = mx+b$ for values of $m$,$x$ and $b$ given on the command line, as in these examples runs:

```
$ ./linear 5 7 2
y=37
$ ./linear 2 5 9
y=19
$ ./linear 3 2 1
y=7
$
```

An incomplete C++ program to calculate this result appears on the next page.

Please complete the program by **filling in the blanks at these places on the next page.**

**AGAIN: LEAVE THIS PAGE BLANK. ANSWER ON THE NEXT PAGE.**

13. Lines 7-8. (Note that you may be able to answer in a single line; I've provided two lines so you have plenty of space for your answer.)

14. On line 13, complete the if statement.

15. On lines 18-20, fill in the three blanks, i.e. the arguments to the function calls to `atoi()`.

16. Fill in the blank on line 22. If the space is too small, you can write your answer near the blank and use an arrow (e.g. ↗) to show where your answer is.

8 D

**Put your answers to questions about `linear.cpp` in the spaces below, directly inside the program code.**

```
1  #include <iostream>
2  #include <cstdlib>
3
4  using namespace std;
5
6  int linear(int m, int x, int b) {
7
8
9  }
10
11 int main(int argc, char *argv[]) {
12
13   if (               ) {
14     cerr << "Usage: ./linear m x b" << endl;
15     exit(1);
16   }
17
18   int m = atoi(       );
19   int x = atoi(       );
20   int b = atoi(       );
21
22   cout << "y=" <<                              << endl;
23
24   return 0;
25 }
```

17. To compile and run the program in the file `linear.cpp` on the CSIL systems (or any similar Unix system), you'd need two commands, one to compile the code, and another to run it on the specific values 1, 2 and 3 for $m$, $x$ and $b$.

    Write these two commands, just as you would type them on CSIL, on two separate lines in the box below.

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## Section 5. What is the output? (10 pts)

Consider this program:

```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5    int x;
6    cin >> x;
7    if (x < 10) {
8      cout << "Live ";
9    }
10   else if (x < 20) {
11     cout << "long ";
12   }
13   else if (x < 30) {
14     cout << "and ";
15   }
16   cout << "prosper!";
17   return 0;
18 }
```

18. When the input is `35` what is the output? Write it this box $\Longrightarrow$ [ ]

19. When the input is `15` what is the output? Write it this box $\Longrightarrow$ [ ]

## Section 6. True/False (5 points)

20. Assuming that these variables are declared and initialized with these values:

```
int x=0;
int y=10;
```

Indicate whether each of the following C++ expressions evaluates to true or false. You may simply put **T** or **F** in the blank beside each expression.

_____ `(x < 0) || (y > 20)`

_____ `(x == 0) && (y == 10)`

_____ `(x == 0) || (y == 20)`

_____ `(x == 0) || (y == 10)`

_____ `(x == 0) && (y == 20)`

D

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2 D

# Answer Key for Exam D

## Section 1. Multiple Choice (25 points)

1. (c)

2. (d)

3. (e)

4. (b)

5. (e)

D

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3

## Section 2. About `sbTemp.cpp`, Multiple Choice (15 points)

6. (b)

7. (c)

8. (d)

## Section 3. Number Conversions (20 pts)

9. 36

10. 9

11. 00001100

12. 10000001

4 D

## Section 4. The `linear.cpp` program (25 pts)

13. The following code should be put in the blank:

```
return m * x + b ;
```

14. The following code should be put in the blank:

```
13    if (argc != 4) {
```

15. The code should be completed as follows:

```
18    int m = atoi(argv[1]);
19    int x = atoi(argv[2]);
20    int b = atoi(argv[3]);
```

16. The following code should be put in the blank:

```
22    cout << "y=" << linear(m, x, b)                    << endl;
```

17. 
```
make linear
./linear 1 2 3
```

    OR

```
g++ linear.cpp -o linear
./linear 1 2 3
```

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Section 5. What is the output? (10 pts)

18. `prosper!`

19. `long prosper!`

Section 6. True/False (5 points)

F `(x < 0) || (y > 20)`

T `(x == 0) && (y == 10)`

T `(x == 0) || (y == 20)`

T `(x == 0) || (y == 10)`

F `(x == 0) && (y == 20)`

E

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1

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# Midterm Exam
# E01

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## Section 1. Multiple Choice (25 points)

Please clearly indicate your choice by circling the appropriate letter. If you make a mistake and have to correct your initial choice, be sure that your intent is clear. (5 pts each)

1. Assume that `scorePerQuiz` is an array of `int` values with 10 elements. Which of the following lines of C++ code assigns the value 8 to the element of `scorePerQuiz` at index 7?

   (a) `scorePerQuiz = 8;`

   (b) `scorePerQuiz[0] = 8;`

   (c) `scorePerQuiz[7] = 8;`

   (d) `scorePerQuiz[8] = 7;`

2. Suppose we want to compute the quantity $a^2 + b^2$ with a call such as this one:

   ```
   result = sumOfSquares(x,y);
   ```

   Consider the following definition of `sumOfSquares`:

   ```
   1 int sumSquares(int a, int b) {
   2   int sum;
   3   sum = (a * a) + (b * b);
   4   return;
   5 }
   ```

   Which statement is true?

   (a) There are no errors

   (b) There is an error on line 1

   (c) There is an error on line 2

   (d) There is an error on line 3

   (e) There is an error on line 4

   (f) There is an error on line 5

   (g) There are errors on lines 1 and 3

   (h) There are errors on lines 2 and 4

   (i) There are errors on lines 3 and 5

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3. Given this declaration:

```
int numList[50];
```

What is the index of the last element in the array `numList`?

(a) 0

(b) 49

(c) 50

(d) 51

(e) It is impossible to say, since `numList` has not been initialized

4. A restaurant gives a discount for children under 10 (children age 9 get the discount, but children age 10 don't). They also give the discount for adults 55 and over. Which expression evaluates to true if a discount should be given?

(a) `(age < 10) && (age > 55)`

(b) `(age < 10) && (age >= 55)`

(c) `(age >= 10) && (age < 55)`

(d) `(age >= 10) || (age <= 55)`

(e) `(age < 10) || (age >= 55)`

5. What is the final value of `y` after this C++ code executes?

```
int x = 77;
int y = 4;
if (x == 77) {
  y = y + 1;
}
if (x < 100) {
  y = y + 1;
}
if (x > 77) {
  y = y + 1;
}
y = y + 1;
```

(a) 4
(b) 5
(c) 6
(d) 7
(e) 8
(f) 9
(g) none of these values

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## Section 2. About `sbTemp.cpp`, Multiple Choice (15 points)

Consider the program `sbTemp.cpp` shown below.

```
1  #include <iostream>
2  using namespace std;
3
4  void sbTemp(int temp) {
5     if (temp < 65) {
6        cout << "Too cold.";
7     }
8     else if ((temp >= 65) && (temp <= 75)) {
9        cout << "Perfect.";
10    }
11    else {
12       cout << "Too hot.";
13    }
14 }
15
16 int main() {
17    sbTemp(60);
18    sbTemp(80);
19    sbTemp(75);
20    return 0;
21 }
```

6. How many function definitions appear in the `sbTemp.cpp` listing, including the definition of `main`?
   (a) None
   (b) 1
   (c) 2
   (d) 3
   (e) 4
   (f) More than 4

7. How many function calls appear in the `sbTemp.cpp` listing? (Do **not** count invocations of the `<<` operator, or the invocation of `main`.)
   (a) None
   (b) 1
   (c) 2
   (d) 3
   (e) 4
   (f) More than 4

8. What is the output of the `sbTemp.cpp` program when run?
   (a) The program produces no output
   (b) `Too cold.Too hot.Perfect.`
   (c) `Too cold.Perfect.Too hot.`
   (d) `Too hot.Perfect.Too cold.`
   (e) `Too hot.Too cold.Perfect.`
   (f) None of these choices

## Section 3. Number Conversions (20 pts)

(5 pts each)
Please perform the following number conversions. You do not need to show your work; just put your final answer in the box indicated.

9. Convert the binary number 00100100 to a decimal number.

10. Convert the binary number 00001001 to a decimal number.

11. Convert the decimal number 12 to an 8-bit binary number.

12. Convert the decimal number 129 to an 8-bit binary number.

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## Section 4. The `linear.cpp` program (25 pts)

Consider a C++ program called `linear.cpp` to evaluate the value of a linear function of the form $y = mx+b$ for values of $m$,$x$ and $b$ given on the command line, as in these examples runs:

```
$ ./linear 5 7 2
y=37
$ ./linear 2 5 9
y=19
$ ./linear 3 2 1
y=7
$
```

An incomplete C++ program to calculate this result appears on the next page.

Please complete the program by **filling in the blanks at these places on the next page.**

**AGAIN: LEAVE THIS PAGE BLANK. ANSWER ON THE NEXT PAGE.**

13. Lines 7-8. (Note that you may be able to answer in a single line; I've provided two lines so you have plenty of space for your answer.)

14. On line 13, complete the if statement.

15. On lines 18-20, fill in the three blanks, i.e. the arguments to the function calls to `atoi()`.

16. Fill in the blank on line 22. If the space is too small, you can write your answer near the blank and use an arrow (e.g. ↗) to show where your answer is.

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**Put your answers to questions about `linear.cpp` in the spaces below, directly inside the program code.**

```
1  #include <iostream>
2  #include <cstdlib>
3
4  using namespace std;
5
6  int linear(int m, int x, int b) {
7
8
9  }
10
11 int main(int argc, char *argv[]) {
12
13   if (               ) {
14     cerr << "Usage: ./linear m x b" << endl;
15     exit(1);
16   }
17
18   int m = atoi(       );
19   int x = atoi(       );
20   int b = atoi(       );
21
22   cout << "y=" <<                              << endl;
23
24   return 0;
25 }
```

17. To compile and run the program in the file `linear.cpp` on the CSIL systems (or any similar Unix system), you'd need two commands, one to compile the code, and another to run it on the specific values 1, 2 and 3 for $m$, $x$ and $b$.

    Write these two commands, just as you would type them on CSIL, on two separate lines in the box below.

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## Section 5. What is the output? (10 pts)

Consider this program:

```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5    int x;
6    cin >> x;
7    if (x < 10) {
8      cout << "Live ";
9    }
10   else if (x < 20) {
11     cout << "long ";
12   }
13   else if (x < 30) {
14     cout << "and ";
15   }
16   cout << "prosper!";
17   return 0;
18 }
```

18. When the input is 5 what is the output? Write it this box $\Longrightarrow$ [ ]

19. When the input is 25 what is the output? Write it this box $\Longrightarrow$ [ ]

## Section 6. True/False (5 points)

20. Assuming that these variables are declared and initialized with these values:

```
int x=0;
int y=10;
```

Indicate whether each of the following C++ expressions evaluates to true or false. You may simply put **T** or **F** in the blank beside each expression.

_____ `(x == 0) && (y == 10)`

_____ `(x == 0) || (y == 20)`

_____ `(x == 0) || (y == 10)`

_____ `(x < 0) || (y > 20)`

_____ `(x == 0) && (y == 20)`

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# CMPSC 16 F21
# Midterm Exam
# E01

By signing your name below, you are asserting that all work on this exam is yours alone, and that you will not provide any information to anyone else taking the exam. In addition, you are agreeing that you will not discuss any part of this exam with anyone who is not currently taking the exam in this room until after the exam has been returned to you. This includes posting any information about this exam on any online forum or social media site. Discussing any aspect of this exam with anyone outside of this room constitutes a violation of the academic integrity standards for this course.

Signature: _____

## Please follow these instructions:

- Right now, before you start, **write your name, email and seat number at the top of every odd page of this exam**. (If you are not taking the exam in Chem 1179, you may leave seat number blank).
- Fill out the blue sheet for questions with your name, email and seat number.
- NO TALKING during the exam.
- If you have a question during the exam, please use the provided blue sheet to ask your question in writing, raise your hand holding up the paper, and then when indicated, pass your blue sheet to a staff member, and wait for your answer in writing.
- **When finished, DO NOT GET UP.** Stay quietly in your seat until you are invited to come up and turn in your exam.
- The staff will invite people to get up to turn in exams every 10-15 minutes. This minimizes distraction to neighboring students.

# Answer Key for Exam E

## Section 1. Multiple Choice (25 points)

1. (c)

2. (e)

3. (b)

4. (e)

5. (d)

## Section 2. About `sbTemp.cpp`, Multiple Choice (15 points)

6. (c)

7. (d)

8. (b)

## Section 3. Number Conversions (20 pts)

9. 36

10. 9

11. 00001100

12. 10000001

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## Section 4. The `linear.cpp` program (25 pts)

13. The following code should be put in the blank:

```
return m * x + b ;
```

14. The following code should be put in the blank:

```
13    if (argc != 4) {
```

15. The code should be completed as follows:

```
18    int m = atoi(argv[1]);
19    int x = atoi(argv[2]);
20    int b = atoi(argv[3]);
```

16. The following code should be put in the blank:

```
22    cout << "y=" << linear(m, x, b)                    << endl;
```

17. 
```
make linear
./linear 1 2 3
```

    OR

```
g++ linear.cpp -o linear
./linear 1 2 3
```

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Section 5. What is the output? (10 pts)

18. `Live prosper!`

19. `and prosper!`

Section 6. True/False (5 points)

__T__ `(x == 0) && (y == 10)`

__T__ `(x == 0) || (y == 20)`

__T__ `(x == 0) || (y == 10)`

__F__ `(x < 0) || (y > 20)`

__F__ `(x == 0) && (y == 20)`