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 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>a-c-a/ab++</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;</td>
<td>i=j=j</td>
<td>1</td>
</tr>
<tr>
<td>b</td>
<td>int i=10,j=2,k=6;</td>
<td>10*!!x==i</td>
<td>0</td>
</tr>
<tr>
<td>c</td>
<td>int i=10,j=2,k=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;</td>
<td>(x!=y)</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.

4. Mark 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. A C++ program always contains at least one
   a. Opening curly brace, {
   b. identifier
   c. return-statement
   d. #include directive
7. Which of the following are valid character constants?
   a. L ‘\n’
   b. ‘0x0C’
   c. ‘\’ L
   d. ‘\23’

8. A mixed-up program is given in Figure 8. The line numbers are not part of the program. Select all correct sequences of line numbers that produce a program that compiles and executes without error.
   a. 4, 8, 1, 7, 3, 5, 2
   b. 3, 4, 8, 1, 7, 6, 2
   c. 1, 7, 5, 2
   d. 1, 3, 7, 5, 2

```cpp
1. int main()
2. }
3. // A crazy mixed up program
4. #include <iostream>
5. return 0;
6. cout << “In 1492 Columbus sailed the ocean blue.”;
7. }
8. using namespace std;
```

**Figure 8.** A mixed-up C++ program
9. A mixed-up program is given in Figure 9 b. The line numbers are not part of the program. Select sequences of lines that will cause the program to display the lines shown in Figure 9 a. There are six lines displayed in Figure 9 a.

a. 5, 6, 12, 3, 11, 2, 9, 8, 10, 7, 1, 4  
b. 5, 6, 12, 3, 11, 2, 1, 9, 8, 10, 7, 8, 4  
c. 6, 12, 3, 11, 2, 8, 9, 8, 1, 10, 1, 7, 4  
d. 5, 6, 12, 3, 11, 2, 1, 9, 8, 7, 8, 4

```cpp
One,

two,

buckle my shoe.
```

**Figure 9 a.** Output for the program in Figure 9 b.

```cpp
1. cout << endl;
2. cout << "One,\n";
3. int main()
4. }
5. // It is the responsibility of the student to bring order out of chaos.
6. #include <iostream>
7. return 0;
8. cout << "\n";
9. cout << "two,";
10. cout << "buckle my shoe.";"
11. {
12. using namespace std;
```

**Figure 9 b.** A mixed-up C++ program

10. What is displayed by program p10?

a. A bit of
    Talcum
    Is always walcum.

b. A bit of Talcum
    Is always walcum.

c. A bit of
    Talcum
    Is always walcum.

d. A bit of Talcum is always walcum.

```cpp
#include <iostream>
using namespace std;
int main()
{
    cout << 'A'; cout << "bit of\n"; cout << "Talcum" << endl;
    cout << "Is"; cout << "always walcum." << endl;
    return 0;
}
```

**Figure 10.** Program p10.
11. Which declarations are syntactically correct?
   a. small s;
   b. unsigned float uf;
   c. long float lf;
   d. unsigned long ul;

12. 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.

13. 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. \( -2^{32} \leq i < 2^{32} \)
   c. \( 2^{-31} \leq i < 2^{31} \)
   d. \( -2^{31} \leq i < 2^{31} - 1 \)

14. 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

15. Which of the following are valid floating-point constants?
   a. 1.602x10e-19f
   b. .0034L
   c. 0.
   d. 2e+9

16. Which pairs of assignment statements can be replaced by a single statement?
   a. \( IQ=SAT-600; \ Age=125 + Age; \)
   b. \( Quiz=4-Test; \ Quiz=Quiz*3; \)
   c. \( Margin=Margin+6; \ Margin=32-Margin; \)
   d. \( Weight=Length+62; \ Measure=Length*Measure; \)
17. What set of numbers do real numbers not include?
   a. Whole numbers
   b. Counting numbers
   c. Complex numbers
   d. Rational numbers

18. Which of the following are valid integer constants?
   a. 1
   b. 012
   c. 0x7FU
   d. 23L

19. Identify correct declarations that when compiled cause no errors or warnings.
   a. char a=”a”;
   b. int i=1.602E-19;
   c. bool b=0;
   d. double d=5;

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

21. Which of the following directives is properly formed.
   a. #include <iostream>
   b. #include (iostream)
   c. #include {iostream}
   d. #include [iostream]

22. Every C++ program must have a
   a. cout statement
   b. function main
   c. #include directive
   d. All of the above

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

24. Identify the incorrect statements.
   a. cout << “Hello World”; 
   b. cout << “Have a nice day”\n;
   c. cout < value;
   d. cout << Programming is great fun;
25. What is displayed by program \texttt{p25}?

\begin{itemize}
  \item a. 1
  \item b. 2
  \item c. 3
  \item d. 4
\end{itemize}

\begin{verbatim}
#include <iostream>
using namespace std;
int main()
{
  int \texttt{a}=5, \texttt{b}=11, \texttt{c}=3, \texttt{d}=4;
  cout << \texttt{a}+\texttt{b} \ % \ \texttt{c}-\texttt{d} << endl;
  return 0;
}
\end{verbatim}

\textbf{Figure 25.} Program \texttt{p25}.

26. The negation operator is

\begin{itemize}
  \item a. unary
  \item b. binary
  \item c. ternary
  \item d. none of the above
\end{itemize}

27. When are preprocessor directives translated?

\begin{itemize}
  \item a. After the source is created but before the C++ compiler is invoked.
  \item b. After the C++ compiler is invoked but before the linkage editor is invoked.
  \item c. After the linkage editor is invoked but before the program is executed.
  \item d. None of the above.
\end{itemize}

28. What is displayed by program \texttt{p28}?

\begin{itemize}
  \item a. $86$
  \item b. $86.99$
  \item c. $87$
  \item d. $86.9932$
\end{itemize}

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

\textbf{Figure 28.} Program \texttt{p28}.
29. 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.

30. 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 |.

31. What is printed by program p31?
   a. 0 3 6 9
   b. 3 6 9 12
   c. 0 3 9 27
   d. 3 9 27 81

```cpp
#include <iostream>
using namespace std;
int main()
{
    int a=0, b=0;
    cout << (b+=3) << " ";
    cout << (b+=3) << " ";
    cout << (b+=3) << " ";
    cout << (b+=3) << " ";
    cout << endl;
    return 0;
}
```

**Figure 8.** Program p31.

32. What is displayed by program p32?

a. 1
b. 512
c. 1024
d. 2048

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

**Figure 32.** Program p32.
33. What is displayed by program p33?

   a.  45
   b.  55
   c.  10
   d.  none of the above

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

**Figure 33.** Program p33.

34. What is displayed by program p34?

   a.  511
   b.  1023
   c.  1024
   d.  2047

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

**Figure 34.** Program p34.

35. Find the value of \( \sum_{i=1}^{15} 2i \)

   a.  60
   b.  120
   c.  240
   d.  480
36. Find the value of \( \sum_{r=0}^{10} 3^r \)

a. 88,573  
b. 59,049  
c. 177,146  
d. none of the above

37. 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

38. 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

39. What is the value of \( 10_{10} \)?

a. \( 00001010_2 \)  
b. \( 00000022_{16} \)  
c. \( 00000012_8 \)  
d. \( 0000000A_{16} \)

40. 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
41. 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

42. What is displayed by program p42?

a. 0
b. 1
c. false
d. true

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

int main()
{
    double a=-5.0, b=29.6, c=4.17e-1;
    cout << (a<b && b<c);
    cout << endl;
    return 0;
}
```

Figure 42. Program p42.

43. What is displayed by program p43.

a. kt
b. ks
c. lt
d. ls

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

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

Figure 43. Program p43.
44. What is displayed by program p44.
   a. 2.9979e08
   b. 2.998e08
   c. 2.997e08
   d. 3.00e8

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

int main()
{
  double c = 2.997924e8;
  cout << scientific << setprecision(3) << c << endl;
  return 0;
}
```

Figure 44. Program p44.

45. What is the value of the expression $0xB << 1$? Mark all correct choices.
   a. 0xA
   b. 0xC
   c. 22
   d. 5

46. What is the value of the expression $0xB >> 1$? Mark all correct choices
   a. 0xA
   b. 0xC
   c. 22
   d. 5

47. What is the value of $0x5 \& 0xA$? Mark all correct choices.
   a. 15
   b. 0
   c. 0x5B
   d. 0x6

48. What is the value of $0x6 ^ 0xA$? Mark all correct choices.
   a. 0xA
   b. 0xB
   c. 0xC
   d. 0xD

49. What is the value of $0x6 | 0xA$? Mark all correct choices.
   a. 11
   b. 12
   c. 13
   d. 14
50. What is the value of \texttt{0x9 | 0xA & 0x3}? Mark all correct choices.

a. 8  
b. 9  
c. 10  
d. 11
51. What is displayed by program p50?

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

```
#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;
}
```

Figure 50. Program p50.