If you encrypt the string “Abcd: EFG” with a rotation of -1, (consider the whole “sorted” alphabet to find the rotated “encoding”: AB... Zabc...z Special characters remain the same!)

What do you get?

A. “Bcde: FGH”
B. “aBCD: efg”
C. “Zabc: DEF”
D. “ZabcDEF”
E. “AbcdEFG”

START PSA2! 😊
1. Which Java class is used to read data from a file?

A. File

B. Scanner

C. Reader

D. PrintWriter
2. Suppose you want to read from a file called “hello.txt”. Write a line of Java code to instantiate a Scanner named *input*.

A. `Scanner input = new Scanner(new File("hello.txt"));`

B. `Scanner input = new Scanner(new PrintWriter("hello.txt"));`

C. `Scanner input = new Scanner(System.in);`

D. `Scanner input = new Scanner("hello.txt");`
3. In the type `java.util.Scanner`, what does the `java.util` part indicate?
(Hint: You might want to refer to section 1.9 as well)

A. Superclass
B. Subclass
C. Interface
D. Package
4. What is the output of the following code:

```java
int[] list = {0, 5, 10, 15, 20, 25};
System.out.println( "Index is " +
    java.util.Arrays.binarySearch(list, 23) );
```

A. Index is -1

B. Index is -6

C. Index is 23

D. Index is false

Return Value
This method returns index of the search key, if it is contained in the array, else it returns \((-\text{insertion point}) - 1\).

The insertion point is the point at which the key would be inserted into the array: the index of the first element greater than the key, or a.length if all elements in the array are less than the specified key.
What’s in a computer?

Computer

- CPU (brains)
  - RAM (temporary storage)
  - Disk or Flash (persistent storage)
What’s in a computer?

The Central Processing Unit:
The logic that transforms data
(to “do the work”)

Memory:
Storage for data that is “actively being used”
(including the program instructions
and all other data the program needs)

Disk:
Long-term, permanent data storage
(e.g., your files)

https://www.stanford.edu/class/cs101/hardware-1.html
In order for a program to process a file, it must load it into memory. This is done via instructions in the programming language (in our case, Java)
Albert Einstein wasn't able to speak until he was almost 4 years old and his teachers said he would "never amount to much".

File Object
- Stores the file name (with the path) privately
- Has lots of methods for manipulating files (but not for reading or writing files!)

Scanner Object
- Used for reading input.
- Pass it a File object to read from a File

PrintWriter Object
- Used for writing output.
- Pass it a File object to write to a File

On your computer (disk)
Java’s “handle” on the file
Reading and Writing (transfer data to and from memory)
Albert Einstein wasn’t able to speak until he was almost 4 years old and his teachers said he would "never amount to much".

Don’t need to know details. Follow the example in the book.

`testEncrypt.txt`

`File Object`

Stores the file name (with the path) privately

Has lots of methods for manipulating files (but not for reading or writing files!)

`File Object`

Used for writing output.

Pass it a File object to write to a File

`PrintWriter Object`

Used for writing output.

Pass it a File object to write to a File

`Scanner Object`

Used for reading input.

Pass it a File object to read from a File

On your computer (disk)

Java’s “handle” on the file

Reading and Writing (transfer data to and from memory)
import java.io.*;
import java.util.*;

// In class StringPlay
public String readIt(String filename) throws IOException {
    File sourceFile = new File(filename);
    Scanner input = new Scanner(sourceFile);
    String allText = "";
    while (_________A___________) {
        String s1 = input.nextLine();
        allText = allText.concat(s1);
    }
    System.out.println(allText);
}

Scanner and IOException are in these packages. These lines tell java where to find them.

Get a handle on the file
Create an object that knows how to get the data from the file (on disk) into memory
Getting Text from a File

// In class StringPlay
public String readIt( String filename ) throws IOException {
    File sourceFile = new File( filename );
    Scanner input = new Scanner( sourceFile );
    String allText = "";
    while ( __________(A)______________ ) {
        String s1 = input.nextLine();
        allText = allText.concat( s1 );
    }
    System.out.println( allText );
}

Why does the compiler complain that this method is missing a return value?
(Discuss)

Missing return statement!!
Print is not the same as return
What is an IOException??

// In class StringPlay
public String readIt( String filename ) throws IOException {
    File sourceFile = new File( filename );
    Scanner input = new Scanner( sourceFile );
    String allText = "";
    while ( __________(A)______________ )
    {
        String s1 = input.nextLine();
        allText = allText.concat( s1 );
    }
    System.out.println( allText );
    return allText;
}

Essentially, an exception is just an error that can be passed around (thrown)

File management and processing methods (among others) may throw an exception!
We need to tell the program what to do in case that happens:
For now don’t worry about it. Just keep throwing it up by adding this to your method
Using the Scanner

// In class StringPlay
public String readIt( String filename ) throws IOException {
    File sourceFile = new File( filename );
    Scanner input = new Scanner( sourceFile );
    String allText = "";
    while (__________(A)______________ )
    {
        String s1 = input.nextLine();
        allText = allText.concat( s1 );
    }
    System.out.println( allText );
    return allText;
}

What code should go in blank (A)
A. input.hasNext()  
B. input.nextLine()  
C. input.next()  
D. true
Using the Scanner

// In class StringPlay
public String readIt( String filename ) throws IOException
{
    File sourceFile = new File( filename );
    Scanner input = new Scanner( sourceFile );
    String allText = "";
    while ( input.hasNext() )
    {
        String s1 = input.nextLine();
        allText = allText.concat( s1 );
    }
    System.out.println( allText );
    return allText;
}

StringPlay s = new StringPlay();
> s.readIt( "haiku.txt" );

Rather than a beep
Or a rude error message:
These words: "File Not Found".

What does this print?
A. The original file text, formatted exactly the same
B. The original file text, but slightly changed
C. Something else
Using the Scanner

// In class StringPlay
public String readIt( String filename ) throws IOException {
    File sourceFile = new File( filename );
    Scanner input = new Scanner( sourceFile );
    String allText = "";
    while ( input.hasNext() ) {
        String s1 = input.nextLine();
        allText = allText.concat( s1 + '\n' );
    }
    System.out.println( allText );
    return allText;
}

StringPlay s = new StringPlay();
> s.readIt( "haiku.txt" );

Rather than a beep
Or a rude error message:
These words: "File Not Found".

The scanner strips the newlines! How can you put them back?

Add the special character for end_of_line to the string
A few tips for PSA2

• Always place your files in the same directory as your code. Paths are hard to get right.

• Use examples from the book

• The hard part is manipulating the strings, not reading from the file

And some “review” before the first in-class exam next week ..
Data, types and variables

```c
char ch = 'B';
int bInt = (int)ch;
char ch2 = ch;
ch2 = 'A';
```

At the end of these statements, what is the value of `ch`?

A. ‘A’
B. ‘B’
C. 65
D. 66
E. I don’t know

At the end of these statements, what is the value of `ch2`?

A. ‘A’
B. ‘B’
C. 65
D. 66
E. I don’t know
String s1 = "Strings are immutable.";
String s2 = s1.concat(" Really, it’s true.");
s1 = s2.concat(" But sometimes they change.");
System.out.println(s1);

What does the above code print?
A. “Strings are immutable.”
B. “Strings are immutable. Really, it’s true.”
C. “Strings are immutable. Really, it’s true. But sometimes they change.”
D. “Really, it’s true. But sometimes they change.”
E. I don’t know

- s1 -> "Strings are immutable." (Wrong)
- s2 -> "Strings are immutable. Really, it’s true."
Which is the correct final memory model*?

```c
int[] array1 = {1, 2, 3};
int[] array2 = array1;
array2[1] = 5;
array2 = new int[4];
```

A. 

B. 

C. 

D.
The built-in Arrays class has useful methods for manipulating arrays. It is found in the package java.util. You can find its javadoc documentation here:

http://docs.oracle.com/javase/6/docs/api/java/util/Arrays.html

```
static void sort(int[] a)
    Sorts the specified array of ints into ascending numerical order.
```

You can create javadocs for your code too! Try it!
The Arrays class

The built-in Arrays class has useful methods for manipulating arrays. It is found in the package java.util. You can find its javadoc documentation here: http://docs.oracle.com/javase/6/docs/api/java/util/Arrays.html

```java
static void sort(int[] a)
    Sorts the specified array of ints into ascending numerical order.
```

```java
> int[] intA = {5, 20, 13, 10};
> Arrays.sort( intA );

Static Error: Undefined name 'Arrays'
```

Why did I get this error?

A. sort is not defined for arrays of integers
B. I misspelled the class name “Arrays”
C. I used the wrong syntax for calling the sort method
D. I haven’t included enough information for java to find the Arrays class
E. I don’t know
The built-in Arrays class has useful methods for manipulating arrays. It is found in the package java.util. You can find its javadoc documentation here: [http://docs.oracle.com/javase/6/docs/api/java/util/Arrays.html](http://docs.oracle.com/javase/6/docs/api/java/util/Arrays.html)

```java
static void sort(int[] a)
    Sorts the specified array of ints into ascending numerical order.

> int[] intA = {5, 20, 13, 10};
> java.util.Arrays.sort( intA );

OR

> import java.util.Arrays;
> int[] intA = {5, 20, 13, 10};
> Arrays.sort( intA );

OR

> import java.util.*;
> int[] intA = {5, 20, 13, 10};
> Arrays.sort( intA );
```
The built-in Arrays class has useful methods for manipulating arrays. It is found in the package java.util. You can find its javadoc documentation here: http://docs.oracle.com/javase/6/docs/api/java/util/Arrays.html

```java
static void sort(int[] a)
    Sorts the specified array of ints into ascending numerical order.

int[] intA = {5, 20, 13, 10};
java.util.Arrays.sort(intA);
```

What is the value of the array that intA refers to after the call to sort?
A. {5, 20, 13, 10}
B. {5, 10, 13, 20}
C. {20, 13, 10, 5}
D. {}
E. I don’t know
The Arrays class

The built-in Arrays class has useful methods for manipulating arrays. It is found in the package java.util. You can find its javadoc documentation here: http://docs.oracle.com/javase/6/docs/api/java/util/Arrays.html

```
static void sort(int[] a)
    Sorts the specified array of ints into ascending numerical order.
```

> int[] intA = {5, 20, 13, 10};
> int[] newIntA = java.util.Arrays.sort( intA );

Static Error: Bad types in assignment: from void to int[]

Why did I get this error? (Discuss with your group)

The method sort returns void (nothing). You cannot set a variable that is supposed to hold an int array to be equal to void.
The built-in Arrays class has useful methods for manipulating arrays. It is found in the package java.util. You can find its javadoc documentation here: [http://docs.oracle.com/javase/6/docs/api/java/util/Arrays.html](http://docs.oracle.com/javase/6/docs/api/java/util/Arrays.html)

```java
static void sort(Object[] a) {
    // Sorts the specified array of objects into ascending order, according to the natural ordering of its elements.
}
```

> String[] stringA = {"Apple", "banana", "Zebra", "mouse"}
> java.util.Arrays.sort( stringA )

What is the value of the array that stringA refers to after the call to sort?

A. {“Apple”, “banana”, “mouse”, “Zebra”}
B. {“banana”, “mouse”, “Apple”, “Zebra”}
C. {“Apple”, “Zebra”, “banana”, “mouse”}
D. {“Apple”, “banana”, “Zebra”, “mouse”}
E. I don’t know

The ASCII/Unicode codes for capital letters are all smaller than those for lowercase letters!
Exam 1: Tuesday next week (in class)

- Will be short: about 1 page (front and back) and 20 minutes
- Questions similar to clicker questions, worksheets, and reading quiz
- Covers material through this Friday (emphasis on PSA 1 and 2 topics)
- We’ll provide you with a list of methods (similar to green boxes in the book)
- Best way to study: redo clicker questions, worksheets and PSAs.