Heuristic Definitions:

Heuristic 1:

1. Number/Name – H1/Zeros

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 (zero is among the numbers) then [multiply the numbers together]

4. Examples:
    1. numbers = {5,4,0,8,9} goal = 0 solution = (5*(4*(0*(8*9))))
    2. numbers = {0,5,3,5,8} goal = 0 solution = (0*(5*(3*(5*8))))
    3. 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 multiply all of the remaining numbers together.
3. Pseudocode – if(the goal is not zero) and (zero is among the numbers) and (the goal is among the numbers) then [add the goal to the product of the remaining numbers together]

4. Examples:
    1. numbers = {7,0,9,2,6} goal = 9 solution = (9+(7*(0*(2*6))))
    2. numbers = {5,4,3,1,0} goal = 4 solution = (4+(5*(3*(1*0))))
    3. 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 the numbers by all of the 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:
    1. numbers = {4,5,6,4,9} goal = 0 solution = ((44)*(5*(6*9)))
    2. numbers = {5,0,6,0,7} goal = 0 solution = ((0-0)*(5*(6*7)))
    3. numbers = {1,0,1,2,3} goal = 0 solution = ((1-1)*(0*(2*3)))

Heuristic 4:

1. Number/Name – Same and Goal Same
2. English – if all the numbers are the same and the goal is the same then add one of the numbers to the addition of the difference of the rest.

3. Pseudocode – if (all the numbers are the same) and (the goal is the same) then [add one of the numbers to the addition of the difference of the rest].

4. Examples:
    1. numbers = {4,4,4,4,4} goal = 4 solution = (4 + ((4-4) + (4-4)))
    2. numbers = {3,3,3,3,3} goal = 3 solution = (3 +((3-3) + (3-3)))
    3. numbers = {7,7,7,7,7} goal = 7 solution = (7 + ((7-7) + (7-7)))

Heuristic 5:

1. Number/Name – Same and Goal One
2. English – if all the numbers are the same and the goal is one then divide two of the numbers and add it to the difference and multiplication of the rest of the numbers

3. Pseudocode – if (all the numbers are the same) and (the goal is one) then [divide two of the numbers and add it to the difference and multiplication of the rest of the numbers].

4. Examples:
    1. numbers = {2,2,2,2,2} goal = 1 solution = ((2/2) +(((2-2) * 2)))
    2. numbers = {3,3,3,3,3} goal = 1 solution = ((3/3)+ (((3-3) * 3)))
    3. numbers = {5,5,5,5,5} goal = 1 solution = ((5/5)+ (((5-5) * 5)))

Heuristic 6:

1. Number/Name – Pair, Three make zero and Goal One
2. English – If the goal is one and three of the numbers make zero and there exists a pair then divide the pair and add the result of the rest of the numbers.

3. Pseudocode – If (the goal is one) and (three of the numbers make zero) and (there exists a pair) then [divide the pair and add the result of the rest of the numbers].

4. Examples:
    1. numbers = {4,4,5,3,2} goal = 1 solution = ((4/4)+(((3+2) - 2)))
    2. numbers = {6,4,2,7,7} goal = 1 solution = ((7/7)+(((4+2) - 6)))
    3. numbers = {2,5,7,8,8} goal = 1 solution = ((8/8)+(((2+5) - 7)))

Heuristic 7:

1. Number/Name – Pair and Rest Goal
2. English – If two of the numbers form a pair and the rest of the numbers make the goal then divide the pair and multiply it by the result of the other three numbers

3. Pseudocode – If (two of the numbers form a pair) and (the rest of the numbers make the goal) then [divide the pair and multiply it by the result of the other three numbers].

4. Examples:
    1. numbers = {2,5,3,4,4} goal = 6 solution = ((4 /4) * ((2-3) +5))
    2. numbers = {1,1,7,2,2} goal = 7 solution = (1 /1) * ((7-2) +2))
    3. numbers = {3,4,2,2,6} goal = 5 solution = ((2/2) * ((6-4)+3))

Heuristic 8:

1. Number/Name – Pair and Goal
2. English – If there exists a pair within the numbers and the goal then add the goal to the product of the difference of the pair and the addition of the rest

3. Pseudocode – If (there exists a pair within the numbers and the goal) then [add the goal to the product of the difference of the pair and the addition of the rest].

4. Examples:
    1. numbers = {3,3,5,4,7} goal = 5 solution = (5 + ((3-3) * (4+7)))
    2. numbers = {6,6,2,1,3} goal = 3 solution = (3 + ((6-6) * (2+1)))
    3. numbers = {7,5,5,1,3} goal = 7 solution = (7 + ((5-5) * (3+1)))