1. Correct Answer: B

   735          $= 7*8^2 + 3*8^1 + 5*8^0$
                        $= 448 + 24 + 5$
                        $= 477$

2. Correct Answer: D
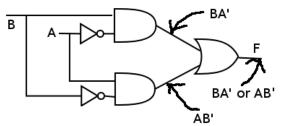
   100011.11 $= 1*2^5 + 0*2^4 + 0*2^3 + 0*2^2 + 1*2^1 + 1*2^0 + 1*2^{-1} + 1*2^{-2}$
                        $= 32 + 2 + 1 + 0.5 + 0.25$
                        $= 35.75$

3. Correct Answer: D

   F(A,B) = AB' or A'B
   This matches none of the solutions given directly. However examining the truth table, it can be seen that this is the exclusive or.

A	B	A'B	B'A	A+B'	A'+B	a)	b)	c)	d)	F(A,B)
F	F	F	F	T	T	F	T	T	F	F
F	T	T	F	F	T	F	F	T	T	T
T	F	F	T	T	F	F	F	T	T	T
T	T	F	F	T	T	F	T	T	F	F

4. Correct Answer: A

   ```
   (A OR B) AND (not B AND C AND A) AND (C OR not A)
   (FALSE OR B) AND (not B AND C AND FALSE) AND (C OR not FALSE)
   B AND FALSE AND (C OR TRUE)
   B AND FALSE AND TRUE
   FALSE        // Anything anded with FALSE is FALSE
   ```

5. Correct Answer: A

   A compiler is used to translate higher-level languages such as C++ and Java to machine code that can be executed by a computer.

6. Correct Answer: B

   Linux is a very robust, open source operating system. The rest of the operating systems listed are proprietary and are not open source.

7. Correct Answer: B

   `Basketball` is derived from `Ball` which means that `Basketball` IS-A `Ball`. `Basketball` inherits all of the public methods in `Ball` as a result.

8. Correct Answer: C

   Encapsulation relates to the data objects being accessed only through get and set accessor methods to prevent users of the class from altering the data in a non-prescribed way (i.e. Setting a radius to a negative number). Abstraction involves placing the details of the implementation of the class where the user need not be concerned about them in order to use the class. Overriding occurs when a method in

a base class is also in the derived class. Overloading occurs when two methods of the same name are in the same class. A destructor is called when an object loses scope.

9. Correct Answer: B

Both `A` and `B` use the default constructors. The `Ball` constructor will set the radius at 1 while the `Basketball` will get a radius of 4.65. The overloaded > operator compares the radii of each object. Since the `Basketball` is also a `Ball`, the operator works with both types of objects as expected. Since `B` has a greater radius, the second `cout` statement will print that "`B is the big ball`".

10. Correct Answer: E

The quicksort uses a divide and conquer approach that recursively sorts each half of the list that was previously divided. If the list is ordered, the succeeding partitions of the list will tend to be unbalanced which reduces the efficiency of the sort. In the best case the quicksort has performance equivalent to $O(N\log_2 N)$, but in the worst case it is no better than the bubble sort.

11. Correct Answer: C

The rows of the adjacency matrix correspond to the nodes that a path would start from, and the columns where the path would end up. Hence since starting from A, paths exist from A to B and E, there would be 1's in the second and fifth columns and 0's in the other columns. The second matrix has directional arrows which will cause the adjacency matrix to be non-symmetric.

12. Correct Answer: E

The second graph has directional paths which will cause it to have a non-symmetric adjacency matrix. This graph has 5 nodes and the degree of the nodes from A thru E for the fourth graph is 3, 4, 2, 3, 2. All of the graphs are planar because when the nodes are put in a single 2 dimensional plane, none of the paths or edges cross over each other.

13. Correct Answer: C

Binary search trees are organized so that data is stored in an organized manner to facilitate quicker searches. In most cases, data elements that are lower in precedence are stored to the left of a node, while those that are of higher precedence are stored to the right of a given node. The third is not a binary search tree because of the placement of nodes M and H. Binary search trees need not be balanced; the first tree provides such an example. However, unbalanced binary search trees are not as efficient to search. For this reason, when adding nodes, tree balancing algorithms are employed.

14. Correct Answer: C

The Wired Equivalent Privacy (WEP) security protocol was previously used to protect wireless networks. However, shortly after the protocol was published, serious flaws were discovered in it. Wi-Fi Protected Access (WPA) was an intermediate solution designed to take the place of WEP until a more robust protocol was available. That more robust protocol was Wi-Fi Protected Access II (WPA2) and is currently the recommended security protocol for wireless networks.

15. Correct Answer: E

Web bugs were originally 1 pixel X 1 pixel images. The request from a user's browser to the web server allowed web sites to capture an IP address and better monitor the activity of the users on the company's web site.

16. Correct Answer: B

Note that the variable `a` is passed by reference to the function `sub`. Any changes made to the variable `a` in the function `sub` are reflected in the value of the variable `a` in `main`.

The trace of the code is as follows:

```
1st iteration of for loop
        i = 0, a = 0, ans = 0
        after call to function add
                i = 0, a = 0, ans = 0
        after call to function sub
                i = 0, a = 0, ans = 0
2nd iteration of for loop
        i = 1, a = 0, ans = 0
        after call to function add
                i = 1, a = 0, ans = 1
        after call to function sub
                i = 1, a = -1, ans = -1
3rd iteration of for loop
        i = 2, a = -1, ans = -1
        after call to function add
                i = 2, a = -1, ans = 1
        after call to function sub
                i = 2, a = -3, ans = -3
4th iteration of for loop
        i = 3, a = -3, ans = -3
        after call to function add
                i = 3, a = -3, ans = 0
        after call to function sub
                i = 3, a = -6, ans = -6
5th iteration of for loop
        i = 4, a = -6, ans = -6
        after call to function add
                i = 4, a = -6, ans = -2
        after call to function sub
                i = 4, a = -10, ans = -10
```

17. Correct Answer: D

The ampersand used in the function declaration for the function sub indicates that the parameter is being passed by reference. Therefore, any changes to that parameter within the function will be reflected in the variable of the calling function.

18. Correct Answer: A

Lines 1 and 2 contain function prototypes for my_div and my_mult, respectively. These prototypes must contain the return type and parameters that will be used in the functions. Lines 14-18 provide the full function definition for the my_div function. Function prototypes allow the programmer to tell the compiler that a given function exists so that it can be used in the code without defining the actual implementation of the code. This allows the programmer to put the main code for the program first for clarity.

19. Correct Answer: E

The program will end when the user enters the number "0". The while loop continues as long as the input is not equal to 0. Entering "exit" when cin is expecting an integer input will cause cin to fail. This failure causes cin to return a boolean false and prevents cin from recognizing any future input. This will cause the variable i to regain its previous value and will result in an infinite loop.

20. Correct Answer: A

As the function my_div is called with only one parameter, the default value of 4 will be used for the variable b. The default value is specified in the function prototype on line 1.

21. Correct Answer: D

The trace of the code is as follows for when the user enters 4:
　　　After the user input, this statement is executed:
```
ans = my_mult(my_div(i,2),2);
```
　　　The call to `my_div` is resolved first. The value of i is 4.
　　　In `my_div`
　　　　　a = 4, b = 2 (b is equal to the default value)
　　　　　a%2 is equal to 0, therefore the else path is executed and 2 (4/2) is returned to `main`
　　　Next, the call to `my_mult` is resolved. The value passed to `my_mult` is 2
　　　In `my_mult`
　　　　　a = 2, b= 2 (b is equal to the default value)
　　　　　a%4 is not equal to 0, therefore the else path is executed and 4(2*2) is returned to `main`
　　　ans is set equal to the returned value from `my_mult`, 4
　　　the value of i (4) and ans (4) are then output

22. Correct Answer: C

The trace of the code is as follow for when the user enters 5:
　　　After the user input, this statement is executed:
```
ans = my_mult(my_div(i,2),2);
```
　　　The call to `my_div` is resolved first. The value of i is 5.
　　　In `my_div`
　　　　　a = 5, b = 2
　　　　　a%2 is not equal to 0, therefore the if path is executed
```
　my_mult(a,10)/b
```
　　　　　my_mult(5,10) is called and resolved before the division
　　　　　In `my_mult`
　　　　　　　a = 5, b = 10
　　　　　　　a%5 is not equal to 0, therefore the else path is executed
　　　　　　　　　and 50 (5*10) is returned to my_div
　　　　　25 (50/2) is now returned to `main`
　　　Next, the call to my_mult in main is resolved. The value passed to my_mult is 25
　　　In my_mult
　　　　　a = 25, b= 2
　　　　　a%4 is not equal to 0, therefore the else path is executed
　　　　　　　and 50 (25*2) is returned to main
　　　ans is set equal to the returned value from my_mult, 50
　　　the value of i (5) and ans (50) are then output

23. Correct Answer: E

Any input from the user will be a string and valid input to the program.

24. Correct Answer: B

`my_func` will count the number of characters in the first string the user enters. In C++, `'\0'` is used to delimit the end of a string. The do-while loop will continue to execute until the end of the string a is reached.

25. Correct Answer: A

In C++, `\0` is used to delimit the end of a string. The do-while loop will continue to execute until the end of the string a is reached.

26. Correct Answer: A

The string "Hello" would be passed to `my_func`. The actual contents of the string would be:

4

Position	0	1	2	3	4	5	6-29
Contents	H	e	l	l	o	\0	Undefined

The do-while loop will loop until the end of the string, \0, is found. In this case, the loop will execute 6 times, incrementing `i` to 5, which is the number of characters in the string "`Hello`". 5 is then passed back to `main` which will output: `Hello 5`

27. Correct Answer: D

Strings read with `cin >>` are delimited with a space. As a result, only the first word would be placed in n. If both words were to be read, another string variable would be needed and a `cin` statement such as this would be used:

```
cin >> n >> m;
```

28. Correct Answer: D

The variable `i` is defined on line 1, outside of any functions. Because of this, its scope is global. Any function can refer to the variable `i`.

29. Correct Answer: C

The variable `k` is defined in the function declaration on line 2. The variable `k`'s scope is local and available only in the function `my_func`. In addition, note that on line 3 the variable `j` is declared. As a result the variable `j` only has scope for the for loop from lines 3 through 6.

30. Correct Answer: E

When the function call `my_func(4)` is made, the counter variable, `j`, used in the outer loop is set to 4. The outer loop will execute while `j < 10`. In this case, the outer loop will execute 6 times. The inner loop will always execute 10 times. 6 x 10 = 60.