

Group Details

Names: Leo Oliver, Shashank Mylarapu

ID's: 1319967, 1502775

Fours Program (Breadth First Search)

1) Results for numbers 1-100

1 = 4/4	22 = 4.4+4.4*4	43 = 44-4/4	64 = 4*4*4
2 = (4+4)/4	23 = 44/4+4+4+4	44 = 44	65 = 4*4*4+4/4
3 = 4-4/4	24 = 4+4+4*4	45 = 44+4/4	66 = 4.4*4*4-4.4
4 = 4	25 = 4+4+4*4+4/4	46 = 44+4/4+4/4	67 = 444/4-44
5 = 4+4/4	26 = 44/4.4+4*4	47 = 44+4-4/4	68 = 4+4*4*4
6 = 44/4.4-4	27 = 44/4+4*4	48 = 44+4	69 = 4+4*4*4+4/4
7 = 44/4-4	28 = 44-4*4	49 = 44+4+4/4	70 = 4.4*4*4+4-4.4
8 = 4+4	29 = 44+4/4-4*4	50 = 44+44/4.4-4	71 = 444/4+4-44
9 = 4+4+4/4	30 = 44-44/4.4-4	51 = 44+44/4-4	72 = 4+4+4*4*4
10 = 44/4.4	31 = 44/4+4+4*4	52 = 44+4+4	73 = 4+4+4*4*4+4/4
11 = 44/4	32 = (4+4)*4	53 = 44+4+4+4/4	74 = 44/4.4+4*4*4
12 = 4+4+4	33 = 44-44/4	54 = 44+44/4.4	75 = 44/4+4*4*4
13 = 4+4+4+4/4	34 = 44-44/4.4	55 = 44+44/4	76 = 44+4*4+4*4
14 = 44/4.4+4	35 = 44-4-4-4/4	56 = 44+4+4+4	77 = 44+44-44/4
15 = 44/4+4	36 = 44-4-4	57 = 44+4+4+4+4/4	78 = 44.4+4.4*4+4*4
16 = 4*4	37 = 44+4-44/4	58 = 44.4+4.4*4-4	79 = 44/4+4+4*4*4
17 = 4*4+4/4	38 = 44+4-44/4.4	59 = 44+44/4+4	80 = (4+4*4)*4
18 = 44/4.4+4+4	39 = 44-4-4/4	60 = 44+4*4	81 = (4+4*4)*4+4/4
19 = 44/4+4+4	40 = 44-4	61 = 44+4*4+4/4	82 = (4.4*4+4)*4-4.4

$20 = 4+4*4$	$41 = 44+4/4-4$	$62 = 44.4+4.4*4$	$83 = 44+44-4-4/4$
$21 = 4+4*4+4/4$	$42 = 44-4/4-4/4$	$63 = 4*4*4-4/4$	$84 = 44+44-4$

$85 = 44+44+4/4-4$	$89 = 44+44+4/4$	$93 = 44+44+4+4/4$	$97 = 4444/44-4$
$86 = 44+44-4/4-4/4$	$90 = 44+44+4/4+4/4$	$94 = (444-4)/4-4*4$	$98 = 44+44+44/4.4$
$87 = 44+44-4/4$	$91 = 444/4-4-4*4$	$95 = 444/4-4*4$	$99 = 444/4+4-4*4$
$88 = 44+44$	$92 = 44+44+4$	$96 = 44+44+4+4$	$100 = (444-44)/4$

2). I tested all integer values of n between 1-1000 and all gave a solution. Theoretically there should be no integer value of n which doesn't give a solution as in the worst case 4/4 can be summed n times.

The program does not provide a solution for irrational numbers like sqrt(2) and pi, as they have infinitely recurring numbers.

A* Search Algorithm

1) MAP1.TXT :

Output:

S is at Point2D [x = 7.0, y = 8.0]

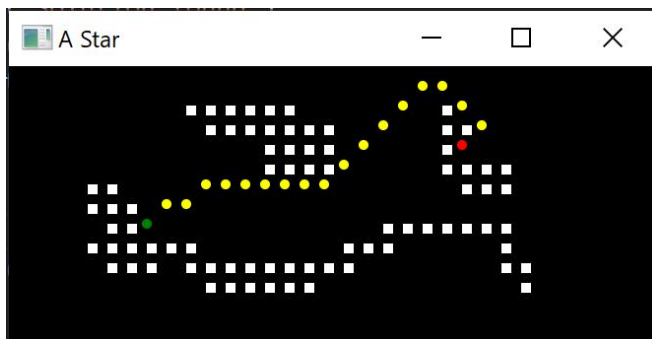
G is at Point2D [x = 23.0, y = 4.0]

Solution found

Time taken to find a solution = 72.1789ms

moves = 22.142135623730955

Frontier Maxed at 92 stages



2) MAP2.TXT

Output:

S is at Point2D [x = 11.0, y = 26.0]

G is at Point2D [x = 27.0, y = 5.0]

Solution found

Time taken to find a solution = 102.2296ms

moves = 33.28427124746191

Frontier Maxed at 286 stages



3) MAP3.TXT

Output:

S is at Point2D [x = 12.0, y = 11.0]

G is at Point2D [x = 35.0, y = 10.0]

Solution found

Time taken to find a solution = 286.6681ms

moves = 42.97056274847713

Frontier Maxed at 238 stages



4) MAP4.TXT

Output:

S is at Point2D [x = 12.0, y = 11.0]

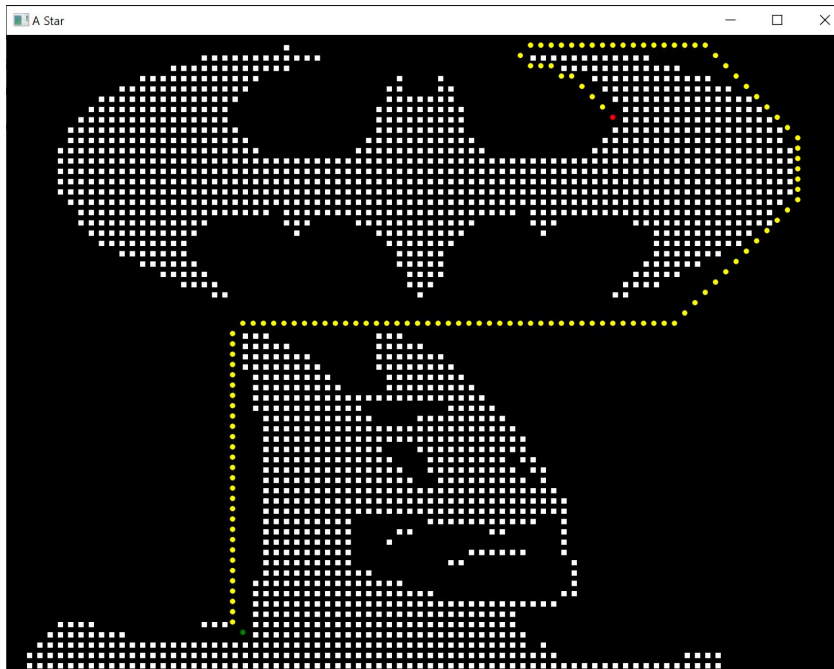
G is at Point2D [x = 35.0, y = 10.0]

Solution found

Time taken to find a solution = 286.6681ms

moves = 42.97056274847713

Frontier Maxed at 2074 stages



5) MAP5.TXT

Output:

S is at Point2D [x = 1.0, y = 2.0]

G is at Point2D [x = 51.0, y = 50.0]

Solution found

Time taken to find a solution = 232.1487ms

moves = 314.04877323527967

Frontier Maxed at 147 stages

