1. Write your name on your scantron in the space labeled NAME.
2. Write CS 1613 in the space labeled SUBJECT.
3. Write the date in the space labeled DATE.
4. Write your CRN in the space labeled HOUR.
5. You may not consult your neighbors, colleagues, or fellow students to answer the questions on this test.
6. Mark all selections that satisfy the question. If selection b, c, and d satisfy a question then mark selections b, c, and d.
7. Darken your selections completely. Make a heavy black mark that completely fills your selection.
8. Answer all 50 questions.
1. Mark all selections whose expressions evaluate to the corresponding value in table 1

<table>
<thead>
<tr>
<th>Selection</th>
<th>Variables</th>
<th>Expression</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>int a=4,b=3,c=2,d=1;</td>
<td>a*b/c%a</td>
<td>2</td>
</tr>
<tr>
<td>b</td>
<td>int a=4,b=3,c=2,d=1;</td>
<td>a*b/c+1</td>
<td>6</td>
</tr>
<tr>
<td>c</td>
<td>int a=4,b=3,c=2,d=1;</td>
<td>++(a*b+c--)</td>
<td>15</td>
</tr>
<tr>
<td>d</td>
<td>int a=4,b=3,c=2,d=1;</td>
<td>--d+c*-a/b++</td>
<td>-2</td>
</tr>
</tbody>
</table>

Table 1.

2. Mark all selections whose expressions evaluate to the corresponding value in table 2

<table>
<thead>
<tr>
<th>Selection</th>
<th>Variables</th>
<th>Expression</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>int i=4,j=3,k=2,m=1;</td>
<td>i*=j+k</td>
<td>14</td>
</tr>
<tr>
<td>b</td>
<td>int i=4,j=3,k=2,m=1;</td>
<td>j*=k+=m=5</td>
<td>21</td>
</tr>
<tr>
<td>c</td>
<td>int i=4,j=3,k=2,m=1;</td>
<td>k*=m+=2</td>
<td>6</td>
</tr>
<tr>
<td>d</td>
<td>int i=4,j=3,k=2,m=1;</td>
<td>m/=i*=k=3+m</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2.

3. Mark all selections whose expressions evaluate to the corresponding value in table 3.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Variables</th>
<th>Expression</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>int i=10,j=2,k=6; double x=3.2; \text{min}=-4.6;</td>
<td>i=j==j</td>
<td>1</td>
</tr>
<tr>
<td>b</td>
<td>int i=10,j=2,k=6; double x=3.2; \text{min}=-4.6;</td>
<td>10*!!x==i</td>
<td>0</td>
</tr>
<tr>
<td>c</td>
<td>int i=10,j=2,k=6; double x=3.2; \text{min}=-4.6;</td>
<td>i+j+k==2*!!k</td>
<td>1</td>
</tr>
<tr>
<td>d</td>
<td>int i=10,j=2,k=6; double x=3.2; \text{min}=-4.6;</td>
<td>(x=!y)</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.

4. Mark all correct selections.
   a. The indirection operator * has higher precedence than the multiplicative operator *.
   b. The multiplicative operator * has higher precedence than the equality operator ==.
   c. The equality operator == has higher precedence than the assignment operator =.
   d. The assignment operator = has higher precedence than the sequential evaluation operator , .

5. Mark all correct selections.
   a. The postfix increment operator ++ has higher precedence than the prefix operator ++.
   b. The binary subtraction operator - has higher precedence than the unary negation operator -.
   c. The equality operator == has higher precedence than the logical and operator &&.
   d. The relational operator < has higher precedence than the logical or operator ||.

6. Mark all correct selections.
   a. The prefix increment operator ++ is left associative.
   b. The assignment operator += is right associative.
   c. The additive operator + is right associative.
   d. The logical not operator ! is right associative.

7. Mark all correct selections.
   a. The left shift operator is <<.
   b. The inequality operator is <>. 
   c. The exponentiation operator is ^.
   d. The bitwise-or operator is |.
8. What is printed by program \texttt{q08}?
   a. 0 3 6 9
   b. 3 6 9 12
   c. 0 3 9 27
   d. 3 9 27 81

\begin{verbatim}
#include <iostream>
using namespace std;
int main()
{
    int b=0;
    for (int a=0; a<4; a++)
        cout << (b+=3) << " ";
    cout << endl;
    return 0;
}
\end{verbatim}

\textbf{Figure 8. Program q08.}

9. What is printed by program \texttt{q09}?
   a. 1 3 6 9
   b. 3 6 9 12
   c. 1 3 9 27
   d. 3 9 27 81

\begin{verbatim}
#include <iostream>
using namespace std;
int main()
{
    int b=1;
    for (int a=0; a<4; a++)
        cout << (b*=3) << " ";
    cout << endl;
    return 0;
}
\end{verbatim}

\textbf{Figure 9. Program q09.}

10. What is printed by program \texttt{q10}?
    a. 16 2 7 0
    b. 4 0 1 0 1 0
    c. 4 1 1 5
    d. none of the above

\begin{verbatim}
#include <iostream>
using namespace std;
void g(int & d, int m) { cout << d/m << " "; d%=m;}
void f(int d) { g(d,250); g(d,40); g(d,5); g(d,1);}
int main()
{
    f(4115);
    cout << endl;
    return 0;
}
\end{verbatim}

\textbf{Figure 10. Program q10.}
11. What is printed by program q11?
   a. dddddddcxv
   b. mmmmlxv
   c. mmmmcxv
   d. mmmmcvvv

```cpp
#include <iostream>
using namespace std;

void g(int &d, int m, char r)
{"for (int a=0; a<d/m; a++) cout << r;
d %= m;
} 

void f(int d)
{"g(d, 1000, 'm');  g(d, 500, 'd');  g(d, 100, 'c');
g(d, 50, 'l');  g(d, 10, 'x');  g(d, 5, 'v');
g(d, 1, 'i');
}

int main()
{"f(4115);
cout << endl;
return 0;
} 
```

Figure 11. Program q11.

12. What is printed by program q12?
   a. vii
   b. viiiiiii
   c. iiiiiii
   d. iiiiv

```cpp
#include <iostream>
using namespace std;

void g(int d, int m, char r)
{"for (int a=0; a<d/m; a++) cout << r;
d %= m;
} 

void f(int d)
{"g(d, 1000, 'm');  g(d, 500, 'd');  g(d, 100, 'c');
g(d, 50, 'l');  g(d, 10, 'x');  g(d, 5, 'v');
g(d, 1, 'i');
}

int main()
{"f(7);
cout << endl;
return 0;
} 
```

Figure 12. Program q12.
13. What is printed by program \(q_{13}\)?
   a. \(ddddddddccccxxxi\)
   b. \(mmmmccccxxxi\)
   c. \(ddddddddllllxxxi\)
   d. \(mmmdccxxxi\)

```cpp
#include <iostream>
using namespace std;

int g(int d, int m, char r)
{
    for (int a = 0; a < d / m; a++)
        cout << r;
    return d % m;
}

void f(int d)
{
    d = g(d, 1000, 'm');
    d = g(d, 500, 'd');
    d = g(d, 100, 'c');
    d = g(d, 50, 'l');
    d = g(d, 20, 'z');
    d = g(d, 10, 'x');
    d = g(d, 5, 'v');
    d = g(d, 1, 'i');
}

int main()
{
    f(3731);
    cout << endl;
    return 0;
}
```

**Figure 13.** Program \(q_{13}\).

14. The set of integers includes
   a. the set of counting numbers.
   b. the set of whole numbers.
   c. the set of negative counting numbers.
   d. the set of rational numbers.

15. Two’s complement integers are stored in four bytes. Each byte consists of eight bits. The value of integer \(i\) is defined for
   a. \(2^{-32} \leq i \leq 2^{32}\)
   b. \(-2^{32} < i < 2^{32}\)
   c. \(2^{-31} \leq i < 2^{31}\)
   d. \(-2^{31} < i < 2^{31}\)

16. Which of the following is entirely composed of valid C++ identifiers?
   a. for he is a jolly good fellow
   b. The cow is of the bovine ilk One end is moo the other milk.
   c. and while she was sleeping
   d. two four six eight who do we appreciate
17. Which pairs of assignment statements can be replaced by a single statement?
   
   a. \(IQ=SAT-600; \text{Age} := 125 + \text{Age};;\)
   
   b. \(Quiz = 4 - \text{Test}; \text{Quiz} = 3 \times \text{Quiz};\)
   
   c. \(\text{Margin} = \text{Margin} + 6; \text{Margin} = 32 - \text{Margin};\)
   
   d. \(\text{Weight} = \text{Length} + 62; \text{Measure} = \text{Length} \times \text{Measure};\)

18. What set of numbers do real numbers not include?
   
   a. Whole numbers
   
   b. Counting numbers
   
   c. Complex numbers
   
   d. Rational numbers

19. Each rectangle below represents a single byte. Select correct valid representations for “A”
   
   a
   
   b
   
   c
   
   d

20. Identify correct declarations that when compiled cause no errors or warnings.
   
   a. \text{char} \(a = "a";\)
   
   b. \text{int} \(i = 1.602E-19;\)
   
   c. \text{bool} \(b = 0;\)
   
   d. \text{double} \(d = 5;\)

21. Every complete statement is terminated by a
   
   a. period
   
   b. # symbol
   
   c. semicolon
   
   d. closing curly brace

22. Which of the following directives is properly formed.
   
   a. \#include <iostream>
   
   b. \#include (iostream)
   
   c. \#include {iostream}
   
   d. \#include [iostream]
23. Every C++ program must have a
   a. `cout` statement
   b. function `main`
   c. `#include` directive
   d. All of the above

24. Preprocessor directives begin with
   a. `#`
   b. `!`
   c. `<`
   d. None of the above

25. Identify the incorrect statements.
   a. `cout << "Hello World";`
   b. `cout << "Have a nice day"\n;`
   c. `cout < value;`
   d. `cout << Programming is great fun;`

26. What is displayed by program `q26`?
   a. 1
   b. 2
   c. 3
   d. 4

```cpp
#include <iostream>
using namespace std;

int main()
{
    int a=5,b=11,c=3,d=4;  
    cout << a+b  %  c-d << endl;
    return 0;
}
```

Figure 26. Program `q26`.

27. The negation operator is
   a. unary
   b. binary
   c. ternary
   d. none of the above
28. What is displayed by program q28?
   
   a. $86 
   b. $86.99 
   c. $87 
   d. $86.9932 

   ```cpp
   #include <iostream>
   #include <iomanip>
   using namespace std;
   int main()
   {
       double R=86.9932;
       cout << setprecision(2) << "$" << R << endl;
       return 0;
   }
   ```

   Figure 28. Program q28.

29. Identify the flowchart in Figure 29 that best describes the flow of control in a C++ while-statement.
   
   a. 
   b. 
   c. 
   d. 

   ![while-statement flowcharts](image-url)

   Figure 29. while-statement flowcharts.
30. Identify the flowchart in Figure 31 that best describes the flow of control in a C++ \textit{for-statement}.

\begin{itemize}
  \item[a.] \hspace{1cm} \hspace{1cm}
  \begin{itemize}
    \item initialization-expression-list
    \item statement
    \item increment-decrement-expression-list
  \end{itemize}

  \begin{itemize}
    \item true
    \item condition
    \item false
  \end{itemize}

  \begin{itemize}
    \item true
    \item initialization-expression-list
  \end{itemize}

  \begin{itemize}
    \item true
    \item statement
    \item increment-decrement-expression-list
  \end{itemize}

  \begin{itemize}
    \item true
    \item condition
    \item false
    \item initialization-expression-list
  \end{itemize}

  \begin{itemize}
    \item true
    \item statement
    \item increment-decrement-expression-list
  \end{itemize}

\end{itemize}

\textbf{Figure 31.} \textit{for-statement} flowcharts
31. What is printed by program q31?

a. 1s  
b. 1h  
c. 2s  
d. 2h

```cpp
#include <iostream>
using namespace std;
int main()
{
    int f[]={0,1,1,2,3,5,8,13,21,34};
    char d[]="twoshoes";
    cout << f[3] << *(d+4);
    cout << endl;
    return 0;
}
```

*Figure 31. Program q31.*

32. What is displayed by program q32?

a. 511  
b. 512  
c. 1023  
d. 1024

```cpp
#include <iostream>
using namespace std;
int main()
{
    int a=0,s=1,t=0;
    while (a<10) {
        t+=s;
        s*=2;
        a++;
    }
    cout << t << endl;
    return 0;
}
```

*Figure 32. Program q32.*
33. What is displayed by program q33?
   a. 511
   b. 512
   c. 1023
   d. 1024

```cpp
#include <iostream>
using namespace std;
int main()
{
    int e=1, s=0;
    for (int a=0; a<10; e=e*2, a++) s=s+e;
    cout << e << endl;
    return 0;
}
```

Figure 33. Program q33.

34. Find the value of $\sum_{i=1}^{15} 2i$
   a. 60
   b. 120
   c. 240
   d. 480

35. Find the value of $\sum_{r=0}^{10} 3^r$
   a. 88,573
   b. 59,049
   c. 177,146
   d. none of the above

36. What is the monthly payment on a loan whose term is ten years, whose APR is 8, and whose principal owed before the first payment is $25,000.00
   a. $208.33
   b. $303.32
   c. $2000.20
   d. none of the above

37. What is the monthly payment on a loan whose term is one year, whose APR is 8, and whose principal owed before the first payment is $1,000.00
   a. $86.99
   b. $83.33
   c. $132.70
   d. none of the above
38. What is displayed by program q38?

a. One for the money. Two for the show. Three to get ready and four to go.

b. One for the money. Two for the show. Three to get ready and four to go.

c. One for the money. Three to get ready and four to go.

d. Two for the show. Three to get ready and four to go.

```cpp
#include <iostream>
using namespace std;

int main() {
    for (int a=0; a<4; a=a+2) {
        switch (a+1) {
        case 1: cout << " One for the money.";
        case 2: cout << " Two for the show.";
                     break;
        case 3: cout << " Three to get ready";
        case 4: cout << " and four to go.";
                     break;
        }
        cout << endl;
    }
    return 0;
}
```

Figure 38. Program q38.

39. What is the present value of a sequence of monthly payments amounting to $250 over a term of twenty (20) years at 6.5 APR?

a. $33,532.00
b. $60,000.00
c. $3,900
d. none of the above
40. Identify valid mathematical expressions for the present value, $P$, of a sequence of equal payments, $R$, at periodic interest rate, $i$, for a term of $n$ periods.

a. $P = \frac{Ri}{1 - (1 + i)^{-n}}$

b. $P = \sum_{k=1}^{n} \frac{R}{(1 + i)^k}$

c. $P = R \frac{1 - (1 + i)^{-n}}{i}$

d. none of the above

41. What is printed by program $q41$?

a. -55 -19 -5 12 12 13 31 67
b. 31 67 13 12 12 -5 -55 -19
c. 67 31 13 12 12 -5 -19 -55
d. none of the above

```cpp
#include <iostream>
#include <fstream>
using namespace std;

void Swap(int& m, int& w) { int b = m; m = w; w = b; }

void Sort(int L[], int M)
{    for (int eol = M-1; eol > 0; eol--)
        { int iom = 0;
          for (int i = 1; i <= eol; i++)
                { if (L[i] < L[iom]) iom = i; }
            Swap(L[iom], L[eol]);
        }
}

void Print(ostream& o, int L[], int M)
{    for (int a = 0; a < M; a++) o << L[a] << " ";
        o << endl;
}

int main()
{    int L[] = {12, -5, 31, 67, -19, 13, 12, -55};
    Sort(L, 8);
    Print(cout, L, 8);
    return 0;
}
```

Figure 41. Program $q41$. 

13
42. What is displayed by program p42?

a.  2   3   5   7   9   11  13  15  17  19
b.  2   3   5   7  11  13  17  19
c.  3   5   7   11  13  17  19
d.  3   5   7   9  11  13  15  17  19

```cpp
#include <iostream>
#include <iomanip>
using namespace std;

bool IsP(int c)
{
    for (int f=3; f<c; f=f+2) if (!(f%c)) return false;
    return true;
}

int main()
{
    for (int c=3; c<20; c=c+2) {
        if (IsP(c)) cout << setw(5) << c;
    }
    cout << endl;
    return 0;
}
```

43. What is displayed by program p43.

a.  kt
b.  ku

c.  lt

d.  lu

```cpp
#include <iostream>
using namespace std;

void P(char c) { c++; }
void Q(char& d) { d++; }

int main()
{
    char a='k', b='t';
    P(a); Q(a); P(b); Q(b);
    cout << a << b << endl;
    return 0;
}
```

44. Identify parameters in program q43.

a.  a
b.  b
c.  c
d.  d

45. Identify arguments program q43.

a.  a
b.  b
c.  c
d.  d
46. Parameters
   a. are defined between enclosing parentheses where the function is defined.
   b. are defined between enclosing parentheses where the function is called.
   c. specify how arguments are passed.
   d. include a type specification.

47. An argument
   a. can be passed by-value if it is an expression.
   b. can be passed by-reference if it is an expression.
   c. can be passed by value if it is a variable.
   d. can be passed by reference if it is a variable.

48. A parameter
   a. becomes an alias when the corresponding argument is passed by-value.
   b. becomes an alias when the corresponding argument is passed by-reference.
   c. is a copy of the corresponding argument when it is passed by-value.
   d. is a copy of the corresponding argument when it is passed by-reference.

49. Mark all correct alternatives.
   a. An odd number has only odd factors.
   b. Suppose \( c = pq \). Variable \( c \) is a candidate to be a prime number. Variable \( c \) is not a prime number if either \( p \) or \( q \) is an integer.
   c. Suppose \( c = pq \). Variable \( c \) is a candidate to be a prime number. Test variable \( c \) by dividing \( c \) by \( p \). Let \( p \) take on the sequence 3, 5, 7, \( \ldots \) We can stop testing \( c \) when \( p \geq q \).
   d. none of the above
50. What is displayed by program p50?

   a. A
   b. B
   c. D
   d. F

Figure 50. Program p50.

```cpp
#include <iostream>
using namespace std;

int main()
{
    int score=40;
    char grade='F';
    if (score < 60) grade='F';
    if (score < 70) grade='D';
    if (score < 80) grade='C';
    if (score < 90) grade='B';
    if (score <= 100) grade='A';
    cout << grade << endl;
    return 0;
}
```