A+ Computer Science

AP REVIEW

2021 AP CS A EXAM

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Multiple Choice

-answer the easiest question 1st

-work through the test more than once

-use the test to take the test

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-bubble answers on answer sheet as you go

-answer every question

-keep track of your time - 90 minutes

Free Response

-Read all 4 questions before writing anything

-answer the easiest question 1st

-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

-write something on every question

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

-keep track of your time

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

  -return correct data type from return methods

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

  -return from all return methods

  -return correct data type from return methods

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

  -check for public/private on methods/variables

  -make super calls in sub class methods as needed

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 scoreGuess( String guess )
{
  int val = 0;
  int len = guess.length();
  for( int i = 0; i <= secret.length()-len; i+=1)
  {
        String ck = secret.substring( i, i+len );
        if( ck.equals(guess) )
              val++;
  }
  return val*len*len;
}

//This can also be done
//using indexOf which I prefer
```

2021 Question 1 Part A

```
public String findBetterGuess(
                        String guess1, String guess2 )
{
        int a = scoreGuess( guess1 );
        int b = scoreGuess( guess2 );
        if( a > b ) return guess1;
        if( b > a ) return guess2;
        if( guess1.compareTo( guess2 ) > 0 )
                return guess1;
        return guess2;
}
```

2021 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 CombinedTable
{
  private SingleTable a;
  private SingleTable b;

  public CombinedTable( SingleTable x, SingleTable y )
  {
    a = x;
    b = y;
  }

  public boolean canSeat( int num )
  {
    return num <= ( a.getNumSeats() + b.getNumSeats()  - 2);
  }

  public double getDesirability()
  {
    double avg = (a.getViewQuality()  + b.getViewQuality() ) / 2;
    if( a.getHeight() == b.getHeight() )
          return avg;
    return avg - 10;
  }
}
```

Make a Class

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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.

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.

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 addMembers(
                    String[] names, int gradYear )
{
  for( String n : names )
  {
    memberList.add(
          new MemberInfo( n, gradYear, true) );
  }
}
```

2021 Question 3 Part A

```
public ArrayList<MemberInfo> removeMembers( int year )
{
  ArrayList<MemberInfo> list;
  list = new ArrayList<MemberInfo>();
  int i = memberList.size()-1;
  while( i >= 0 )
  {
        MemberInfo curr = memberList.get( i );
        if( curr.getGradYear() <= year &&
                                        curr.inGoodStanding())
          list.add( curr );
        if( curr.getGradYear() <= year )
          memberList.remove( i );
        i--;
  }
  return list;
}
```

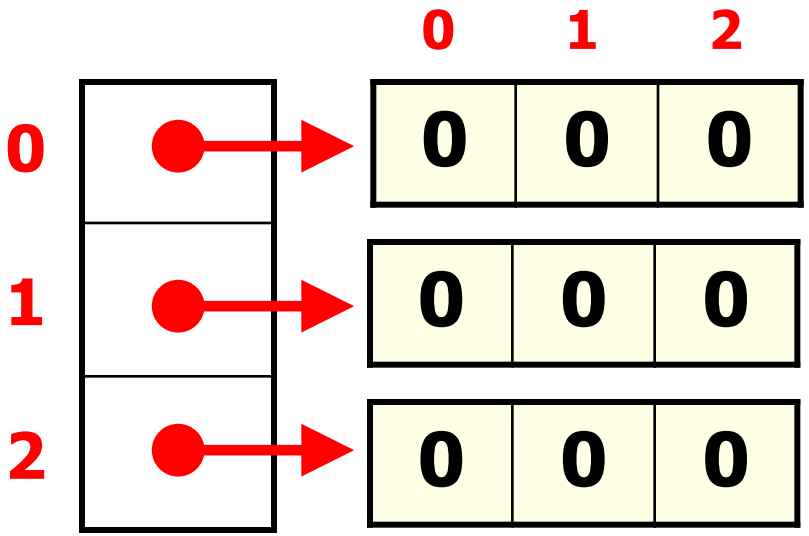
2021 Question 3 Part B

Free Response Question 4

Matrices

Matrices

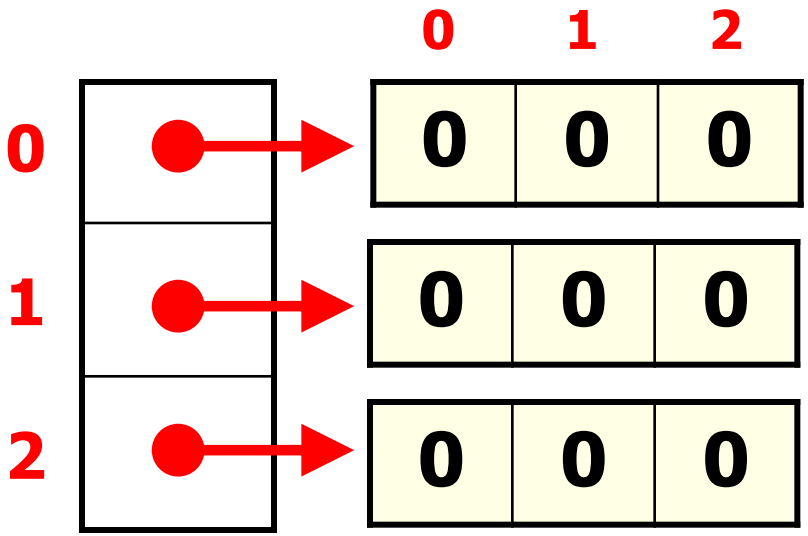
Typically, 1 question on the A test free response will require that students manipulate a 2-dimensional array.



Matrices

A matrix is an array of arrays.

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



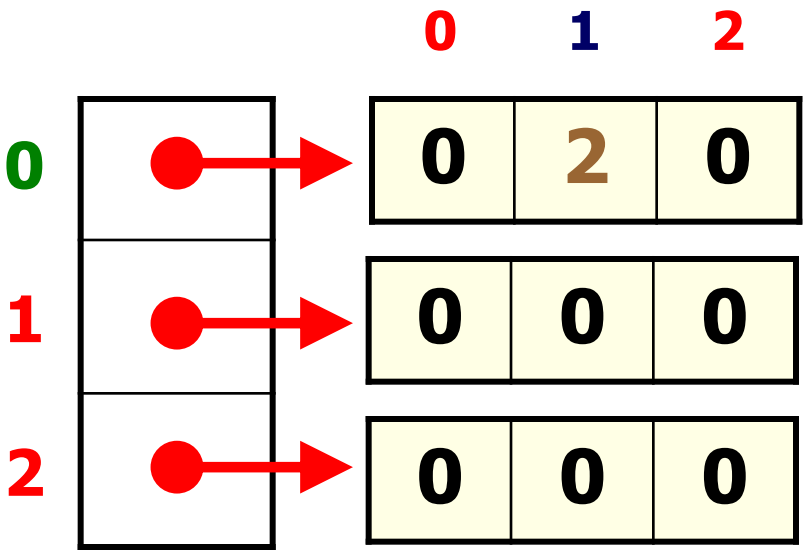
Matrices

A matrix is an array of arrays.

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

Which array?

Which spot?



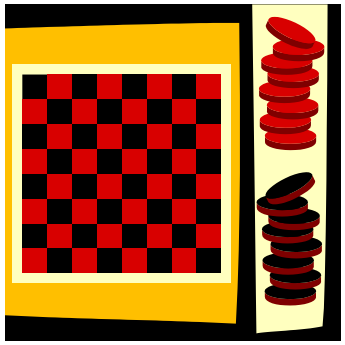
Matrices

	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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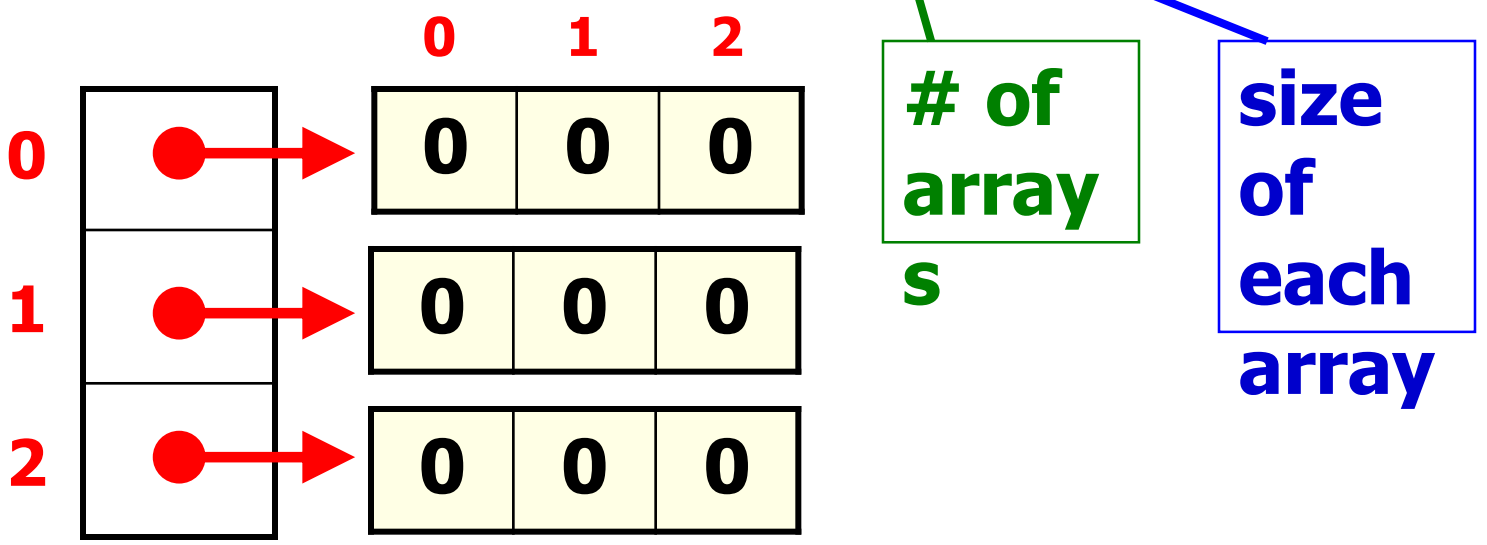

Matrices – for each

```
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 static boolean isNonZeroRow(
                                        int[][] array2D, int r )
{
  for( int v : array2D[r] )
        if( v == 0 )
              return false;
  return true;
}
```

2021 Question 4 part A

```
public static int[][] resize( int[][] array2D )
{
  int cnt = numNonZeroRows( array2D );
  int[][] box = new int[ cnt ][ 0 ];
  int c = 0;
  for( int i = 0; i < array2D.length; i++ )
  {
        //aliasing approach – living dangerously
        if( isNonZeroRow( array2D, i ) )
              box[c++] = array2D[ i ];
  }
  return box;
}
```

2021 Question 4 part B.1

```
public static int[][] resize2( int[][] array2D )
{
  int cnt = numNonZeroRows( array2D );
  int[][] box = new int[ cnt ][ 0 ];
  int c = 0;
  for( int i = 0; i < array2D.length; i++ )
  {
    if( isNonZeroRow( array2D, i ) )
    {
        //instead of the aliasing option – boring, but it works
        int[] bob = new int[array2D[i].length];
        for( int x = 0; x < array2D[ i ].length; x++ )
              bob[x] = array2D[i][x];
        box[c++] = bob;
    }
  }
  return box;
}
```

2021 Question 4 part B.2

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