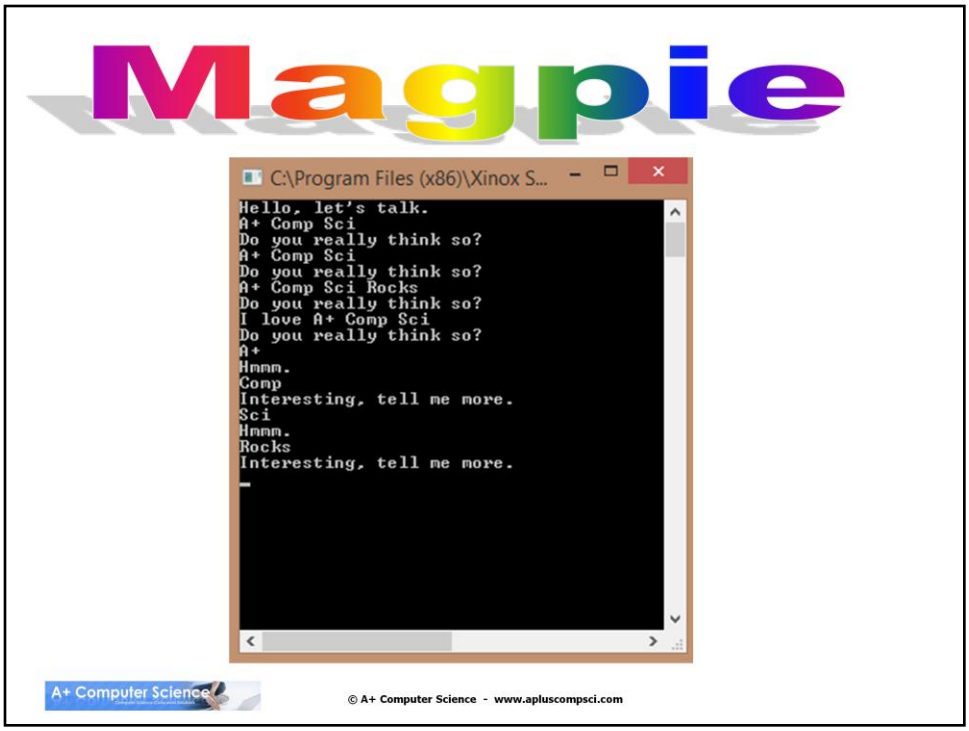
New AP CS A Labs
Magpie, PictureLab, and Elevens



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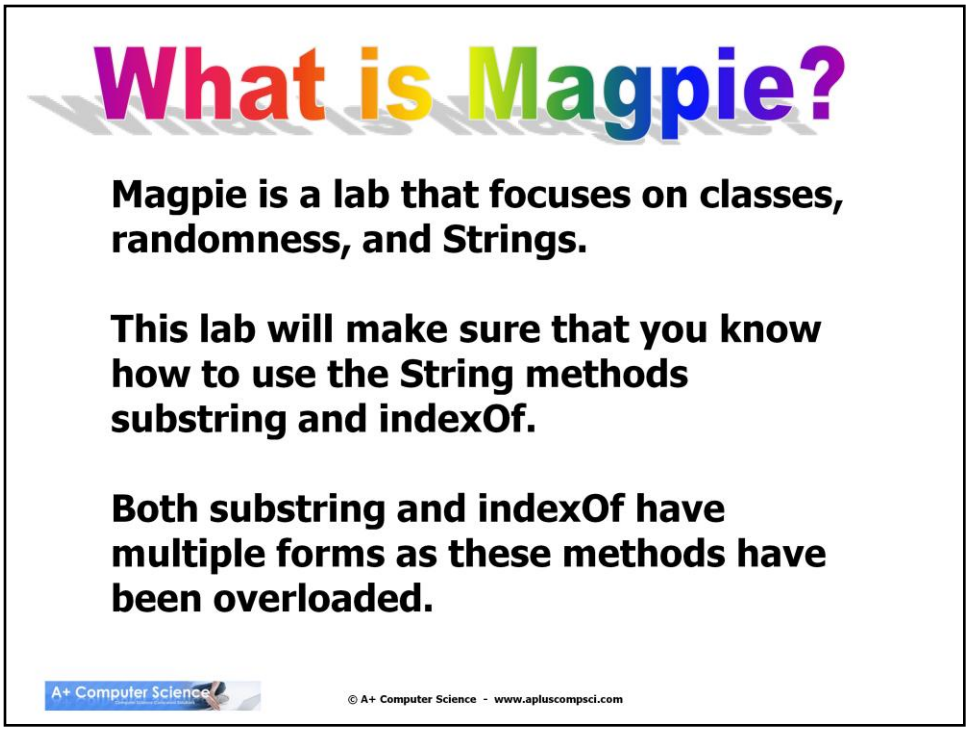

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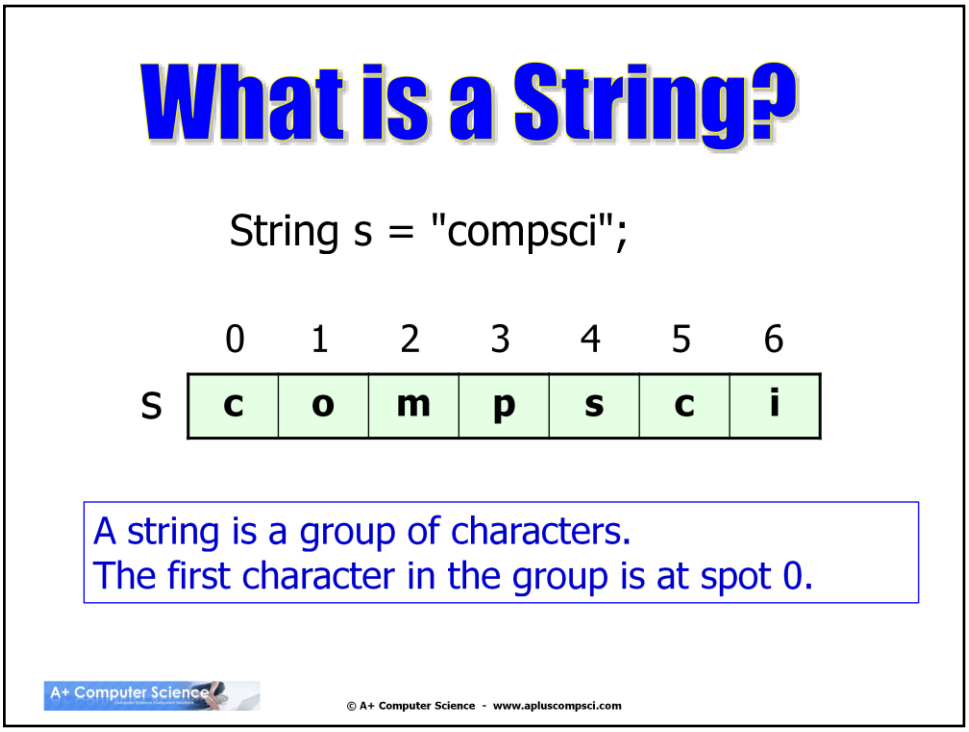

A String is a group of characters. Strings are used to store words, which can consist of letters, numbers, and symbols.

String
Methods from AP CS Subset

Name	Use
`int length()`	Returns length of String
`int indexOf(String str)`	Returns first position of str in the string if found, -1 if not found
`String substring(int from)`	Returns a substring of the string starting at from to length() – 1
`String substring(int from, int to)`	Returns a substring of the string starting at from to to – 1

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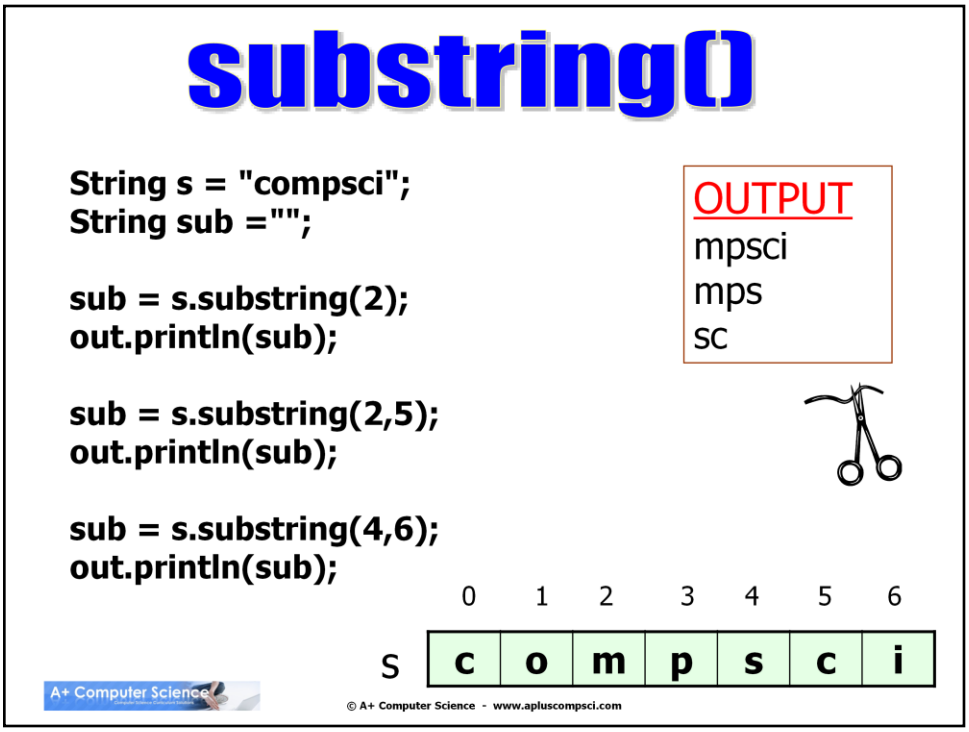
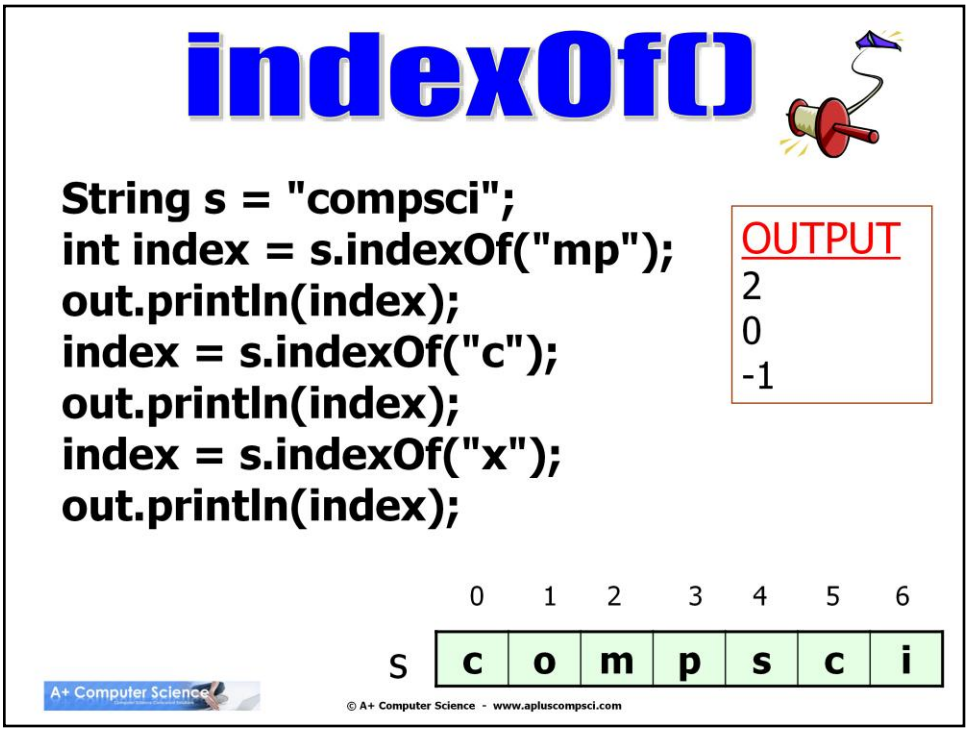
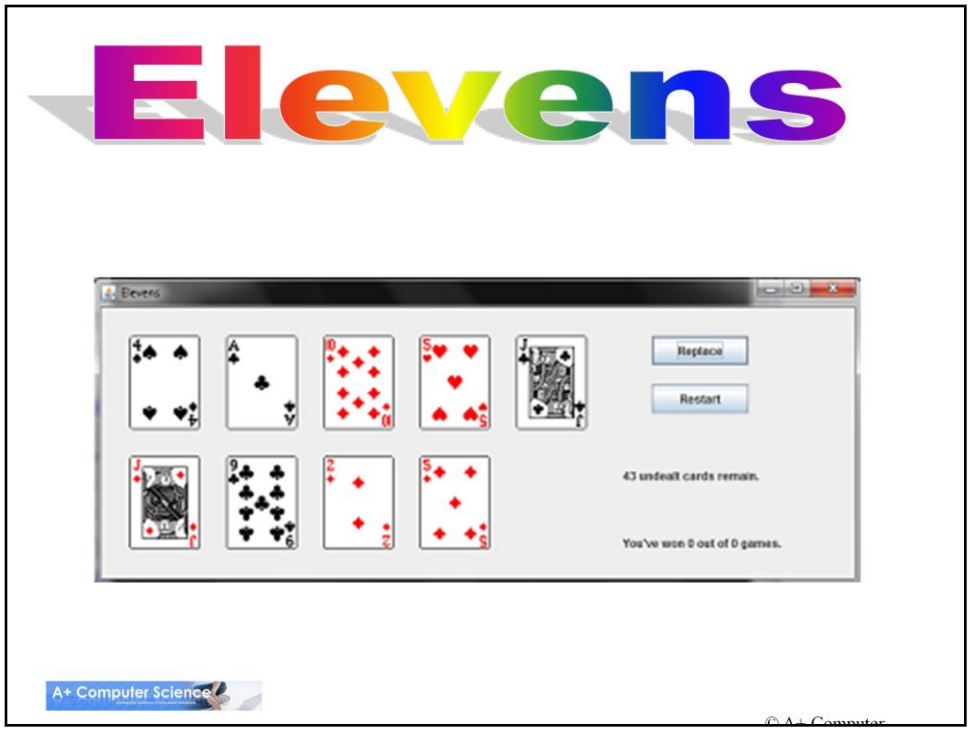


The String `substring()` method returns a String containing a section from the original String.



The String `indexOf()` method looks for a value and returns the spot at which that value is stored. If the value provided is not present in the String, -1 is returned. -1 would not be a valid spot in the String which is why -1 was chosen as the return value when a value is not found.



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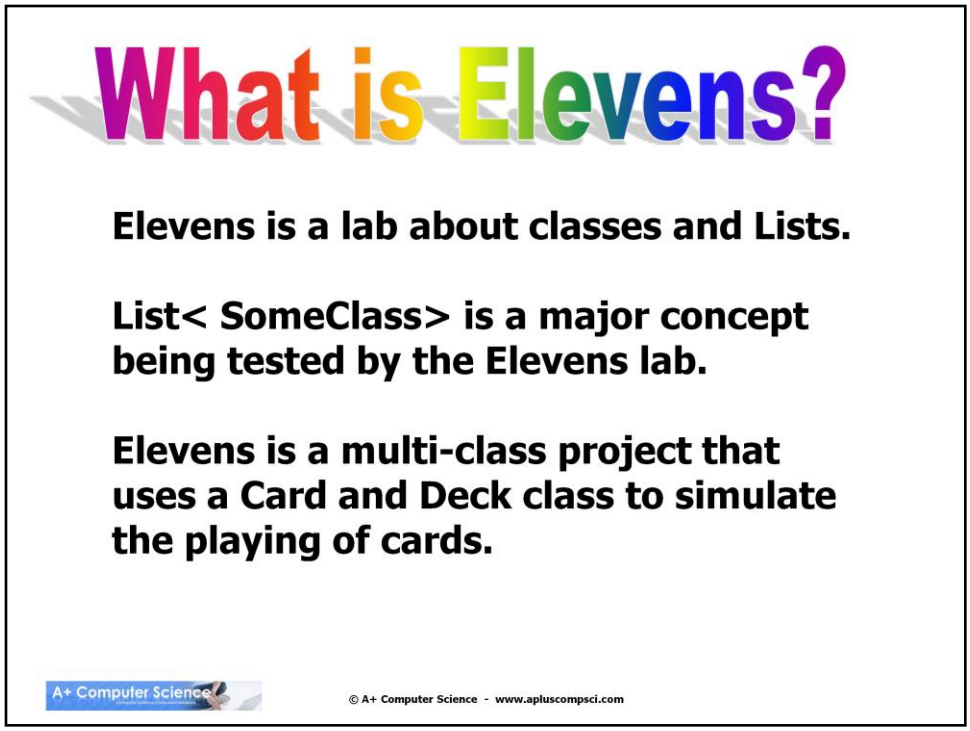

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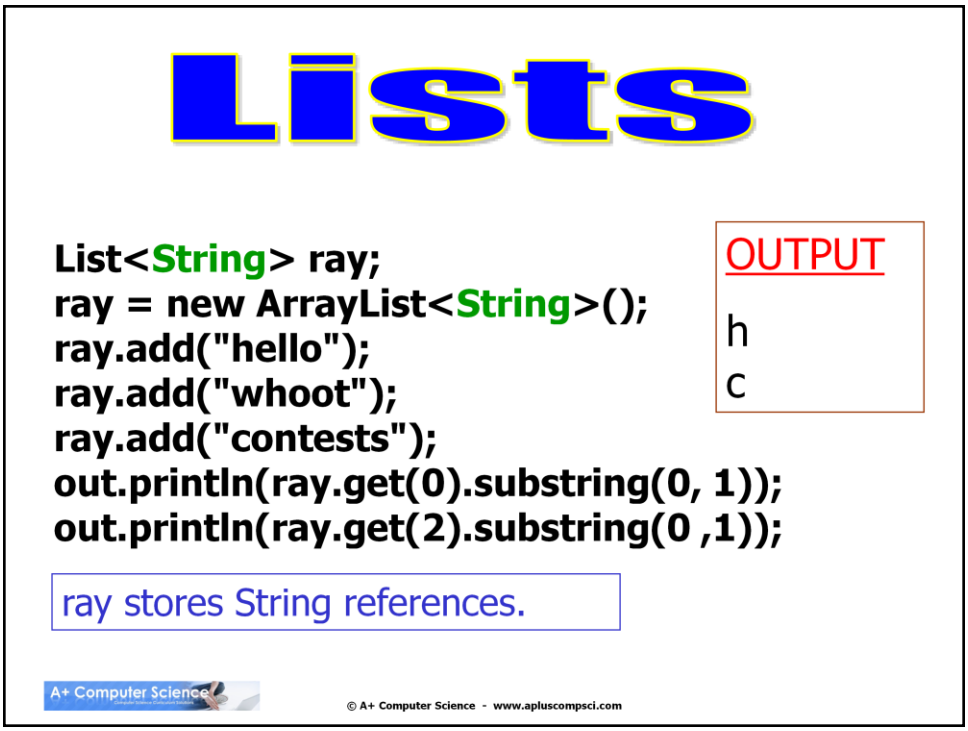
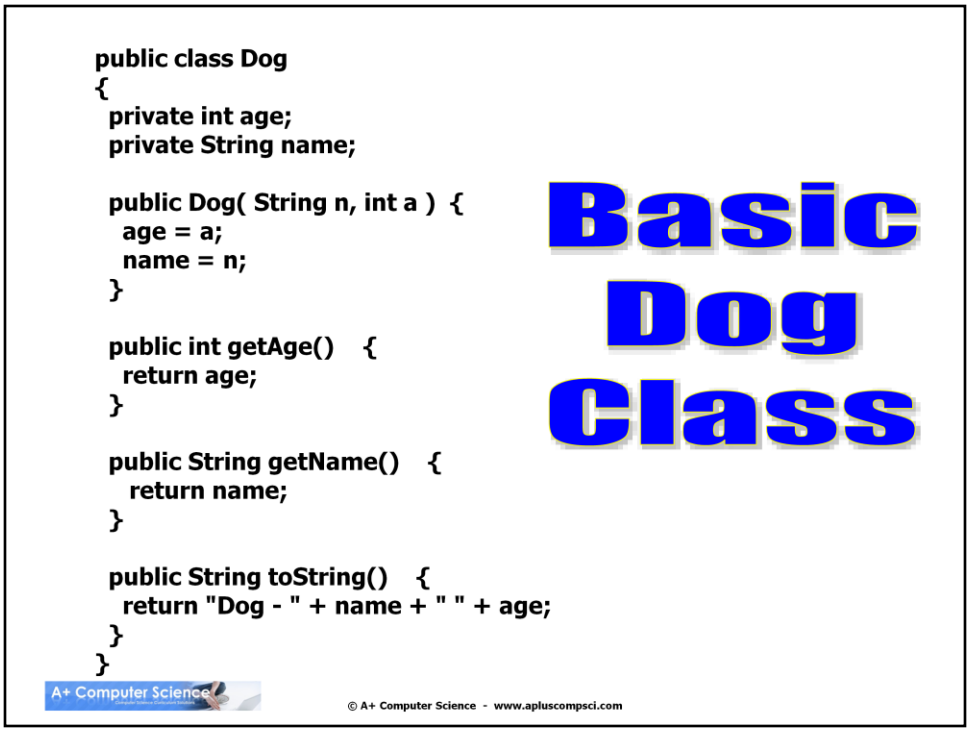
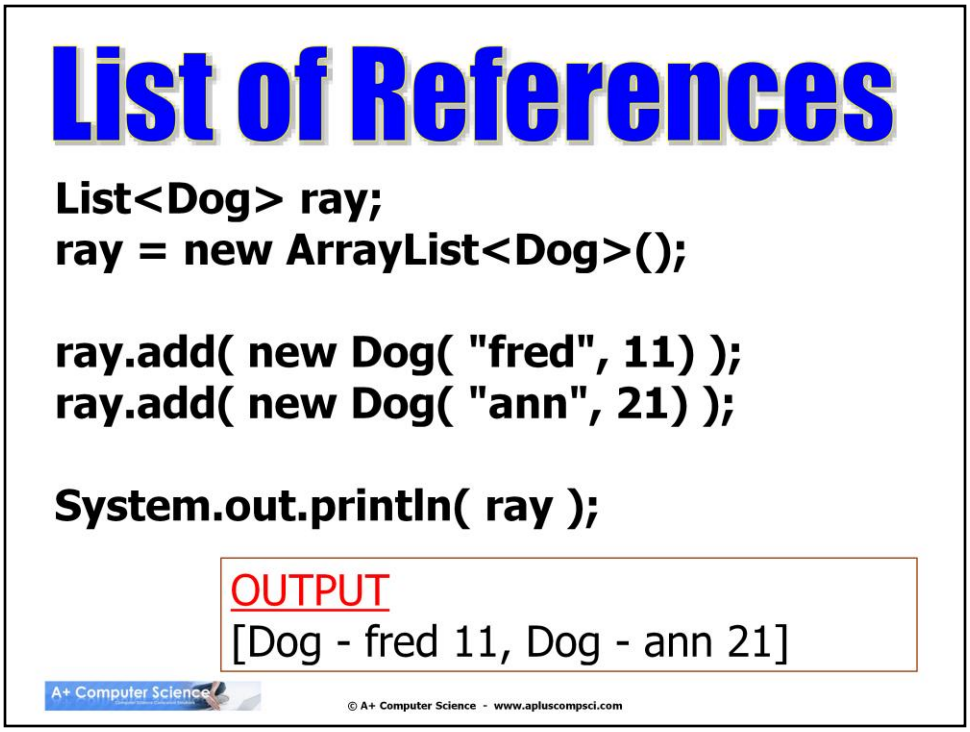


In the example above, ray is an ArrayList that stores String references.



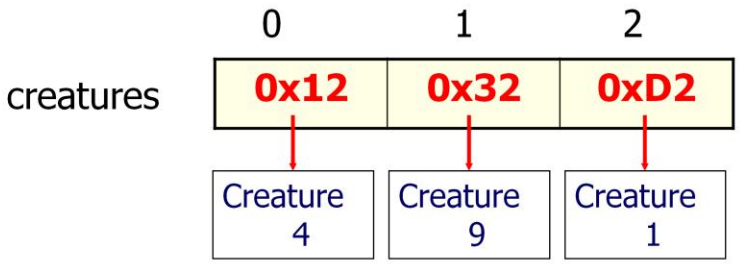
Classes are used to store related methods and variables.



Lists / ArrayLists can store references to objects. This enables each spot in the List / ArrayList to house more than just a single value. Each spot can house multiple variables and methods all of which would be contained in a class.

List of References

```
List<Creature> creatures;
creatures  = new ArrayList<Creature>();
creatures.add(new Creature(4));
creatures.add(new Creature(9));
creatures.add(new Creature(1));
```

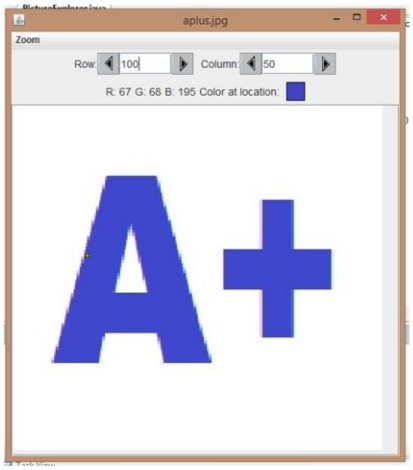


ArrayList
frequently used methods

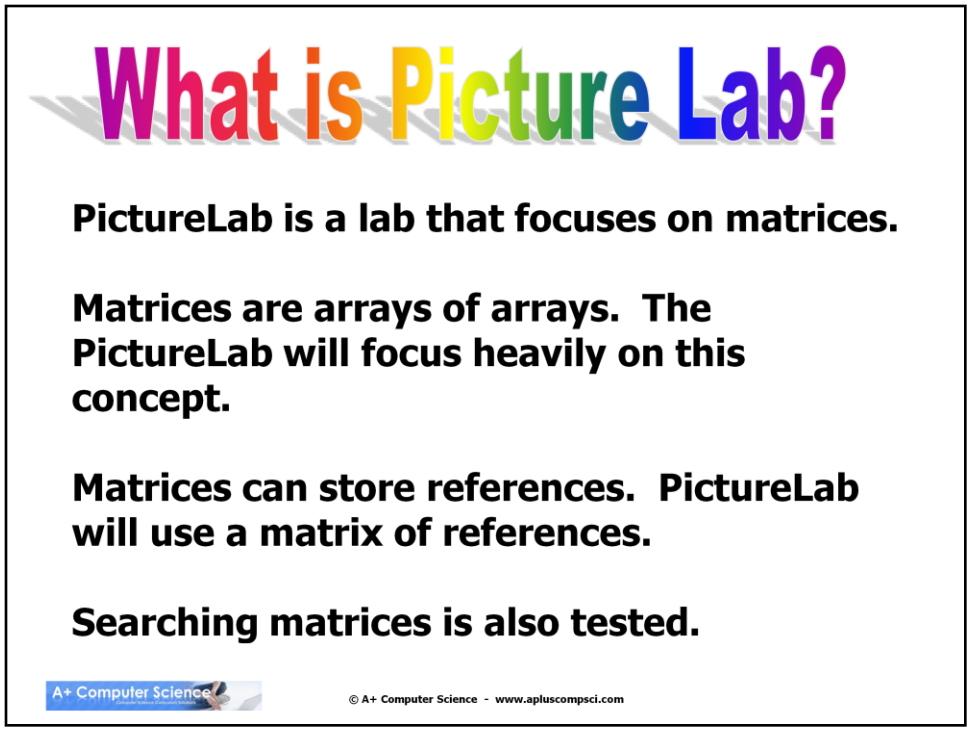
Name	Use
add(item)	adds item to the end of the list
add(spot,item)	adds item at spot – shifts items up->
set(spot,item)	put item at spot z[spot]=item
get(spot)	returns the item at spot return z[spot]
size()	returns the # of items in the list
remove()	removes an item from the list
clear()	removes all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

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

Picture Lab



A+ Computer Science



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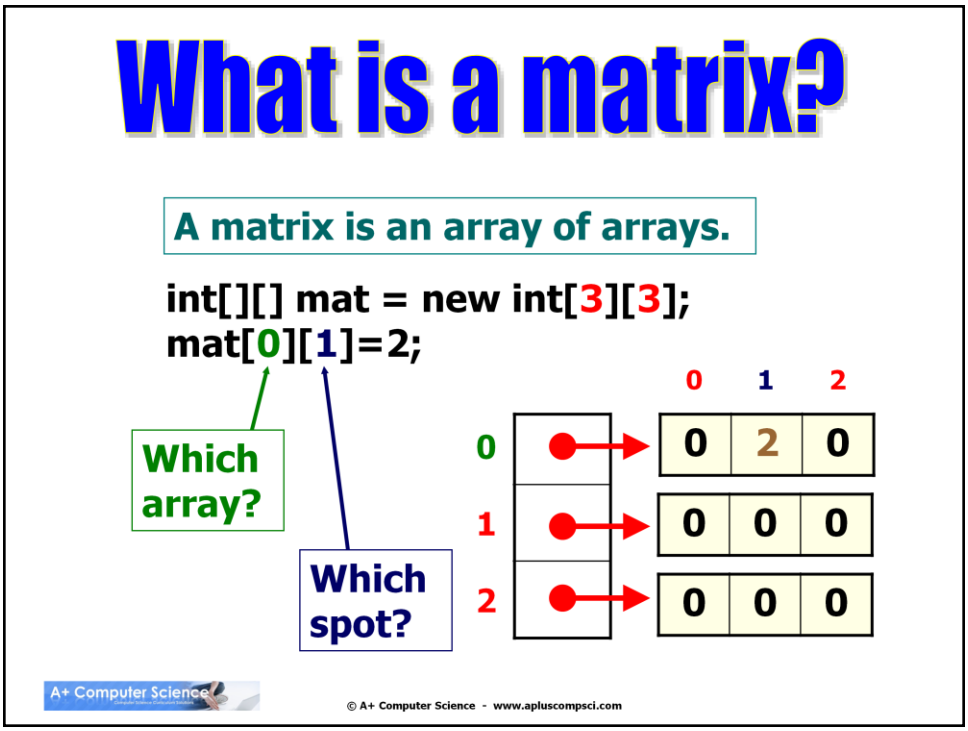
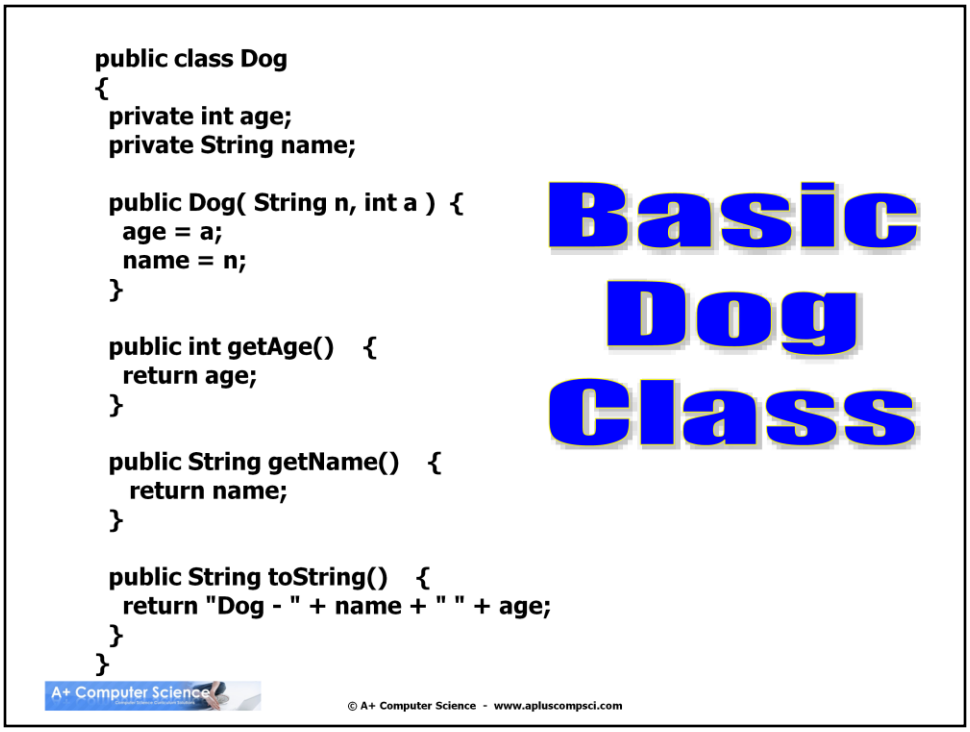


Each spot in an matrix stores the location/address of an array.

`mat[0]` stores the location / address of a one-dimensional array.

```
mat[0][1]=2;
```

This line sets `mat[0]` spot 1 to 2.



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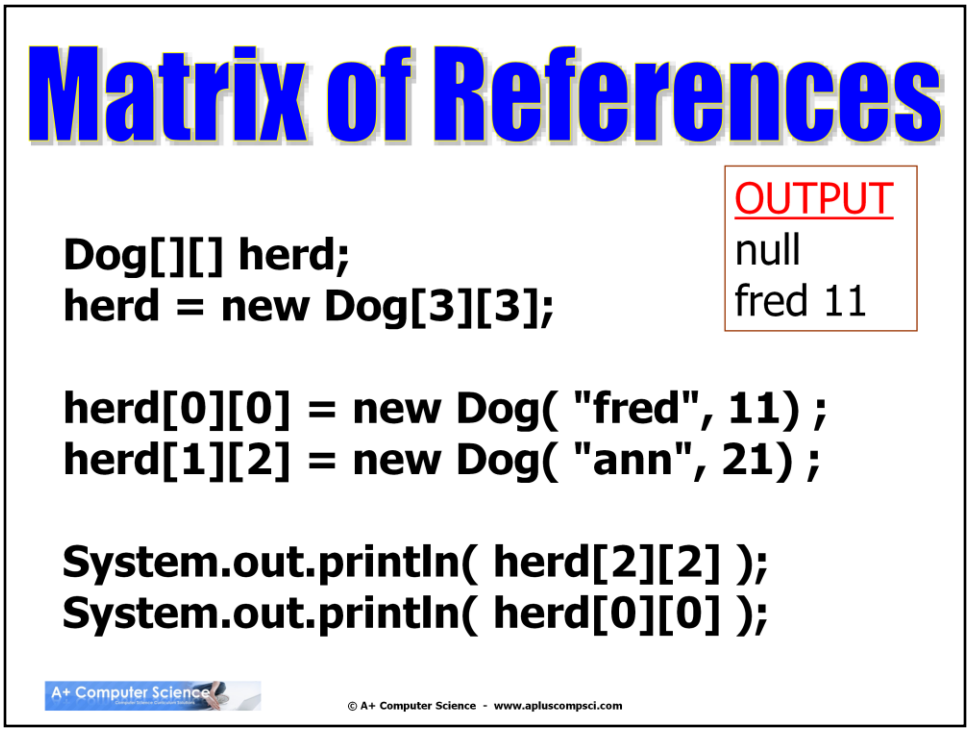

Matrices can store references to objects. This enables each spot in the matrices to house more than just a single value. Each spot can house multiple variables and methods all of which would be contained in a class.

Searching a Matrix

```
int[][] mat = {{5,7},{5,3,4,6},{0,8,9}};
int count = 0;
for( int[] row : mat )
{
  for( int num : row )
  {
    if( num == 5 )
      count++;
  }
}
System.out.println("5 count = "  + count);
```

OUTPUT

```
5 count = 2
```


Searching for values in an array or matrix is a common process often tested on the AP exam.

What is a Picture?


```
public static void main(String[] args)
{
  Picture aplusPic = new Picture("aplus.jpg");
  aplusPic.explore();
  aplusPic.zeroBlue();
  aplusPic.explore();
}
```


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