Constraint Satisfaction Problems

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# Problem 1: Backtracking

How many calls does your algorithm need (on average) for n=10? Is there a lot of variation in the amount of calls when you try this multiple times?

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Run** | **Calls** | **Run** | **Calls** | **Run** | **Calls** | **Run** | **Calls** | **Run** | **Calls** |
| **0** | 128 | **20** | 16 | **40** | 60 | **60** | 24 | **80** | 77 |
| **1** | 59 | **21** | 201 | **41** | 109 | **61** | 85 | **81** | 163 |
| **2** | 17 | **22** | 26 | **42** | 29 | **62** | 17 | **82** | 19 |
| **3** | 74 | **23** | 74 | **43** | 144 | **63** | 168 | **83** | 93 |
| **4** | 33 | **24** | 12 | **44** | 45 | **64** | 22 | **84** | 80 |
| **5** | 16 | **25** | 27 | **45** | 238 | **65** | 11 | **85** | 32 |
| **6** | 183 | **26** | 306 | **46** | 150 | **66** | 48 | **86** | 62 |
| **7** | 42 | **27** | 47 | **47** | 439 | **67** | 47 | **87** | 196 |
| **8** | 97 | **28** | 23 | **48** | 168 | **68** | 124 | **88** | 302 |
| **9** | 23 | **29** | 656 | **49** | 244 | **69** | 16 | **89** | 46 |
| **10** | 13 | **30** | 51 | **50** | 207 | **70** | 75 | **90** | 15 |
| **11** | 11 | **31** | 298 | **51** | 231 | **71** | 97 | **91** | 11 |
| **12** | 135 | **32** | 117 | **52** | 11 | **72** | 31 | **92** | 34 |
| **13** | 22 | **33** | 49 | **53** | 664 | **73** | 12 | **93** | 20 |
| **14** | 37 | **34** | 137 | **54** | 228 | **74** | 18 | **94** | 267 |
| **15** | 52 | **35** | 45 | **55** | 39 | **75** | 62 | **95** | 296 |
| **16** | 213 | **36** | 32 | **56** | 11 | **76** | 41 | **96** | 218 |
| **17** | 40 | **37** | 22 | **57** | 57 | **77** | 151 | **97** | 301 |
| **18** | 104 | **38** | 69 | **58** | 23 | **78** | 124 | **98** | 29 |
| **19** | 35 | **39** | 348 | **59** | 29 | **79** | 15 | **99** | 15 |

This is a report of 100 runs of the backtracking algorithm.

The mean is 104.8

The standard deviation is 121.7

For further insight, the minimum and maximum of the calls number are 11 and 664.

So, on average the algorithm needs 104.8 calls for n = 10, and there is a lot of variation in the amount of calls, seeing as the standard deviation is 121.7, but also encouraged by the staggering difference between the minimum amount of calls (11) and the maximum (664).

# Problem 2: Forward Checking

# Problem 3: AC3

# Problem 4: Sudoku