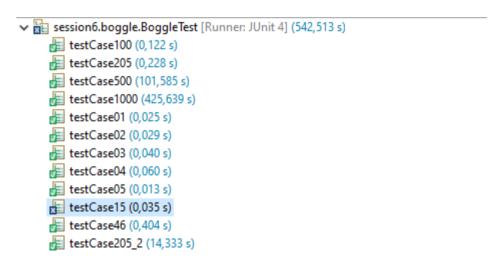
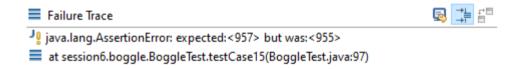
Algorithmics	Student information	Date	Number of session
	UO: UO269412		6
	Surname: Carrillo	Escuela de	
	Name: Javier		Ingeniería Informática



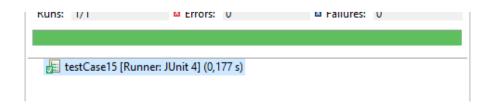
## **Activity 1. Test cases**





The test case 15 probably won't work due to the QS that exists in table, but I thought the implementation I did supported more than one letter in the board (subtracting the length of the word).

**UPDATE:** After changing the file of the table 15, the test now succeeds.



Algorithmics	Student information	Date	Number of session
	UO: UO269412		6
	Surname: Carrillo		
	Name: Javier		

## Activity 2. Times for different executions

1       14         21       38         31       177         41       324         51       419         61       807         71       1233         81       2079         91       2841         101       3552         111       5611         121       6485         131       7247         141       7166         151       7961         161       8905         171       10862         181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131         351       46380    <	n	Time (ms)
21       38         31       177         41       324         51       419         61       807         71       1233         81       2079         91       2841         101       3552         111       5611         121       6485         131       7247         141       7166         151       7961         161       8905         171       10862         181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	1	
31       177         41       324         51       419         61       807         71       1233         81       2079         91       2841         101       3552         111       5611         121       6485         131       7247         141       7166         151       7961         161       8905         171       10862         181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	11	14
41       324         51       419         61       807         71       1233         81       2079         91       2841         101       3552         111       5611         121       6485         131       7247         141       7166         151       7961         161       8905         171       10862         181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	21	38
51       419         61       807         71       1233         81       2079         91       2841         101       3552         111       5611         121       6485         131       7247         141       7166         151       7961         161       8905         171       10862         181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	31	177
61       807         71       1233         81       2079         91       2841         101       3552         111       5611         121       6485         131       7247         141       7166         151       7961         161       8905         171       10862         181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	41	324
71       1233         81       2079         91       2841         101       3552         111       5611         121       6485         131       7247         141       7166         151       7961         161       8905         171       10862         181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	51	419
81       2079         91       2841         101       3552         111       5611         121       6485         131       7247         141       7166         151       7961         161       8905         171       10862         181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	61	807
91       2841         101       3552         111       5611         121       6485         131       7247         141       7166         151       7961         161       8905         171       10862         181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	71	1233
101       3552         111       5611         121       6485         131       7247         141       7166         151       7961         161       8905         171       10862         181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	81	2079
111       5611         121       6485         131       7247         141       7166         151       7961         161       8905         171       10862         181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	91	2841
121     6485       131     7247       141     7166       151     7961       161     8905       171     10862       181     11931       191     12581       201     13974       211     14941       221     15760       231     18127       241     20203       251     21739       261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	101	3552
131     7247       141     7166       151     7961       161     8905       171     10862       181     11931       191     12581       201     13974       211     14941       221     15760       231     18127       241     20203       251     21739       261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	111	5611
141     7166       151     7961       161     8905       171     10862       181     11931       191     12581       201     13974       211     14941       221     15760       231     18127       241     20203       251     21739       261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	121	6485
151     7961       161     8905       171     10862       181     11931       191     12581       201     13974       211     14941       221     15760       231     18127       241     20203       251     21739       261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	131	7247
161     8905       171     10862       181     11931       191     12581       201     13974       211     14941       221     15760       231     18127       241     20203       251     21739       261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	141	7166
171     10862       181     11931       191     12581       201     13974       211     14941       221     15760       231     18127       241     20203       251     21739       261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	151	7961
181       11931         191       12581         201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	161	8905
191     12581       201     13974       211     14941       221     15760       231     18127       241     20203       251     21739       261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	171	10862
201       13974         211       14941         221       15760         231       18127         241       20203         251       21739         261       22934         271       26570         281       28403         291       31014         301       32708         311       36493         321       39354         331       39470         341       43131	181	11931
211     14941       221     15760       231     18127       241     20203       251     21739       261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	191	12581
221 15760 231 18127 241 20203 251 21739 261 22934 271 26570 281 28403 291 31014 301 32708 311 36493 321 39354 331 39470 341 43131	201	13974
231     18127       241     20203       251     21739       261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	211	14941
241     20203       251     21739       261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	221	15760
251     21739       261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	231	18127
261     22934       271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	241	20203
271     26570       281     28403       291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	251	21739
281 28403 291 31014 301 32708 311 36493 321 39354 331 39470 341 43131	261	22934
291     31014       301     32708       311     36493       321     39354       331     39470       341     43131	271	26570
301 32708 311 36493 321 39354 331 39470 341 43131	281	28403
311 36493 321 39354 331 39470 341 43131	291	31014
321 39354 331 39470 341 43131	301	32708
331 39470 341 43131	311	36493
341 43131	321	39354
	331	39470
351 46380		43131
	351	46380

Algorithmics	Student information	Date	Number of session
	UO: UO269412		6
	Surname: Carrillo		
	Name: Javier		

361	48507
371	52903
381	55728
391	59437
401	61236
411	64851
421	68463
431	76052
441	77368
451	82050
461	85080
471	87219
481	92181
491	95852
501	102314

The complexity of the problem follows a linear complexity, as can be seen taking some theorical values (theorical value of n = 401 -> 60957, close to the 61236 obtained. Theorical of n = 261 -> 22605, close to the 22934 obtained.)

## Activity 3. Code improvements

When first approaching the problem, I used an array list to avoid any kind of complications regarding the structure that stores the dictionary and focus on the backtracking implementation. After finally passing some tests, I realized that this structure was far from optimal so I exchanged it for an Hashtable of strings. Realizing it was still slow, I implemented an Hashtable of strings and booleans, the booleans indicating if that word in the dictionary was already in the solutions. Realizing it was still small, I thought about dividing the Hashtable into different hashtables that would store sections of the dictionary (one from a to m, other to m to r and so), thus converting the structure into a hashtable<hashtable<string,boolean>, string>. However, while looking for ways to implement a better dictionary, I found the prefix tree structure (which used a far more

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developed "sectioning" than the one that I planned to, so I implemented that structure in the end).