Task 1 – Defining Heuristics

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Heuristic 1

1. Number/Name – H1/Zeroes
2. English – If the goal is zero and zero is among the numbers, then multiply all of the numbers together.
3. Pseudocode – if (the goal is zero) and (goal is among the numbers) then [multiply the numbers togethers together].
4. Examples
    a. numbers = {5,4,0,8,9} goal = 0 solution = (5*(4*(0*(8*9))))
    b. numbers = {0,5,3,5,8} goal = 0 solution = (0*(5*(3*(5*8))))
    c. numbers = {7,6,7,1,0} goal = 0 solution = (7*(6*(7*(1*0))))

Heuristic 2

1. Number/Name – Zero and Goal
2. English – If the goal is nonzero and zero and the goal are among the numbers, then add the goal to the result of multiplying all of the remaining numbers together.
3. Pseudocode – if (the goal is not zero) and (zero is among the numbers) and (goal is among the numbers) then [add the goal to the product of the remaining numbers together].
4. Examples
    a. numbers = {7,0,9,2,6} goal = 9 solution = (9+(7*(0*(2*6))))
    b. numbers = {5,4,3,1,0} goal = 4 solution = (4+(5*(2*(1*0))))
    c. numbers = {0,2,3,5,3} goal = 3 solution = (3+(0*(2*(3*5))))

Heuristic 3

1. Number/Name – Zero Goal and Pair
2. English – If the goal is zero and a pair exists among the numbers, then multiply the difference between the pair of numbers by all remaining numbers.
3. Pseudocode – if (the goal is zero) and (a pair exists among the numbers) then [multiply the difference between the pair of numbers by all of the remaining numbers].
4. Examples
    a. numbers = {4,5,6,4,9} goal = 0 solution = ((4-4)*(5*(6*9)))
    b. numbers = {5,0,6,0,7} goal = 0 solution = ((0-0)*(5*(6*7)))
    c. numbers = {1,0,1,2,3} goal = 0 solution = ((1-1)*(1*(2*3)))

Heuristic 4

1. Number/Name – Pair and Goal
2. English – If the goal is nonzero and a pair and the goal are among the numbers, then add the goal to the result of multiplying all the remaining numbers by the difference of the pair.

3. Pseudocode – if (the goal is not zero) and (a pair is among the numbers) and (goal is among the numbers) then [add the goal to the product of the remaining numbers and the difference of the pair].
4. Examples
    a. numbers = {7,9,9,2,6} goal = 2 solution = ((2 + ((9-9) *(7*6))
    b. numbers = {5,4,3,1,1} goal = 4 solution = ((4 + ((1-1) *(5*3))
    c. numbers = {2,2,3,5,3} goal = 5 solution = ((5 + ((2-2) *(3*3))

Heuristic 5

1. Number/Name – Pair and Make Goal
2. English – If the goal is nonzero and a pair exists and the goal can be made from the remaining numbers, then divide the first pair number by the second and multiply the result by the goal made from the remaining numbers.
3. Pseudocode – if (the goal is not zero) and (a pair is among the numbers) and (goal can be made from the remaining numbers) then [divide the two numbers in the pair and multiple the quotient by the goal made by the remaining numbers].
4. Examples
    a. numbers = {7,9,9,2,6} goal = 2 solution = ((9/9) * ((7-6) *2))
    b. numbers = {5,4,3,1,1} goal = 4 solution = ((1/1) * ((5-4) +1))
    c. numbers = {2,2,3,5,3} goal = 5 solution = ((3/3) * ((2/2) *5))

Heuristic 6

1. Number/Name – Half and Two
2. English – If a number is half the goal and two can be made from the remaining numbers and the goal is greater than one, then multiply the half number by the expression used to make two.
3. Pseudocode – if (the goal is greater than one) and (one number is half the goal) and (two can be made from the remaining numbers) then [then multiply the half number by the expression used to make two].
4. Examples
    a. numbers = {7,9,1,2,6} goal = 2 solution = (1 * ((7-(9-6))/2))
    b. numbers = {5,4,3,1,2} goal = 4 solution = (2 * ((3-1)*(5-4)))
    c. numbers = {2,2,3,5,3} goal = 6 solution = (3 * (((5-2)/3)*2))

Heuristic 7

1. Number/Name – Double and Two
2. English – If a number is double the goal and two can be made from the remaining numbers and the goal is a nonzero, then divide the double number by the expression used to make two.
3. Pseudocode – if (the goal is not zero) and (one number is half the goal) and (two can be made from the remaining numbers) then [then divide the double number by the expression used to make two].

4. Examples
    a. numbers = {7,9,2,2,6} goal = 1 solution = (2 / ((7-(9-6))/2))
    b. numbers = {5,4,3,1,4} goal = 2 solution = (4 / ((3-1)*(5-4)))
    c. numbers = {2,2,3,5,6} goal = 3 solution = (6 / (((5-2)/3)*2))

Heuristic 8

1. Number/Name – One More and One
2. English – If a number is one more than the goal and one can be made from the remaining numbers and the goal is a nonzero, then subtract the number that's one more than the goal by the expression used to make one.
3. Pseudocode – if (one number is one more than the goal) and (one can be made from the remaining numbers) then [subtract the number that's one more than the goal by the expression used to make one].
4. Examples
    a. numbers = {7,9,2,2,6} goal = 5 solution = (6 - ((2 -((9-7)/2)))
    b. numbers = {5,4,3,1,4} goal = 2 solution = (3 – (((5+4)/4)*1))
    c. numbers = {4,2,3,5,6} goal = 3 solution = (4 - (((6-5)*(3-2))