Trace tables

Trace tables are used to show how the values of variables change as a program runs

They are useful to work out if an algorithm does what it should do - as a planning tool but also in testing

Exam questions featuring trace tables will usually include loops - which is slightly complicated…

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]
6	-1	False	-	-

Start with the values assigned in the section before the loop first starts

i hasn’t been initialised yet, so it and word[i] are blank - they don’t exist

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]
6	-1	False	-	-

Then do the first pass through the loop…

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]
6	-1	False	-	-
6	-1	False	0	“b”

Then do the first pass through the loop…

b is not found on the first pass through, so i becomes 1 at the end of the loop

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]
6	-1	False	-	-
6	-1	False	0	“b”
			1	

Then do the first pass through the loop…

b is not found on the first pass through, so i becomes 1 at the end of the loop - knowing when to update variables like this is tricky

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]
6	-1	False	-	-
6	-1	False	0	“b”
6 ②	-1 ⑤	False ④	1 ①	“a” ③
			2	

Then do the the next pass through the loop…

Note - you **don’t** fill the row in from left to right

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]
6	-1	False	-	-
6	-1	False	0	“b”
6	-1	False	1	“a”
6			2	

And the third pass…

Note that the first column never changes it’s value

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]
6	-1	False	-	-
6	-1	False	0	“b”
6	-1	False	1	“a”
6			2	“n”

On the third pass, word[i] equals char - so we found the character.

Note: you don’t fill the row in from left to right…

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]
6	-1	False	-	-
6	-1	False	0	“b”
6	-1	False	1	“a”
6		True	2	“n”

This is the only time we get inside the if section - word[i] == char

So, foundIT becomes True…

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]
6	-1	False	-	-
6	-1	False	0	“b”
6	-1	False	1	“a”
6	3	True	2	“n”

And pos is set to i + 1 - as i is 2, pos becomes 3

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]
6	-1	False	-	-
6	-1	False	0	“b”
6	-1	False	1	“a”
6	3	True	2	“n”
			3	

At the end of the iteration through the loop i becomes i + 1

Trace table - while loop

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]
6	-1	False	-	-
6	-1	False	0	“b”
6	-1	False	1	“a”
6	3	True	2	“n”
			3	

The loop now stops: foundIt is True so part of the while line is not met so it stops. A for loop would continue iterating all the way through.

word = “banana”

char = “n”

len(word)	pos	foundIt	i	word[i]