10. Flowcharts Summary and Assessment

What did we do last time?

Program Design

DATATYPES, ARRAYS AND SEARCHING FOR A CHARACTER

Data Types in Programs (types of variables)

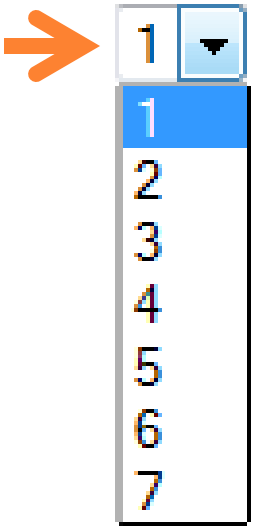
NUMBERS	**Integers** 100, 56, 9000000, 256,	**Decimal** $,£,€ 3.14, 6.626068 , 100.01	*int, float, decimal, numeric, tinyint, smallint, bigint, money, real*
TEXT	**Character** 'A', 'C', 'h', 'a','r'	**String** "a text string"	*char(n), varchar(n), text, nchar(n), nvarchar(n), ntext*
DATES	**DateTime** 2010-12-01	**TimeStamp** 2010-12-01 23:55:10	*datetime, timestamp, date, time*
BINARY	**Bit** 1 , 0	**Binary** 100011100011101010	*bit, binary(n),varbinary(n), image*
BOOLEAN	**Boolean** True, false	*boolean*	**NULL and void are value type in some languages = undefined, value unknown**

Arrays

- An array is **a variable** that **can contain more than one value**
- But the values must all be of the **same type**
- An egg box in memory, with a name
- Or a **list** in memory

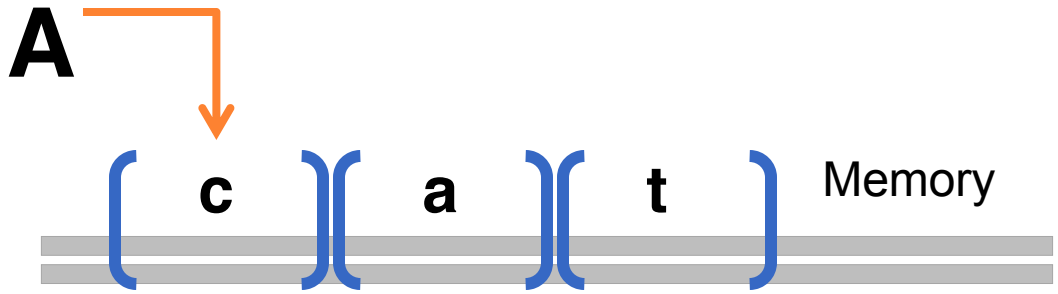
myVariable

myVariable



Elements in an array

The string variable



0 1 2 Memory slot reference number

A[0] **A[1]** **A[2]** Getting the value of a memory slot

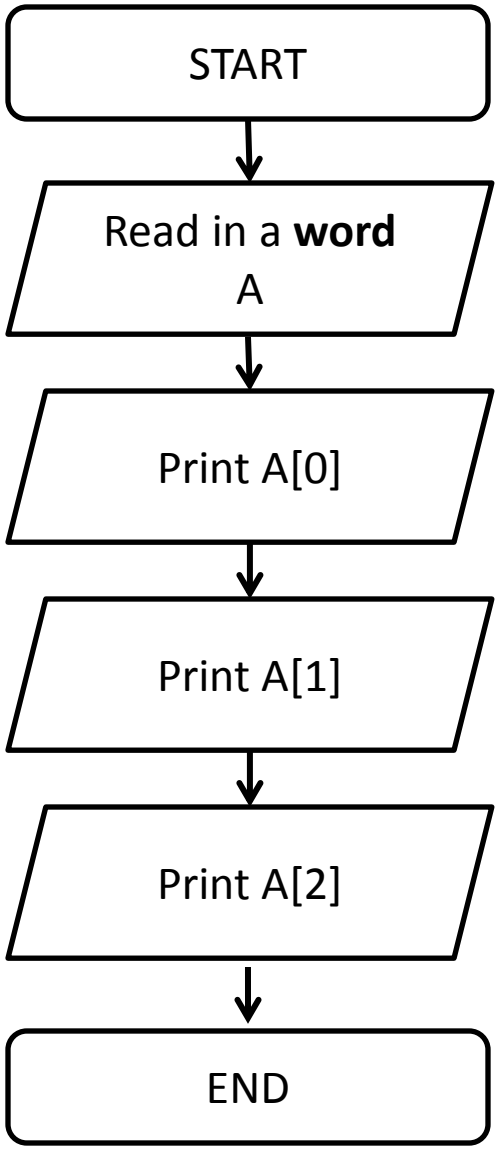
Type : ***character array = string***

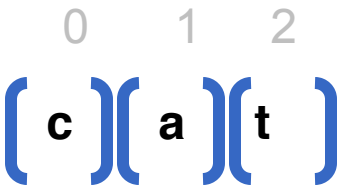
Flowcharts (Problem 15)

- So let's say we want to express the following algorithm:

  Print out each character in the word "cat".

Symbol	Name	Function
	Start/end	An oval represents a start or end point.
	Arrows	A line is a connector that shows relationships between the representative shapes.
	Input/Output	A parallelogram represents input or ouptut.
	Process	A rectangle represents a process.
	Decision	A diamond indicates a decision.





c

a

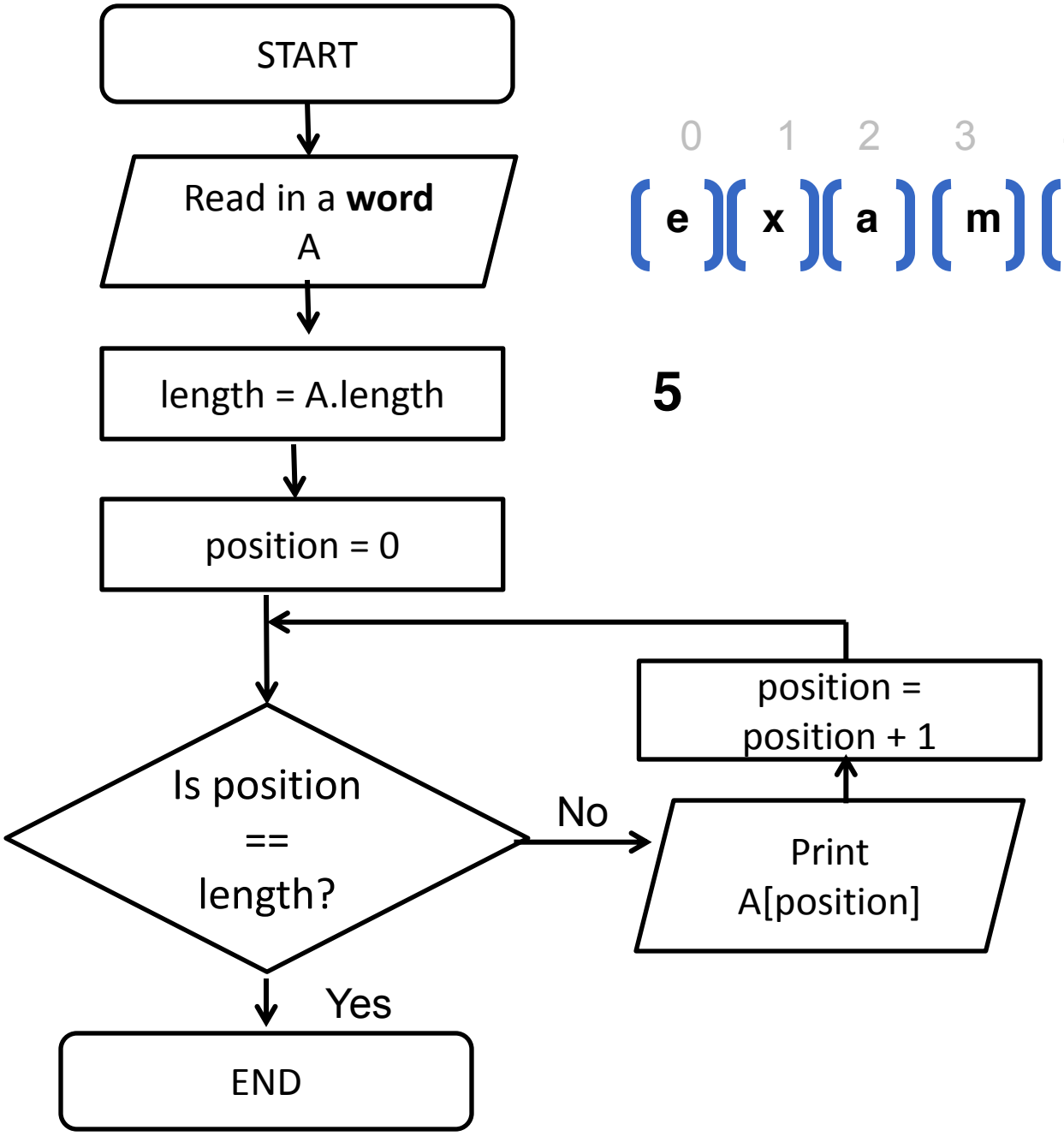
t

Flowcharts (Problem 16)

- So let's say we want to express the following algorithm:

Print out each character in any word that is entered.

Symbol	Name	Function
	Start/end	An oval represents a start or end point.
	Arrows	A line is a connector that shows relationships between the representative shapes.
	Input/Output	A parallelogram represents input or ouptut.
	Process	A rectangle represents a process.
	Decision	A diamond indicates a decision.



0 1 2 3 4

[e][x][a][m][s]

5

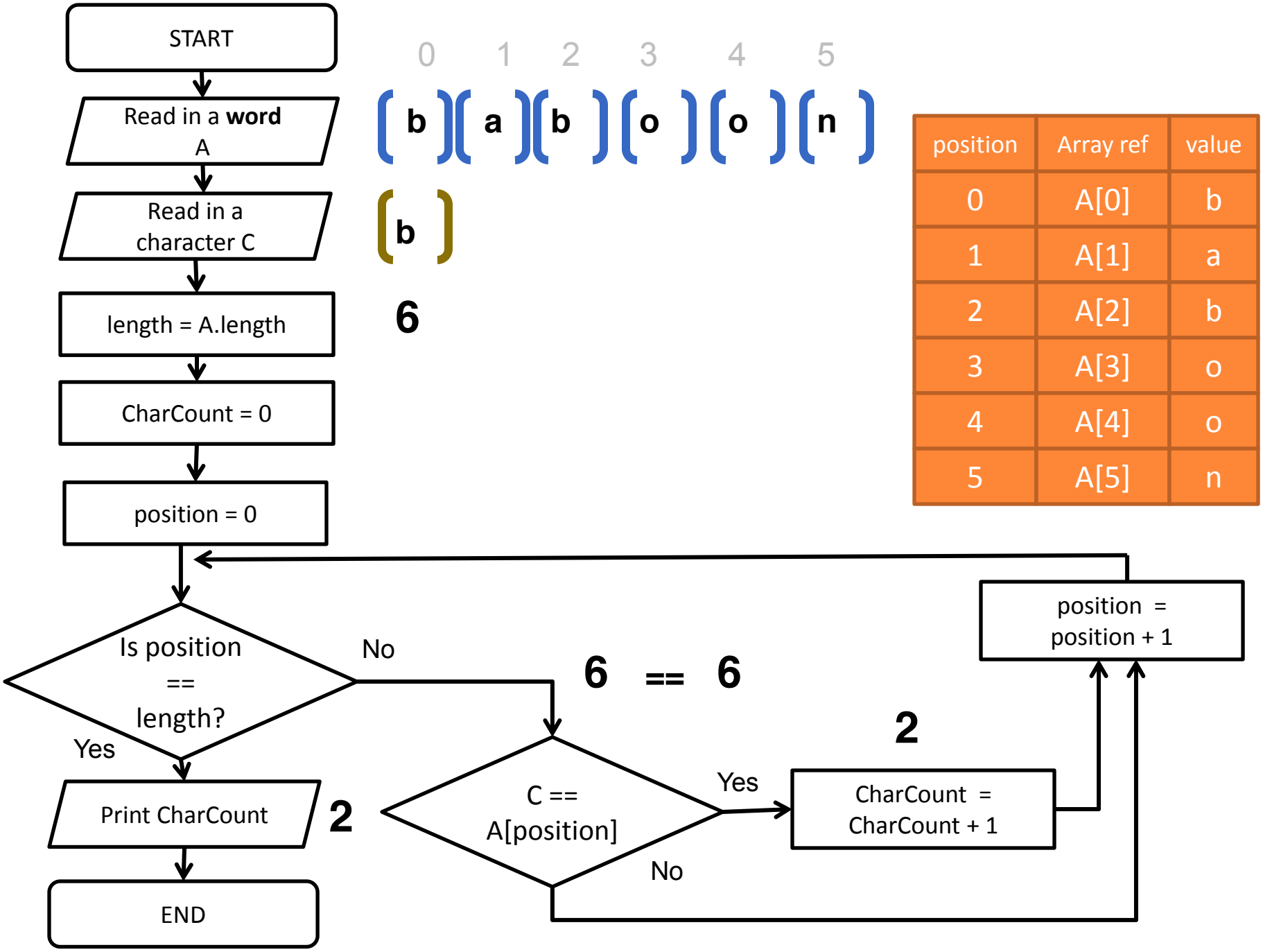
position	Array ref	value
0	A[0]	e
1	A[1]	x
2	A[2]	a
3	A[3]	m
4	A[4]	s

Flowcharts (Problem 17)

- So let's say we want to express the following algorithm:

Given a word and a character from that word print out the number of times the character is in the word.

Symbol	Name	Function
	Start/end	An oval represents a start or end point.
	Arrows	A line is a connector that shows relationships between the representative shapes.
	Input/Output	A parallelogram represents input or ouptut.
	Process	A rectangle represents a process.
	Decision	A diamond indicates a decision.



position	Array ref	value
0	A[0]	b
1	A[1]	a
2	A[2]	b
3	A[3]	o
4	A[4]	o
5	A[5]	n

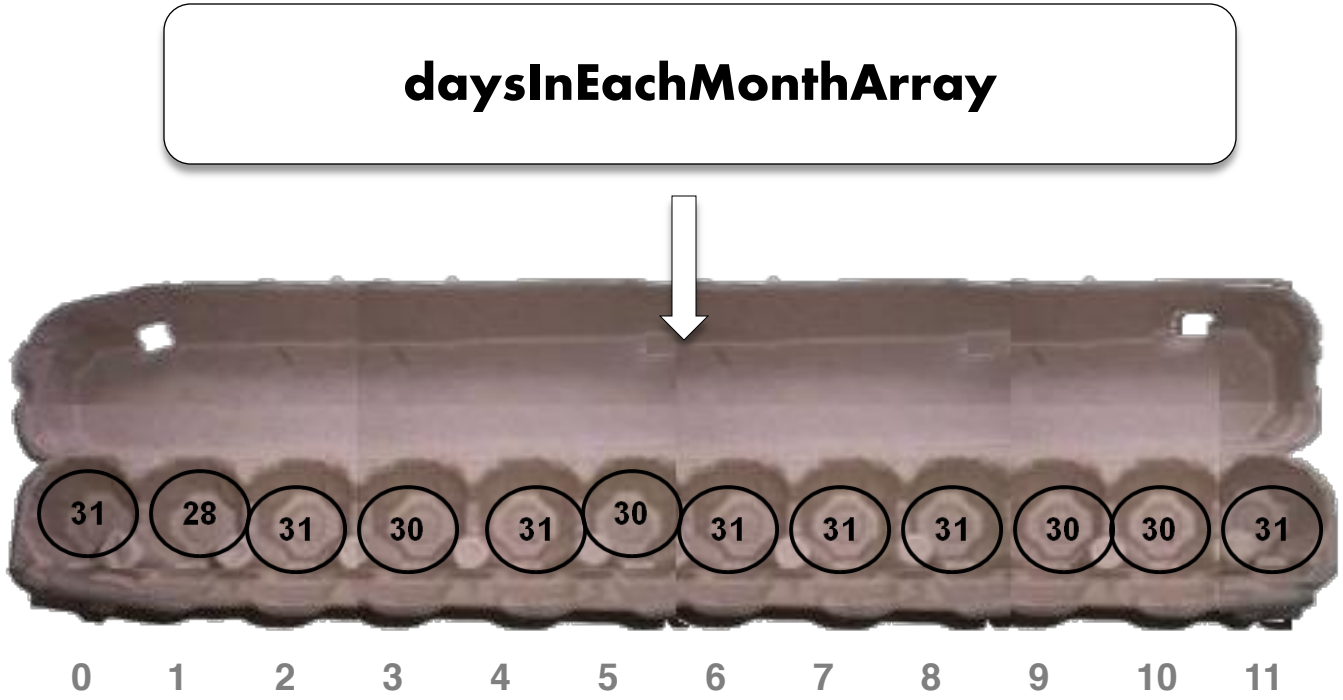
Not just for letters in a word

We can store lists of other data types in an array

What is it used for

- Example: Used to store lists of things that you may want to reference

  e.g. to store the number of days in each month of the year, or a list of words of a wordlist



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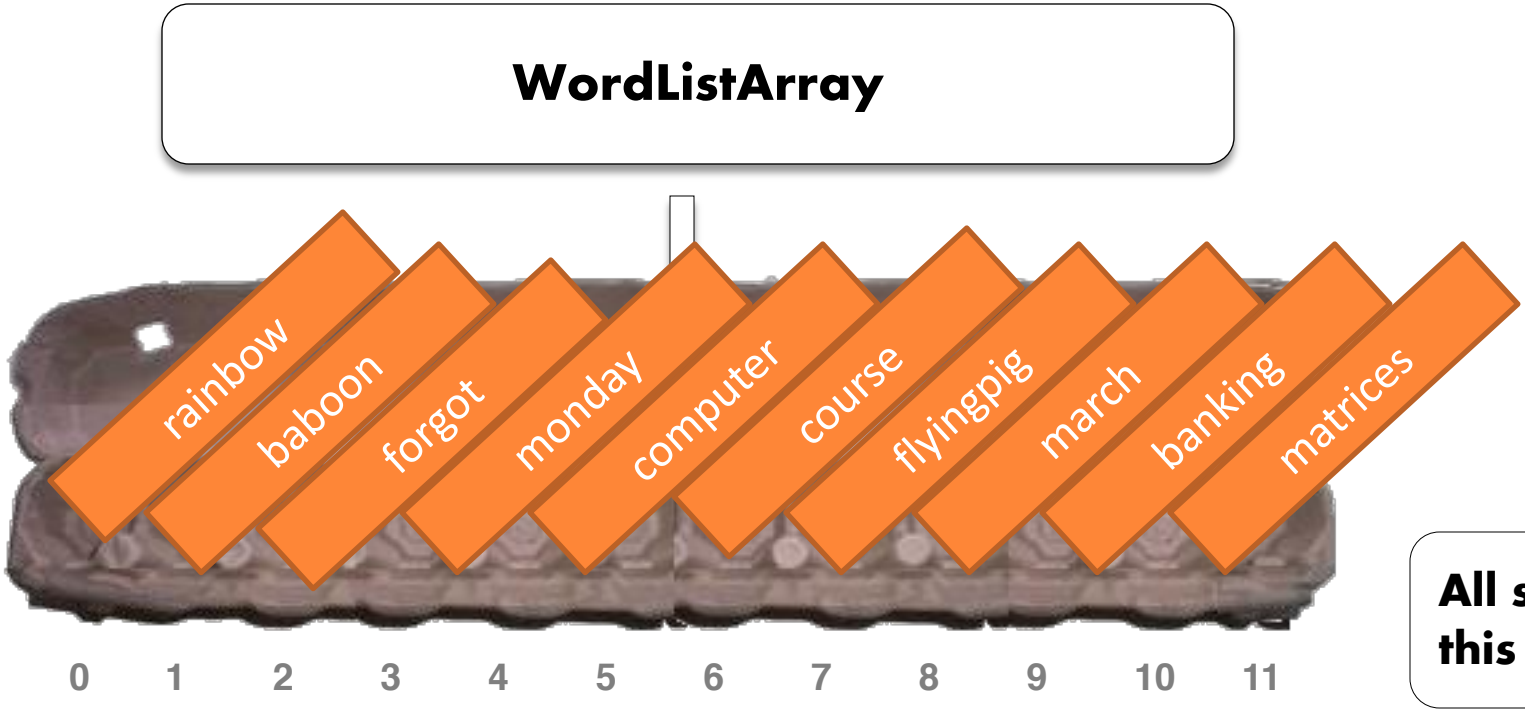
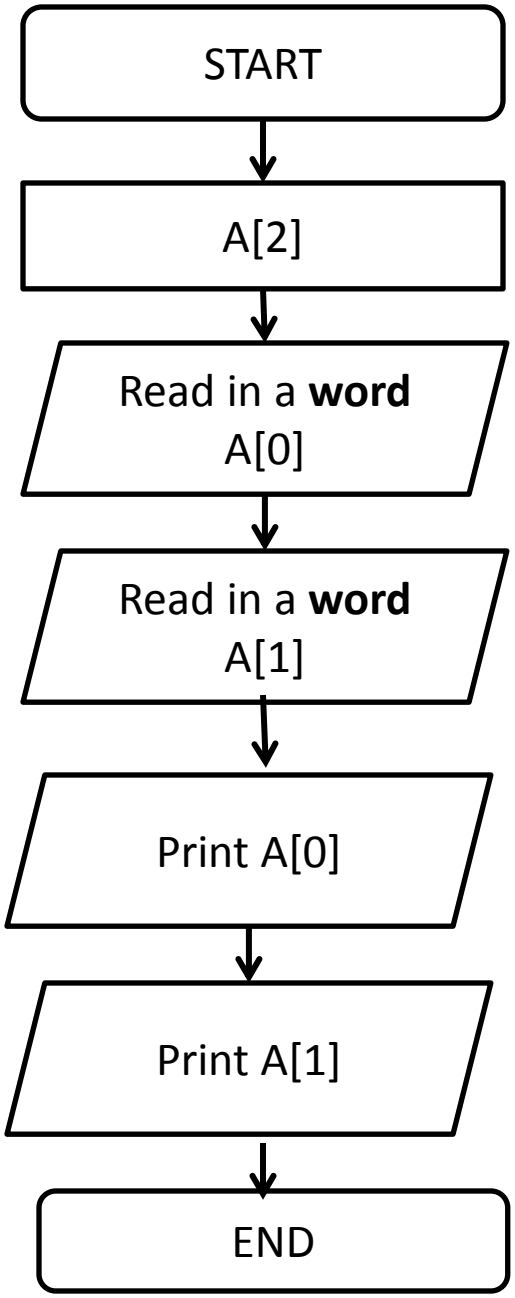


Flowcharts (Problem 18)

- So let's say we want to express the following algorithm:

Read in two words and print them out (We want to use an array to store the words).

Symbol	Name	Function
	Start/end	An oval represents a start or end point.
	Arrows	A line is a connector that shows relationships between the representative shapes.
	Input/Output	A parallelogram represents input or ouptut.
	Process	A rectangle represents a process.
	Decision	A diamond indicates a decision.


START
A[2]
Read in a **word**
A[0]
Read in a **word**
A[1]
Print A[0]
Print A[1]
END


0
1


0
1
John


John
Mary

John

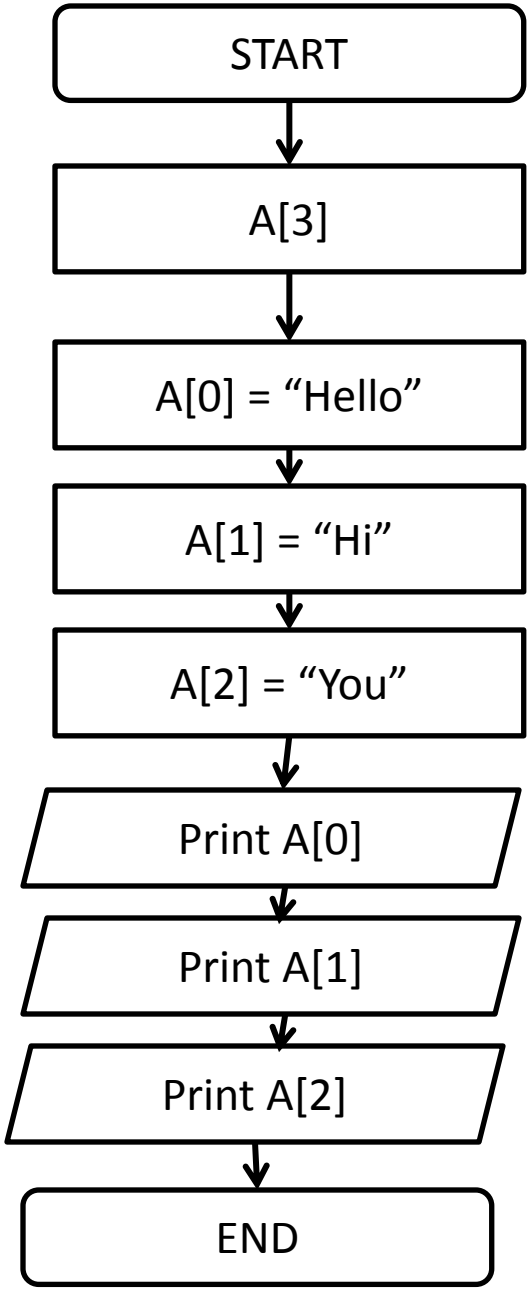
Mary

Flowcharts (Problem 19)

- So let's say we want to express the following algorithm:

Place 3 words into memory and print them out (We want to use an array to store the words).

Symbol	Name	Function
	Start/end	An oval represents a start or end point.
	Arrows	A line is a connector that shows relationships between the representative shapes.
	Input/Output	A parallelogram represents input or ouptut.
	Process	A rectangle represents a process.
	Decision	A diamond indicates a decision.



Create a variable, called A
A is an array.

The memory slots owned by the variable A can be referenced using an index number that starts as zero

Hello

Hi

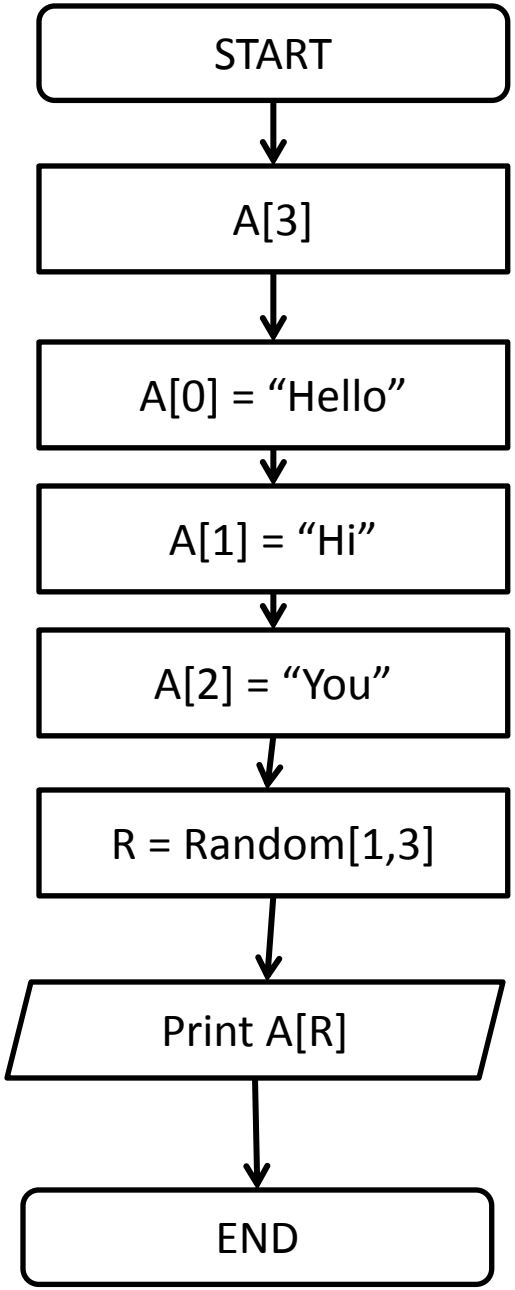
You

Flowcharts (Problem 20)

- So let's say we want to express the following algorithm:

Place 3 words into memory, generate a random number between 1 and 3, print out the word chosen by the random number generator.

Symbol	Name	Function
	Start/end	An oval represents a start or end point.
	Arrows	A line is a connector that shows relationships between the representative shapes.
	Input/Output	A parallelogram represents input or ouptut.
	Process	A rectangle represents a process.
	Decision	A diamond indicates a decision.

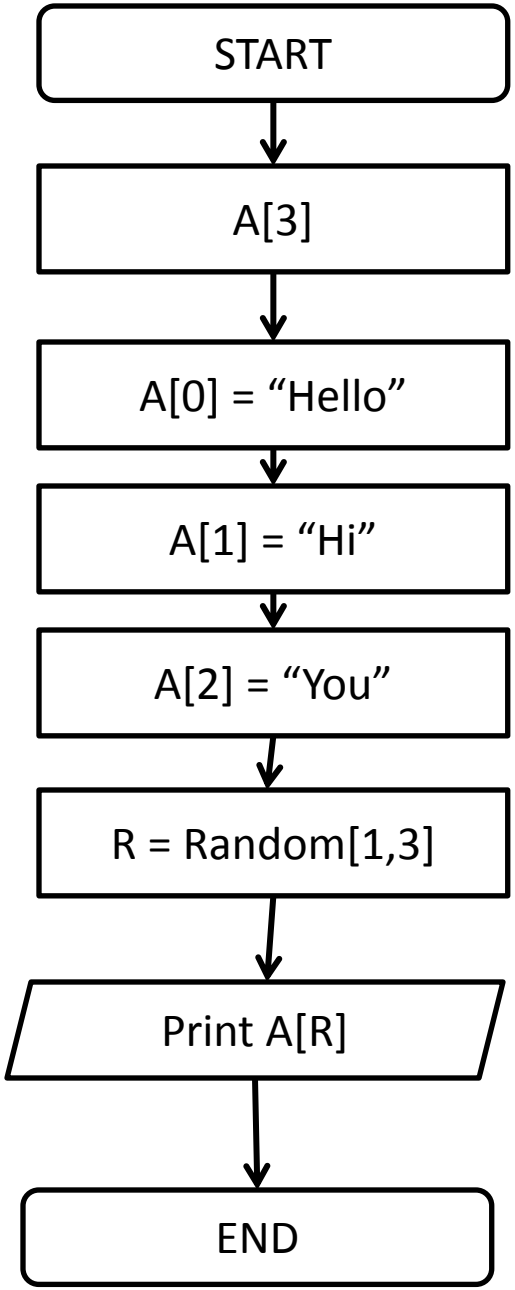


Create a variable, called A
A is an array.

The memory slots owned by the variable A can be referenced using an index number that starts as zero

R = 2

There is a problem here with the use of the variable R to access a position in an array



Create a variable, called A
A is an array.

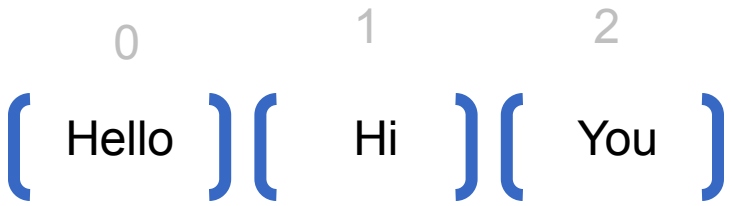
The memory slots owned by the variable A can be referenced using an index number that starts as zero

R = 2

What are R’s possible values?

0 1 2 **Problem?** **1 2 3**

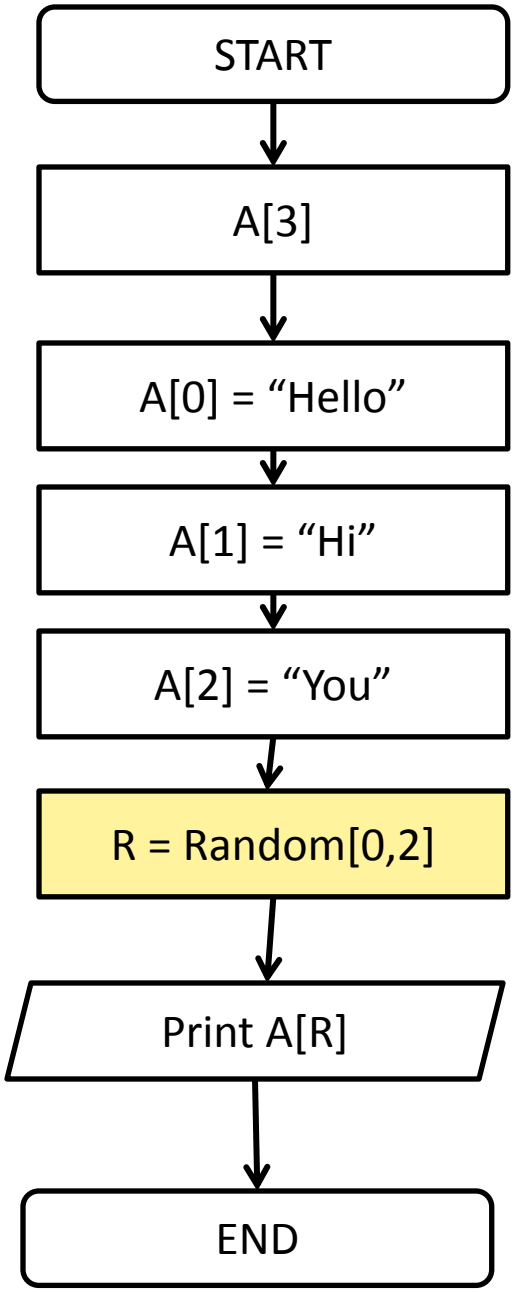
What are the index values on the array?



The 0 word will never be picked

If position 3 is used there will be an error as there is no position 3

R = Random[1,3]



OPTION 1

Create a variable, called A
A is an array.

0 1 2

( ) ( ) ( )

The memory slots owned by the variable A can be referenced using an index number that starts as zero

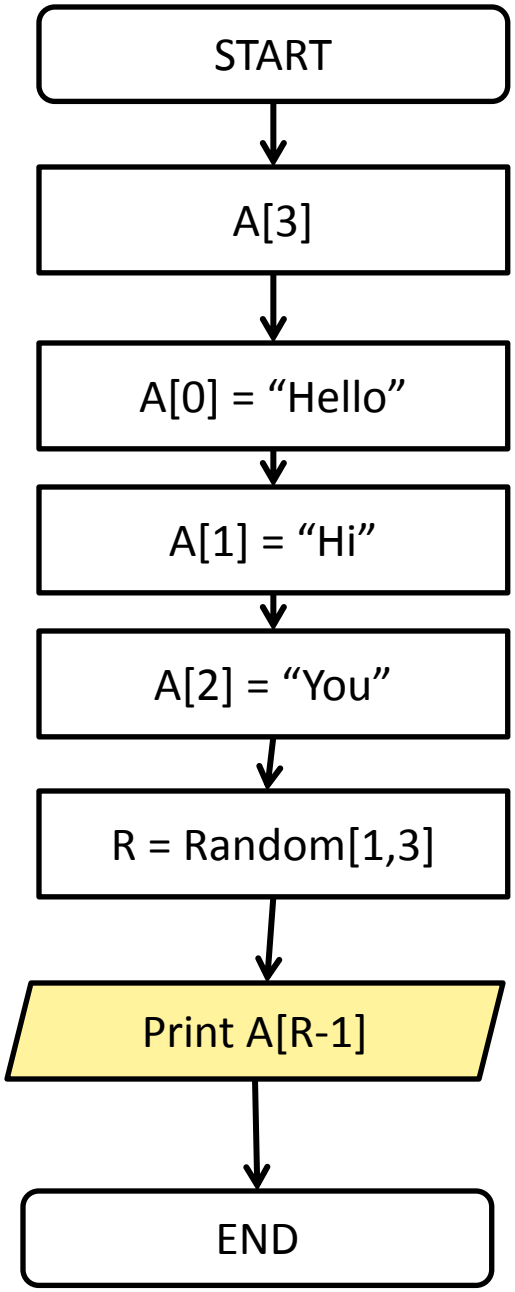
0 1 2

(Hello) (Hi) (You)

R = 2

You

Option 1:
Change the random numbers to be integers between 0 and 2



OPTION 2

Create a variable, called A
A is an array.

The memory slots owned by the variable A can be referenced using an index number that starts as zero

R = 2

Hi

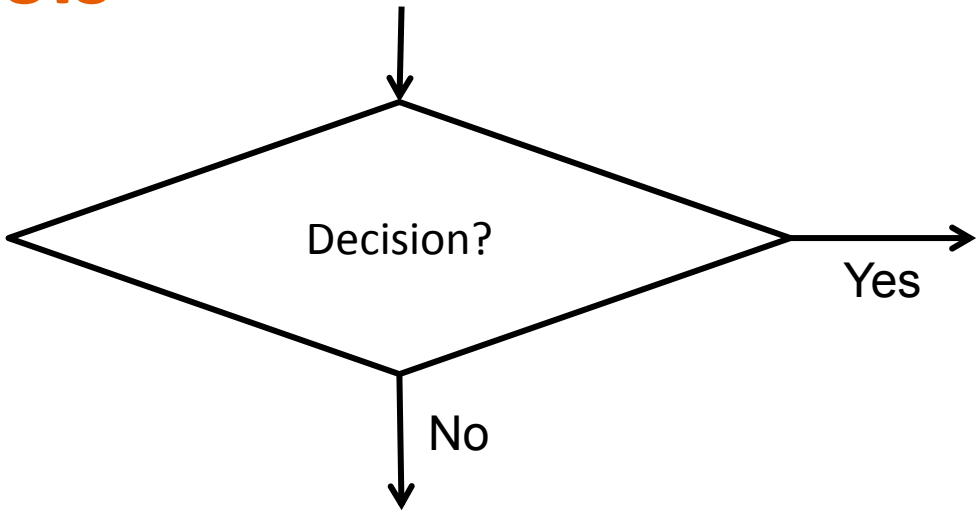
A [1]

Option 2:
R - 1 will ensure we start from 0 and never use 3

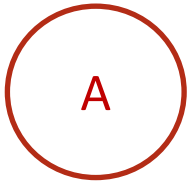
A summary on flowcharts

Flowcharts Symbols

START or END



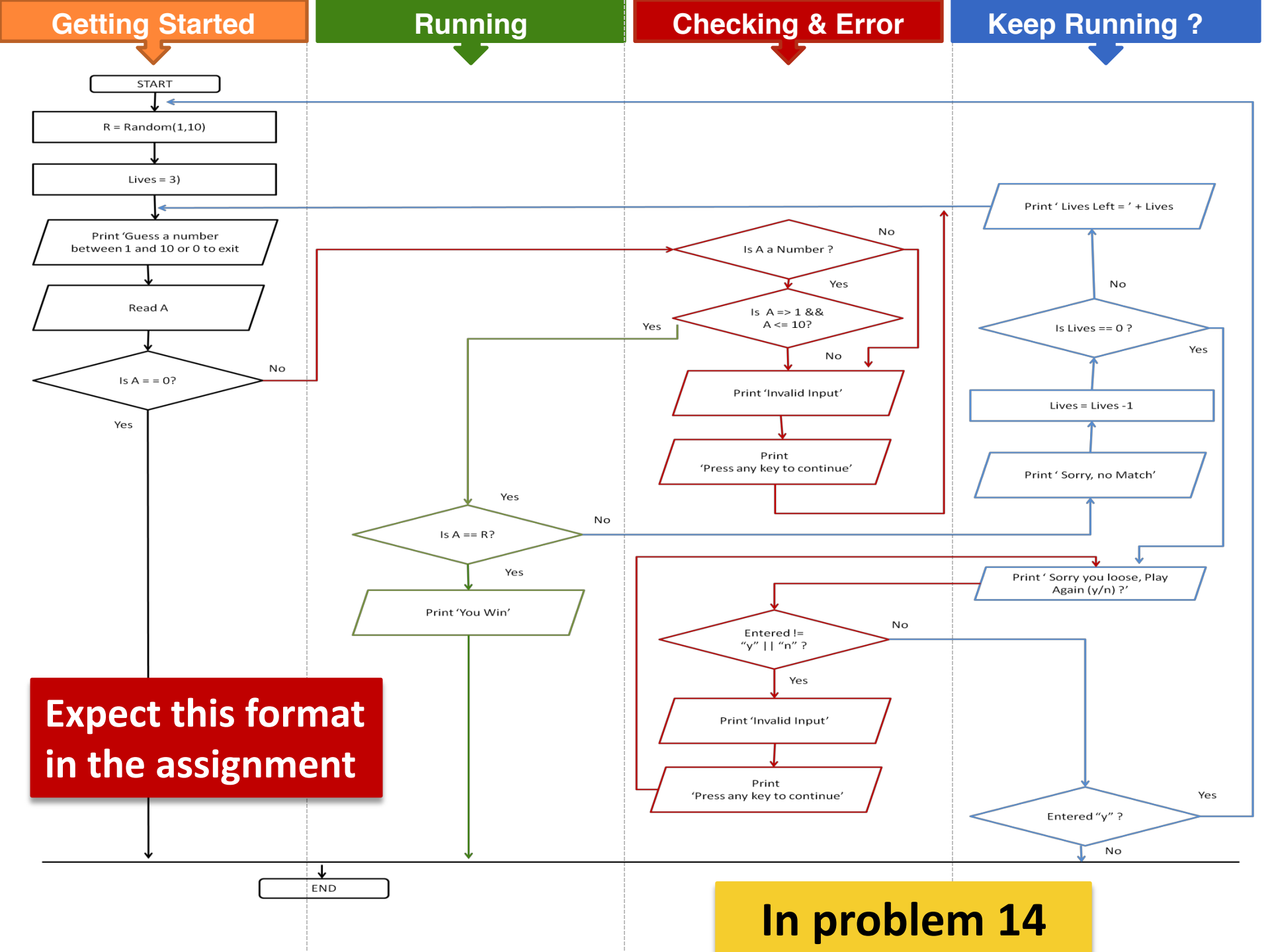
READ IN or PRINT OUT



PROCESS

Good practice in flowcharts design

- Every input has an error checking
- Use plenty user interactions
- Using swimming lanes
- Avoid crossing arrow flows


Getting Started
Running
Checking & Error
Keep Running ?
START
R = Random(1,10)
Lives = 3)
Print 'Guess a number between 1 and 10 or 0 to exit
Read A
Is A = = 0?
No
Yes
Is A a Number ?
No
Yes
Is A => 1 && A <= 10?
Yes
No
Print 'Invalid Input'
Print 'Press any key to continue'
Is A == R?
Yes
No
Print 'You Win'
Print ' Lives Left = ' + Lives
No
Is Lives == 0 ?
Yes
Lives = Lives -1
Print ' Sorry, no Match'
Print ' Sorry you loose, Play Again (y/n) ?'
Entered != "y" || "n" ?
No
Yes
Print 'Invalid Input'
Print 'Press any key to continue'
Entered "y" ?
Yes
No
END
Expect this format in the assignment
In problem 14