1. Why do we need the #include and #define directive in C++ programs?
2. What are the use of the functions cin and cout?
3. Are there any other commands that can be used instead of cin and cout?
4. What are syntax, run-time and logical errors? What type of error does the compiler detect?
5. List three standard data types of C++.
6. Determine the result for:  a) 34/3  b) 34%3  c)3/62  d)3.0/62
7. The _____ selection statement is used to execute one action when a condition is true and another action when the condition is false.
8. How could the width of the text/output be set?
9. How could we set the precision of a floating point number output, say to 3 decimal places?
10. Show two ways a constant can be declared in a program.
11. Write C++ statements to carry out the following steps.
   a) if item is nonzero, then multiply product by item and save the result in product; otherwise, skip the multiplication. In either case, print the value of product.
   b) store the absolute difference of x and y in y, where the absolute difference is (x-y) or (y-x), whichever is positive. Do not use the absolute function in your solution.

Programming Exercises

1. Write a program that reads five integer numbers from the keyboard, and display the largest and smallest of the numbers entered.
   Hint: To find the largest of five integers, do comparison four times, for every integer:-
   if (a>b && a>c && a>d && a>e) largest=a;
   if (b>a && b>c && b>d && b>e) largest=b;
   if (c>a && c>b && c>d && c>e) largest=c;
   if (d>a && d>b && d>c && d>e) largest=d;
   if (e>a && e>b && e>c && e>d) largest=e;
   cout<<"\nThe largest number is " << largest;

2. Write a program to find the sum of the digits of a number given by the user. That is, if the user enters 456, then the sum is 15.

3. Write a program that reads a list of test scores and prints the test scores together with the letter grades according to the following scale:-

<table>
<thead>
<tr>
<th>Score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100</td>
<td>A</td>
</tr>
<tr>
<td>80-89</td>
<td>B</td>
</tr>
<tr>
<td>70-79</td>
<td>C</td>
</tr>
<tr>
<td>60-69</td>
<td>D</td>
</tr>
<tr>
<td>0-59</td>
<td>F</td>
</tr>
</tbody>
</table>
4. Write a program that generates two random numbers between 0 and 100 and ask user to provide the correct answer if the numbers are added together. If the answer given is wrong, print ‘sorry, better luck next time’ and exit, if correct, congratulates the user and exit. Create the random number using `rand()` and the number must be different every time.

   **Hint**: To create random number, use:-
   ```cpp
   #include<cstdlib>
   #include<ctime>
   srand(time(NULL)); //need to generate the seed for random number, do only once
   m = rand()%100;     //m now has a value between 0 and 99
   another way is by:-
   m = (rand()+time(0))%100; //No need the srand(time(NULL)); statement
   ```

5. Write a program to compute the real roots of a quadratic equation of the form $ax^2 + bx + c = 0$. The roots $x_1$ and $x_2$ are calculated using:

   $$x_1, x_2 = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

   The program should prompt the user to enter the constants a, b, c. The roots will be displayed according to the following rules:
   a) If both a and b are zero, there is no solution. Display “No solution”.
   b) If a is zero, there is only one root, i.e. $-c/b$. Display the root.
   c) If $(b^2 - 4ac)$ is negative, there are no real roots. Display “Roots are imaginary”.
   d) For all other combinations, there are two real roots. Calculate and display the roots.

   Test the program by using a, b, c as follows:
   i) 3, 8, 5  
   ii) -6, 7, 8  
   iii) 0, 9, -10  
   iv) 0, 0, 11

6. Write a program using `switch` statement that will display the character the user enter. The user will enter a single character A, B, C or D. Other than A, B, C, D the program will display ‘Invalid input’.

7. Write a program using `switch` statement that will display:-
   a) ‘You have entered 1’ if the user enters 1.
   b) ‘The square of 2 is 4’ if the user enters 2.
   c) ‘Number 3 is a prime number’ if the user enters 3.
   d) ‘Number 4 is an even number’ if the user enters 4.
   e) ‘Invalid input’ if user enters other than 1, 2, 3 or 4.

8. An online book club awards points to its customers based on the number of books purchased each month. The points are awarded as follows:-
Write a program that asks the user to enter the numbers of books purchased this month and then displays the number of points awarded. Include a `switch` statement in your program.

9. The following table shows the approximate speed of sound, measured in feet per second, travels in air, water, and steel.

<table>
<thead>
<tr>
<th>Medium</th>
<th>Speed (ft/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>1100</td>
</tr>
<tr>
<td>Water</td>
<td>4900</td>
</tr>
<tr>
<td>Steel</td>
<td>16400</td>
</tr>
</tbody>
</table>

Write a program that displays a menu allowing the user to select air, water or steel. After the user has made a selection, the number of feet a sound wave will travel in the selected medium should be entered. The program then display the amount of time it will take to travel that distance. The program must check that the distance cannot be 0 or less.

10. A triangle of sides a, b, and c can be categorized as ‘equilateral’, isosceles’ and ‘scalene’. A triangle can be drawn only if \((a+b) > c\) and \((b+c) > a\) and \((a+c) > b\).
A triangle is equilateral when \(a = b\) and \(b = c\).
A triangle is isosceles when \(a = b\) or \(b = c\) or \(c = a\).
A triangle is scalene if \(a \neq b\) and \(b \neq c\) and \(c \neq a\).

Write a program to accept an input \(a, b, c\) as the triangle sides, and then prints out whether the triangle is ‘equilateral’, isosceles’ or ‘scalene’.

**PART A**

1. An expression using the greater-than, less-than, greater-than-or-equal-to, less-than-or-equal-to, equal, or not-equal operator is called a(n) _______ expression.

2. The value of a relational expression is 0 if the expression is _______ or 1 if the expression is _______.

3. The if statement regards an expression with the value 0 as _______ and an expression with a nonzero value as _______.

4. For an if statement to conditionally execute a group of statements, the statements must be enclosed in a set of _______.

5. In an if/else statement, the if part executes its statement(s) if the expression is _______, and the else part executes its statement(s) if the expression is _______.

<table>
<thead>
<tr>
<th>Books Purchased</th>
<th>Points Earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>4 or more</td>
<td>60</td>
</tr>
</tbody>
</table>
PART B

1. Construct a logical expression to represent each of the following conditions:
   a) *score* is greater than or equal to 80 but less than 90;
   b) *answer* is either ‘N’ or ‘n’;
   c) *n* is between 0 and 7 but not equal to 3;
   d) *n* is divisible by 3 but not by 30;
   e) *n* is between 0 and 7 but not an even number;

2. What is wrong with the following codes? Correct it.
   a) ```
      cin << count;
   ```
   b) ```
      if x < y min = x;
      else min = y;
   ```
   c) ```
      cout << “Enter n: “;
      cin >> n;
      if (n < 0) 
      cout << “That is negative. Try again.” << endl;
      cin >> n;
      else cout << “OK., n = “ << n << endl;
   ```

3. Assume the variables x=5, y=6 and z=8. Indicate if each of the following conditions is true or false:-
   a) `(x = = 5) || (y > 3)`
   b) `(7 <= x) && (z > 4)`
   c) `(2 != y) && (z != 4)`

4. Assume the variables x=5, y=6 and z=8. Indicate if each of the following conditions is true or false:-
   a) `(x >= 0) || (x <= y)`
   b) `(z – y) > y`
   c) `!((z – y) > x)`