1. Correct Answer: B
SOLUTION:
Encapsulation refers to "hiding" the data behind get and set methods to insure that those using the class cannot cause the data within the class to contain illegal values (ex. -3 for the radius of a circle).
Enumeration refers to how each of the items in a group is counted. To enumerate would be to address/process each item in the group and is not a key component in OOP.
Abstraction refers to "hiding" the details of the workings of the class.
Polymorphism refers to the same named code (functions, operators) to function differently depending upon the type with which it is used.
Inheritance allows for a class to be derived from another class and use all of the methods within the base class without having to recode them.
Encapsulation, **abstraction**, **polymorphism** and **inheritance** are the basis upon which OOP is built.

2. Correct Answer: C
SOLUTION:
A constructor is code that is executed automatically when an object is created. The purpose is to initialize the data values within the object.

3. Correct Answer: B
SOLUTION:
Public methods may be used outside of the class.
Protected methods may only be used within the class or within a derived class.
Private methods may only be used within the class.
Friend methods are actually members of another class, but are allowed access to all items within the class including the private and protected items.
There is no privileged designation for class items.

4. Correct Answer: A
SOLUTION:

$$10010011 = 1*2^7 + 0*2^6 + 0*2^5 + 1*2^4 + 0*2^3 + 0*2^2 + 1*2^1 + 1*2^0$$
$$= 1*128 + 0*64 + 0*32 + 1*16 + 0*8 + 0*4 + 1*2 + 1*1$$
$$= 128 + 16 + 2 + 1$$
$$= 147$$

5. Correct Answer: D
SOLUTION:
C is clearly not equal to the output. The rest of the functions are given below in the truth table.

A	B	C	A'C	B'C	(ABC)'	A'B'C	b	c	d	e
F	F	F	F	F	T	F	T	F	F	F
F	F	T	T	T	T	T	T	T	T	T
F	T	F	F	F	T	F	T	F	F	F
F	T	T	T	F	T	F	T	F	T	T
T	F	F	F	F	T	F	T	F	F	F
T	F	T	F	T	T	F	T	F	T	F
T	T	F	F	F	T	F	T	F	F	F
T	T	T	F	F	F	F	F	F	F	F

6. Correct Answer: E
SOLUTION:

The exclusive or (XOR) gate has two inputs and its output is true when one input is true and the other is false.

7. Correct Answer: B
SOLUTION:

$$752 = 7*8^2 + 5*8^1 + 2*8^0$$
$$= 7*64 + 5+8 + 2*1$$
$$= 448 + 40 + 2$$
$$= 490$$

8. Correct Answer: C
SOLUTION:
The binary search is a searching, not a sorting algorithm.

9. Correct Answer: E
SOLUTION:
Linked lists use more memory than arrays for the equivalent amount of data due to the list storing the pointer/reference to the next item.
Arrays are faster at accessing specific items because the program can jump to the specific item directly without traversing the entire list.
Inserting or deleting with a linked list is quicker as only a few pointers must be switched and one item is either created or destroyed depending upon whether it is an insert or delete.
Arrays on the other hand must shift the rest of the items in the list up or down depending upon whether is an insertion or deletion.

10. Correct Answer: B
SOLUTION:
An associative array is normally ordered by a key which is bound to a value. There is no temporal ordering of the elements in the array.
A queue is ordered by arrival of elements. The elements that arrive first are the first elements to leave the queue.
In its simplest form, a linked list is unordered. An element can be dynamically inserted or removed from any position within the list. A linked list can be used to implement other data structures such as queues, stacks, and associative arrays.
A stack is also ordered by arrival. Unlike the queue, the last element to arrive on the stack is the first element to leave the stack.

11. Correct Answer: C
SOLUTION:
The diagram to the right is a flow chart that describes the logic/algorithm that a program will follow.
Entity relationship diagrams are used to describe the structure of a database.
State transition diagrams are used in event driven programs to describe the functionality of an application.
UML object diagrams are used to describe the relationships that exist between different class objects.
Network diagrams illustrate the connections between different nodes in the network.

12. Correct Answer: E
SOLUTION:
To obtain data from a traditional hard drive, first the data must be found on the drive (seek time) and then it must be transferred off the drive through the system bus (transfer time). Both of these times are related to how fast the drive can spin. The hard drive is non-volatile meaning it does not lose data values when power is shut off. Some hard drives have more than one platter and the drive will store data on both sides of the platters.

13. Correct Answer: B
SOLUTION:

Network Neutrality or net neutrality is the idea that all data packets should be treated equally in terms of how they are routed through the internet. Under net neutrality, an internet service provider should not provide a preference for packets from one person or one company over another. Users would purchase a certain level of service and then would use the bandwidth provided for that service with their data packets receiving a preference at the routers based only upon the arrival of the data packet and not who it came from or where it is going.

14. Correct Answer: C
SOLUTION:
The Domain Name Service provides a mapping of URLs to internet addresses. This is a distributed system where given domains (i.e. google.com, mckendree.edu) are responsible for the internet addresses associated with their own domains. Root DNS servers are used to identify Top Level Domain (TLD) server domains such as .edu, .com, and .org, which identify all authoritative servers. The authoritative servers are responsible for identifying all addresses within a given domain.

15. Correct Answer: A
SOLUTION:
Assignment operators assign a value to the left operand.
Answer b adds the item on the right to the left and assigns it to the left.
Answer c mods the item on the right with the item on the left and assigns it to the left.
Answer d just assigns the right to the left item.
Answer a though is a comparison operator that compares the right and left item and returns true if they are equal.

16. Correct Answer: E
SOLUTION:
This program prints out the decimal equivalent of two raised to a given power. The first column is the power that two will be raised to. The second column is the value of two raised to that power.
The output from the program is:

```
 0        1
 1        2
 2        4
 3        8
 4       16
 5       32
 6       64
 7      128
 8      256
 9      512
10     1024
```

17. Correct Answer: D
SOLUTION:
The for statement will execute one more time than the body of the for. The final execution is when the for condition in the for statement is not true.

18. Correct Answer: C
SOLUTION:
The body of the for statement will execute 11 times—0 to 10.

19. Correct Answer: A
SOLUTION:
The setw(n) function manipulates the output stream by making the width of the next output equivalent to the n. If the setw() functions had not been used, the output would have looked like this:
```
01
```

```
12
24
38
416
532
664
7128
8256
9512
101024
```

20. Correct Answer: A
SOLUTION:
The key to understanding this problem is the evaluation of the expression in the switch statement. Just like all expressions. If the character entered is a lowercase letter, `(input >= 'a' && input <= 'z')` will evaluate to one, and a lowercase letter multiplied by one is the lowercase letter. Otherwise if the input is not a lowercase letter, `(input >= 'a' && input <= 'z')` will evaluate to zero. A lowercase letter multiplied by zero is zero.
If the input is a lowercase vowel, 1 will be output.
If the input is a lowercase consonant, 3 will be output.
Any other input that is not lowercase would be multiplied by zero, yielding zero, which will cause 2 to be output.

21. Correct Answer: D
SOLUTION:
See solution above.

22. Correct Answer: D
SOLUTION:
Line 5 – This statement reads in the user input and, if deleted, will change the execution of the program.
Line 8 – If this statement were to be deleted, a user input of "e" would have an output of 3 instead of 1.
Line 13 – If this statement were to be deleted, control would pass to the next executable statement and a 2 would also be output.
Line 19 – Within a switch statement, the break statement transfers execution to the line of code following the switch statement. If there is no break statement coded for a case, control passes to the next executable statement within the switch statement. As the default case is the last block in the switch statement, control will be passed to the line of code following the switch statement, regardless of whether the break statement is used or not.
Line 21 – This statement outputs the answer and, if deleted, will change the execution of the program.

23. Correct Answer: D
SOLUTION:
Within a switch statement, the break statement transfers execution to the line of code following the switch statement. If there is no break statement coded for a case, control passes to the next executable statement within the switch statement. As there is no break statement associated with the first four case labels, the executable statements associated with the fifth case label will be executed for all five.

24. Correct Answer: B
SOLUTION:
Escaping characters inside of double quotes requires the use of the back slash \. Using **"** will just terminate the quote and not result in printing a **"** to the screen. \n will result in a new line and \t will result in a tab. **'** will result in printing a **'**. But **"** will result in printing just the **"** to the screen.

25. Correct Answer: C
SOLUTION:

	Value of i
Line 3 initializes i to zero.	0
Line 4 increments i.	1
Line 5 outputs i.	1
Line 6 increments i.	2
Line 7 outputs i.	2
Line 8 outputs, then increments i.	2 is output, then incremented to 3
Line 9 increments, then outputs i.	3 is incremented, and 4 is output

26. Correct Answer: E
SOLUTION:
Line 3 initializes i and does not have an increment operator.
Line 4 uses a compound assignment operator to increment i.
Line 6 uses the assignment operator and an arithmetic operator to increment i.
Line 8 uses the post-increment operator to increment i. This operator increments i after it has been used in the cout statement.
Line 9 uses the pre-increment operator to increment i. This operator increments i before it is used in the cout statement.

27. Correct Answer: D
SOLUTION:
The statements within the for and while loops may or may not be executed as these loops check the loop condition before executing the statements within the loop.
The goto statement is not a loop statement; it is an unconditional branch and should not be used in modern programs.
The do while loop is a post-test loop. The loop condition is checked after the statements within the loop have executed. These statements will always execute at least once.

28. Correct Answer: E
SOLUTION:
While choice a does not provide a dimension for the array, the compiler will allocate an array with 5 elements based on the 5 initializing values with the braces.
Choice b declares an array with five elements and sets each element to the initializing value of zero.
Choice c will cause a compile-time error. The array is declared with 4 elements, but there are 5 initializing values.

29. Correct Answer: A
SOLUTION:
The trace of the code follows.

in	i	sum	total	Comment
10	0	0	0	Starting
10	1	0	0	sum += i++; does not change sum since i is 0, but adds to i
10	1	0	1	Adds 1 to total
10	2	0	1	top of for
10	2	2	1	post increment so use i value of 2 before incrementing
10	3	2	1	finish incrementing i
10	3	2	2	Adds 1 to total
10	4	2	2	top of for
10	4	6	2	Adds i to sum
10	5	6	2	finish incrementing i
10	5	6	3	Adds 1 to total
10	6	6	3	top of for
10	6	12	3	Adds i to sum
10	7	12	3	finish incrementing i
10	7	12	4	Adds 1 to total
10	8	12	4	top of for
10	8	20	4	Adds i to sum
10	9	20	4	finish incrementing i
10	9	20	5	Adds 1 to total
10	10	20	5	top of for, which now ends and then prints 5

This code will add up the total of all of the the odd numbers between 0 and the number entered, including that number and displays that total. It also sums up all the evens as well between 0 and the number, not including the number, but does nothing with that output.

30. Correct Answer: D
SOLUTION:
For the previous problem, the answer with input of 10 was 5, which is the number of odd numbers less than or equal to 10. As a further example, the trace for input of 5 follows.

in	i	sum	total	Comment
5	0	0	0	Starting
5	1	0	0	sum += i++; does not change sum since i is 0, but adds to i
5	1	0	1	Adds 1 to total
5	2	0	1	top of for
5	2	2	1	post increment so use i value of 2 before incrementing
5	3	2	1	finish incrementing i
5	3	2	2	Adds 1 to total
5	4	2	2	top of for
5	4	6	2	Adds i to sum
5	5	6	2	finish incrementing i
5	5	6	3	Adds 1 to total
5	6	6	3	top of for

Loop terminates and the output is 3, the number of odd numbers less than or equal to 5.