1) ITERATION

   n=4
   for XXX1XXX :
       for XXX2XXX :
           print XXX3XXX,
           print "\n"

Which code fragments complete the method such that the output is:

1
22
333
4444

a) XXX1XXX = i in range( 0, n )
   XXX2XXX = j in range( 0, i )
   XXX3XXX = i,

b) XXX1XXX = i in range( 0, n )
   XXX2XXX = j in range( 0, i )
   XXX3XXX = j,

c) XXX1XXX = i in range( 1, n+1 )
   XXX2XXX = j in range( 0, i )
   XXX3XXX = i,

d) XXX1XXX = i in range( 1, n+1 )
   XXX2XXX = j in range( 1, i )
   XXX3XXX = i,

e) XXX1XXX = i in range( 1, n+1 )
   XXX2XXX = j in range( 1, i )
   XXX3XXX = j,
2) CONDITIONAL

```python
x = 2
y = 16

if ( True and False ) or True :
    if  x < y:
        x = x * x
    else:
        y = x + y

if ( False or True )  and False :
    if x <= y :
        x = x + 1
    else :
        y = y + y
else :
    x = x * x

if x <= y :
    y = x + y

print "x = ", x
print "y = ", y
```

What is the output of this code fragment?

a) x = 4
   y = 22

b) x = 3
   y = 19

c) x = 4
   y = 20

d) x = 4
   y = 23

e) x = 16
   y = 32
3) BST

class Node :
    def __init__( self, data) :
        self._data = data
        self._right = None   # right child node
        self._left = None     # left child node
...

def traverse(self, root):
    if root is not None:
        print root._data
        if root._left is not None:
            traverse(root._left)
        if root._right is not None:
            traverse(root._right)

What is the output of the “traverse” method on the above binary search tree (BST), where 8 is passed as the root?

<table>
<thead>
<tr>
<th></th>
<th>a) 3</th>
<th>b) 2</th>
<th>c) 8</th>
<th>d) 8</th>
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<td>15</td>
<td>5</td>
<td>13</td>
<td>3</td>
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</tr>
</tbody>
</table>
4) ARRAY

array1 = [ 4, 5, 3, 6, 2, 7, 1 ]
array2 = [ 7, 4, 2, 1 ]


if array1[ 1 ] > array2[ 1 ]:

What is the value of array1 after this code is executed?

a) [ 4, 4, 2, 7, 2, 2, 1 ]
b) [ 4, 7, 3, 6, 7, 7, 7 ]
c) [ 4, 7, 2, 7, 6, 7, 7 ]
d) [ 4, 7, 2, 7, 2, 2, 1 ]
e) [ 4, 7, 2, 6, 6, 7, 6 ]
5) HASH TABLE

Which is the resulting Hash Table that is made when the following <key, data> pairs are added? The hash code form of the key is given in the parenthesis after the pair. The HashTable is of size 5 and uses external chaining.

< “Fluffy” , “Cat” > ( 54 )
< “Fido” , “Dog” > ( 33 )
< “Mr. Bubbles” , “Fish” > ( 79 )
< “Bugs” , “Rabbit” > ( 12 )
< “Robbie” , “Robot” > ( 10 )
< “Puff” , “Dragon” > ( 25 )
< “Tux” , “Penguin” > ( 31 )

a)

<table>
<thead>
<tr>
<th>Fluffy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fido</td>
</tr>
<tr>
<td>Mr.Bubbles</td>
</tr>
<tr>
<td>Bugs</td>
</tr>
<tr>
<td>Robbie</td>
</tr>
</tbody>
</table>

d)

<table>
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<tr>
<th>Robot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat</td>
</tr>
<tr>
<td>Rabbit -&gt; Fish</td>
</tr>
<tr>
<td>Dragon</td>
</tr>
<tr>
<td>Dog</td>
</tr>
<tr>
<td>Penguin</td>
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</table>

e)

<table>
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</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Dog</td>
</tr>
<tr>
<td>Rabbit</td>
</tr>
<tr>
<td>Penguin</td>
</tr>
<tr>
<td>Dragon -&gt; Robot</td>
</tr>
</tbody>
</table>

c)

<table>
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<tr>
<th>Robbie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puff</td>
</tr>
<tr>
<td>Tux</td>
</tr>
<tr>
<td>Bugs</td>
</tr>
<tr>
<td>Fido</td>
</tr>
<tr>
<td>Fluffy -&gt; Mr.Bubbles</td>
</tr>
</tbody>
</table>

6) ELEMENT COMPARISON FOR SORTING

The following function "isSorted" should return true if the array " x " is sorted in ascending order. Otherwise, the function should return false:

```python
def isSorted( x ) :
    #missing code
```

Which of the following code fragments is the missing code?

a)  
```python
b = True
for i in range( 0, len(x)-1 ) :
    if x[ i ] > x[ i + 1 ] :
        b = False
    else :
        b = True
return b
```

b)  
```python
for i in range( 0, len(x)-1 ) :
    if x[ i ] > x[ i + 1 ] :
        return False
return True
```

c)  
```python
b = False
for i in range( 0, len(x)-1 ) :
    if x[ i ] > x[ i + 1 ] :
        b = False
return b
```

d)  
```python
b = False
for i in range( 0, len(x)-1 ) :
    if x[ i ] > x[ i + 1 ] :
        b = True
return b
```

e)  
```python
for i in range( 0, len(x)-1 ) :
    if x[ i ] > x[ i + 1 ] :
        return True
return False
```
7) OO BASICS

class Trace :
    def __init__(self , n) :
        self.myNumber = n

    def getMyNumber( self ) :
        return self.myNumber

    def setMyNumber( self, n ) :
        self.myNumber = n

    def __str__( self ) :
        return "My number is %d" % self.myNumber

def myFunction() :
    a = Trace( 5 )
    b = Trace( 6 )
    c = Trace(-3 )

    myArray = []
    myArray.append( b )
    myArray.append( c )
    myArray.append( a )

    for i in myArray :
        print i.getMyNumber()

    b.setMyNumber( c.getMyNumber() )
    a.setMyNumber( c.getMyNumber() )

print b
print myArray[ 2 ]

return
What is the output when “myFunction” (on the preceding page) is called?

a) 5
   6
   -3
   -3
   -3

b) 5
   6
   -3
   My number is -3
   My number is -3

c) 6
   -3
   5
   My number is 6
   My number is -3

d) 6
   -3
   5
   My number is -3
   My number is -3

e) My number is 6
   My number is -3
   My number is 5
   -3
   -3
8) LOOPING

```python
x = [2, 1, 4, 5, 7]
limit = 7
i = 0
sum = 0

while sum < limit and i < len(x):
    sum = sum + x[i]
    i = i + 1
return i
```

What is the value of the variable "i" after the code is executed?

a) 0
b) 2
c) 3
d) 4
e) 7
9) SORTING

The following function “sortArray” should return an array “x” sorted in ascending order:

```python
def sortArray(x):
    #missing code
```

Which of the following code fragments is the missing code?

a) for i in range (0, len(x)):
    min = i
    for j in range (i+1, len(x)):
        if x[j] <= x[min] :
            min = j
        temp = x[min]
        x[min] = x[i]
        x[i] = temp
    return x

b) for i in range (0, len(x)):
    min = i
    for j in range (i+1, len(x)):
        if x[min] <= x[j] :
            min = j
        temp = x[min]
        x[min] = x[i]
        x[i] = temp
    return x

c) for i in range (0, len(x)):
    min = i
    for j in range (i+1, len(x)):
        if x[j] <= x[min] :
            min = j
        temp = x[min]
        x[i] = x[min]
        x[i] = temp
    return x
d) for i in range ( 0, len(x) ) :
    min = i
    for j in range ( i+1, len(x) ) :
        if x[min] <= x[j] :
            min = j
        temp = x[min]
        x[i] = x[min]
        x[i] = temp
    return x

e) for i in range ( 0, len(x) ) :
    min = i
    for j in range ( i, len(x) ) :
        if x[j] <= x[min] :
            min = j
        temp = x[min]
        x[i] = x[min]
        x[i] = temp
    return x
10) ITERATION

n = 5
for XXX1XXX :
    sum = 0
    print "sum (",
    for XXX2XXX :
        sum = sum + j
        print XXX3XXX,
    print ") =",XXX4XXX,"\n"

Which code fragments complete the method such that the output is:

sum ( 1 ) = 1
sum ( 1 2 ) = 3
sum ( 1 2 3 ) = 6
sum ( 1 2 3 4 ) = 10
sum ( 1 2 3 4 5 ) = 15

a) XXX1XXX = i in range( 1, n+1 )
XXX2XXX = j in range( 0, i )
XXX3XXX = j
XXX4XXX = sum

b) XXX1XXX = i in range( 1, n+1 )
XXX2XXX = j in range( 1, i+1 )
XXX3XXX = j
XXX4XXX = sum

c) XXX1XXX = i in range( 0, n )
XXX2XXX = j in range( 0, i )
XXX3XXX = j
XXX4XXX = sum

d) XXX1XXX = i in range( 1, n+1 )
XXX2XXX = j in range( 1, i+1 )
XXX3XXX = sum
XXX4XXX = j

e) XXX1XXX = i in range( 0, n )
XXX2XXX = j in range( 1, i+1 )
XXX3XXX = sum
XXX4XXX = sum
11) RECURSION

def tryMe( s , c , value) :
    if  len(s) == 0 :
        return value
    elif  s[ 0 ] == c :
        value = value * 2
        return tryMe( s[ 1: ] , c , value )
    else :
        value = value + 1;
        return tryMe(s[ 1: ], c , value )

What is the value returned by this function call?
tryMe( "mississippi" , 'i' , 1 )

a) 60  
b) 213  
c) 44  
d) 12  
e) 30
12) POLYMORPHISM

Given the following class hierarchy:

```java
public abstract class Emotion
    has: public void express()

public interface Crying
    has: public void tears()

public class Joy extends Emotion implements Crying
    has: public void smile()
    has: public void tears()

public class PureJoy extends Joy
    has: public void exult()

public class Anger extends Emotion
    has: public void yell()
```

Determine whether the following statements will compile and run without errors.
If no errors write OK.
If compile error write COMP
If run time error write RUN

1) Emotion e = new Emotion();
2) Emotion my = new Joy();
3) Emotion great = new PureJoy();
   great.tears();
4) Emotion well = new Joy();
   ((Anger)well.yell());
5) PureJoy lastone = new Joy();

<table>
<thead>
<tr>
<th></th>
<th>a) OK</th>
<th>b) COMP</th>
<th>c) COMP</th>
<th>d) OK</th>
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<td>OK</td>
<td>OK</td>
<td>COMP</td>
<td>COMP</td>
</tr>
</tbody>
</table>
13) SORTING

The following function “sortArray” should return an array “x” sorted in ascending order:

```python
def sortArray(x):
    #missing code
```

Which of the following code fragments is the missing code?

a) for i in range ( 0, len(x) ) :
    key = x[i]
    position = i
    while (position > 0) and (key < x[position]) :
        x[position] = x[position-1]
        position = position - 1
    x[position] = key
return x

b) for i in range ( 0, len(x) ) :
    key = x[i]
    position = i
    while (position > 0) and (key < x[position]) :
        x[position-1] = x[position]
        position = position - 1
    key = x[position]
return x

c) for i in range ( 0, len(x) ) :
    key = x[i]
    position = i
    while (position > 0) and (key < x[position-1]) :
        x[position] = x[position-1]
        position = position - 1
    key = x[position]
return x
d) for i in range ( 0, len(x) ) :
    key = x[i]
    position = i
    while (position > 0) and (key < x[position-1]) :
        x[position] = x[position-1]
        position = position - 1
    x[position] = key
return x

e) for i in range ( 0, len(x) ) :
    key = x[i]
    position = i
    while (position > 0) and (key < x[position-1]) :
        x[position-1] = x[position]
        position = position - 1
    x[position] = key
return x
14) SEARCHING

array = [ 0, 1, 2, 3, 5, 9, 4, 8 ]
i = 0

while i < ( len( array ) - 1 ) and array[ i + 1 ] > array[ i ] :
    i = i + 1

print i

What is the output of the code above?

a) 6
b) 5
c) 7
d) 4
e) 9
15) DYNAMIC BINDING

class Temp:
    def printer(self):
        print "Printer method in Temp class"

class myTemp (Temp):
    def printer(self):
        print "Printer method in myTemp class"

class aTemp (myTemp):
    def printer(self):
        print "Printer method in aTemp class"

def testing () :
    t = Temp()
    t.printer()
    at = aTemp()
    t = at
    t.printer()
    mt = myTemp()
    mt.printer()
    mt = t
    mt.printer()
    return

What is the output of the preceding code?

a) Printer method in Temp class
   Printer method in Temp class
   Printer method in myTemp class
   Printer method in myTemp class

b) Printer method in Temp class
   Printer method in aTemp class
   Printer method in Temp class
   Printer method in aTemp class

c) Printer method in aTemp class
   Printer method in Temp class
   Printer method in Temp class
   Printer method in aTemp class

d) Printer method in aTemp class
   Printer method in aTemp class
   Printer method in myTemp class
   Printer method in myTemp class

e) Printer method in Temp class
   Printer method in aTemp class
   Printer method in myTemp class
   Printer method in aTemp class
16) LINKED LIST

class ListNode:
    def __init__(self, data):
        self._next = None
        self._data = data

Assume that position is an object of class ListNode. Assume that head is the beginning of the linked list.

Which of the following class changes position so that it is referencing the next item in the linked list and deletes the node at the beginning of the linked list?

a) position._next = head._next
    head._next = head

b) position._next = head._next
    head = position._next

c) position = head._next
    head = position

d) position = head._next
    head = position._next

e) position = head
    head = position._next