A+ Computer Science

AP REVIEW

2023 AP CS A EXAM

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Multiple Choice

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-keep track of your time - 90 minutes

Free Response

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-most times question 1 is the easiest

-see if part B calls part A and so on

-many times part C consists of A and B calls

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-write legibly / use PENCIL!!!!!!!!!!

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Free Response

-When writing methods

-use parameter types and names as provided

-do not redefine the parameters listed

-do not redefine the methods provided

-return from all return methods

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Free Response

-When writing a class or methods for a class

-know which methods you have

-know which instance variables you have

-check for public/private on methods/variables

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Free Response

-When extending a class

-know which methods the parent contains

-have the original class where you can see it

-make sure you have super calls

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Free Response Topics

Algorithms / Logic
– ifs, loops, methods

Make a Class
– create a class

Array/ArrayList
– get,set,remove,add,size - [],length

Matrices
– nested loops - array of arrays concepts

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Free Response Question 1

Algorithms / Logic

Algorithms / Logic

Algorithm problems often use array and strings, but like this year, they sometimes just use simple loops and method calls.

Algorithms / Logic

```
for(int aplus=1; aplus<7; aplus+=2)
{
  out.println("comp");
  out.println( aplus );
}
```

OUTPUT

```
comp
1
comp
3
comp
5
```

Algorithms / Logic

```
int run=25;
while(run>=10)
{
   out.println(run);
   out.println("loop");
   run=run-5;
}
```

OUTPUT

```
25
loop
20
loop
15
loop
10
loop
```

```
public int findFreeBlock( int period, int duration )
{
  //essentially the same as quest 3 part B
  int run= 0;
  int s = 0;
  for( int m = 0; m<=59; m++ )
  {
    if( isMinuteFree( period, m) )
    {
        if( run == 0 )
          s = m;
        run++;
        if( run == duration )
          return s;
    }
    else  run = 0;  //reset the run
  }
  return -1;
}   //There are other options as well.
```

2023 Question 1 Part A

```
public boolean makeAppointment( int startPeriod,
                                int endPeriod, int duration )
{
  for( int go = startPeriod; go <= endPeriod; go++ )
  {
    int loc = findFreeBlock( go, duration );
    if( loc != - 1 ){
      reserveBlock( go, loc, duration );
      return true;
    }
  }
  return false;
}
```

2023 Question 1 Part B

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Free Response Question 2

Make a class

Make a Class

```
public Triangle(int a, int b, int c)
{
  sideA=a;
  sideB=b;
  sideC=c;
}
```

Constructors are similar to methods. Constructors set the properties of an object to an initial state.

Make a Class

```
public void setSideA(int a )
{
    sideA=a;
}
```

Modifier methods are methods that change the properties of an object.

Make a Class

```
public int getSideA()
{
  return sideA;
}
```

Accessor methods are methods that retrieve or grant access to the properties of an object, but do not make any changes.

Make a Class

```
public class Triangle
{
   private int sideA;
   private int sideB;
   private int sideC;
```

Instance variables store the state information for an object.

```
public class Sign
{
   private String line;
   private int wid;

   public Sign( String s, int w )  {
      line = s;
      wid = w;
   }

   public int numberOfLines()   {
      int cnt =  line.length() / wid;
      if( line.length() % wid != 0 )
         cnt++;
      return cnt;
   }
}
```

Make a Class

2023 Question 2 PART 1

```
public String getLines()
{
  if( line.length() == 0 )
    return null;

  int c = numberOfLines();
  String s = "";
  int i = 0;
  while( c > 1  ) {
        s += line.substring(i,i+wid) + ";";
        i += wid;
        c--;
  }
  s += line.substring(i);
  return s;
}
```

Make a Class

2023 Question 2 PART 2

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Free Response Question 3

ArrayList

ArrayList

A typical ArrayList question involves putting something into an ArrayList and removing something from an ArrayList.

34	76	-8	44	22	-998

ArrayList

Arraylist is a class that houses an array.
An ArrayList can store any type.
All ArrayLists store the first reference at spot / index position 0.

34	76	-8	44	22	-998

ArrayList

frequently used methods

Name	Use
add(item)	adds item to the end of the list
add(spot,item)	adds item at spot – shifts items up->
set(spot,item)	put item at spot z[spot]=item
get(spot)	returns the item at spot return z[spot]
size()	returns the # of items in the list
remove()	removes an item from the list
clear()	removes all items from the list

```
import  java.util.ArrayList;
```

ArrayList

```
List<String> ray;
ray = new ArrayList<String>();
ray.add("hello");
ray.add("whoot");
ray.add("contests");
out.println(ray.get(0).charAt(0));
out.println(ray.get(2).charAt(0));
```

OUTPUT

```
h
c
```

ray stores String references.

ArrayList

```
int spot=list.size()-1;
while(spot>=0)
{
   if(list.get(spot).equals("killIt"))
      list.remove(spot);

   spot--;

}
```

ArrayList

```
for(int spot=list.size()-1; i>=0; i--)
{
   if(list.get(spot).equals("killIt"))
      list.remove(spot);
}
```

ArrayList

```
int spot=0;
while(spot<list.size())
{
   if(list.get(spot).equals("killIt"))
      list.remove(spot);
   else
      spot++;
}
```

```
public void cleanData( double lower, double upper )
{
  for( int i = temperatures.size()-1; i>=0; i-- )
  {
    if( temperatures.get(i) > upper )
        temperatures.remove(i);
    else if ( temperatures.get(i) < lower )
        temperatures.remove(i);
  }
}
```

2023 Question 3 Part A

```
public int longestHeatWave( double threshold )
{
  int cnt = 0;
  int max = 1;
  for( double v : temperatures )
  {
        if( v > threshold )
        {
          cnt++;
          if( cnt > max )
            max = cnt;
        }
        else  cnt = 0;
  }
  return max;
}
```

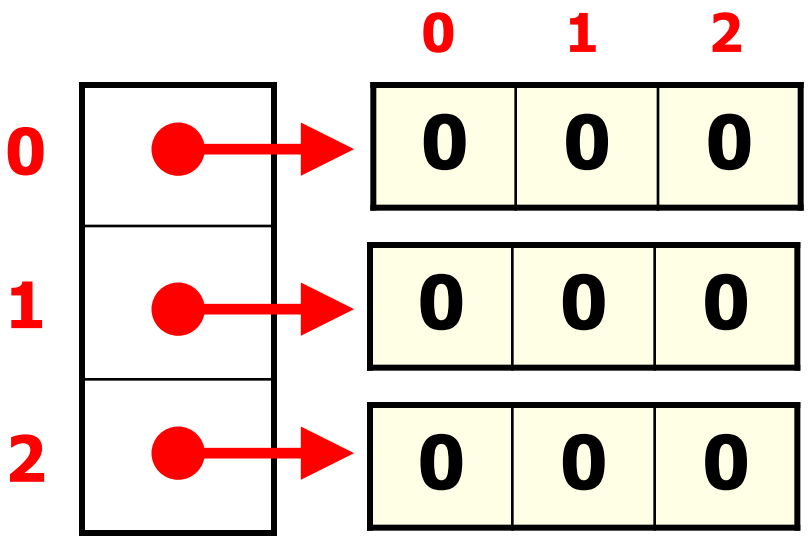
2023 Question 3 Part B

Free Response Question 4

Matrices

Matrices

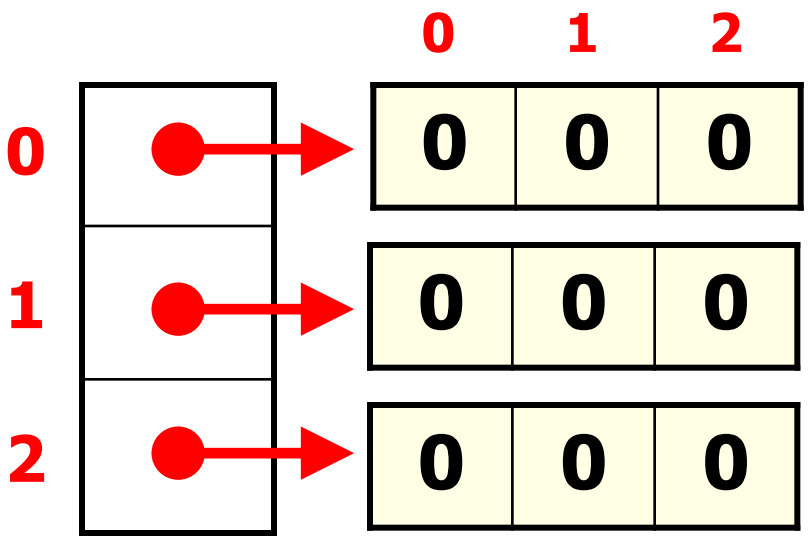
Typically, 1 question on the A test free response will require that students manipulate a 2-dimensional array.



Matrices

A matrix is an array of arrays.

```
int[][] mat = new int[3][3];
```



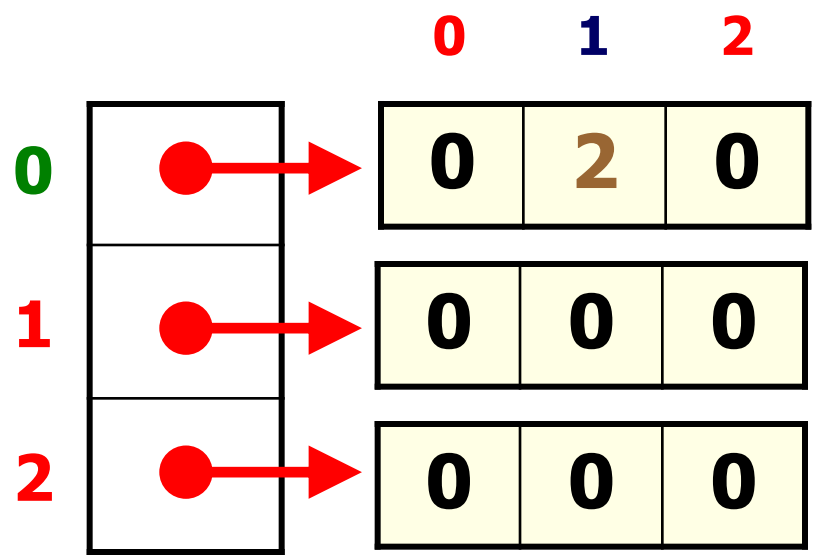
Matrices

A matrix is an array of arrays.

```
int[][] mat = new int[3][3];
mat[0][1]=2;
```

Which array?

Which spot?



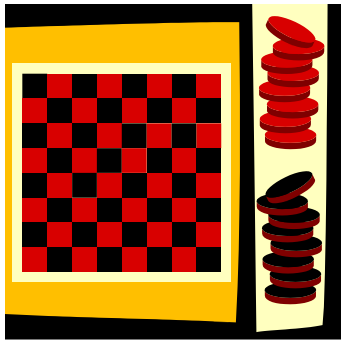
Matrices

	0	1	2	3	4
0	0	0	0	5	0
1	0	0	0	0	0
2	0	0	7	0	0
3	0	0	0	0	0
4	0	3	0	0	0

mat[2][2]=7;

mat[0][3]=5;

mat[4][1]=3



Matrices

```
for( int r = 0; r < mat.length; r++)
{
  for( int c = 0; c < mat[r].length; c++)
  {
      mat[r][c] = r*c;
  }
}
```

if mat was 3x3

0	0	0
0	1	2
0	2	4

Matrices

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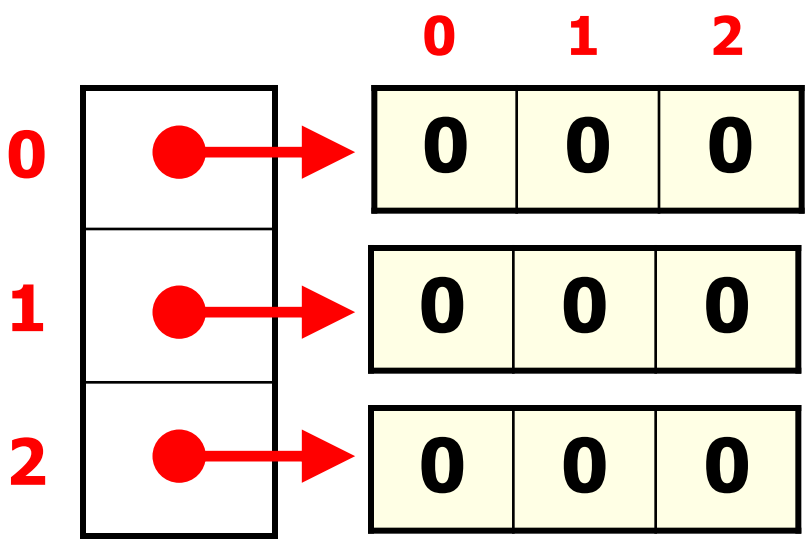
```
int[][] mat = new int[3][3];
```



# of arrays

size of each array

Matrices – for each

```
int[][] mat = {{5,7},{5,3,4,6},{0,8,9}};

for( int[] row : mat )
{
  for( int num : row )
  {
    System.out.print( num + " ");
  }
  System.out.println();
}
```

OUTPUT

```
5 7
5 3 4 6
0 8 9
```

Matrices – for loop

```
int[][] mat = {{5,7},{5,3,4,6},{0,8,9}};

for( int r = 0; r < mat.length; r++ )
{
  for( int c = 0; c < mat[r].length; c++ )
  {
    System.out.print( mat[r][c] + " ");
  }
  System.out.println();
}
```

OUTPUT

```
5 7
5 3 4 6
0 8 9
```

```
public boolean moveCandyToFirstRow( int col )
{
  if( box[0][col] != null )
        return true;

  for( int r = 1; r < box.length; r++ )
  {
        if( box[r][col] != null )
        {
           box[0][col]=box[r][col];
           box[r][col]=null;
           return true;
        }
  }
  return false;
}
```

2023 Question 4 part A

```
public Candy removeNextByFlavor( String flavor )
{
  for( int r = box.length-1; r >=0; r-- )
  {
    for( int c = 0; c < box[r].length; c++ )
    {
      if( box[r][c] != null &&
            box[r][c].getFlavor().equals( flavor) )
      {
            Candy tmp = box[r][c];
            box[r][c] = null;
            return tmp;
      }
    }
  }
  return null;
}
```

2023 Question 4 part B

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