*Question:* Solving The problem SEND + MORE= MONEY

*Answer:*

Input

Given variables or objects ={S,E,N,D,M,O,R,Y}

Values={{0,1,2,3,4,5,6,7,8,9}

And

Carries={C1,C2,C3,C4}

Values={0,1}

Constraint:

All variables must have unique value

No two variables can be same

They must follow the given addition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| C1 | C2 | C3 | C4 |  |
|  | S | E | N | D |
| + | M | O | R | E |
| M | O | N | E | Y |

* C1=1 then C2+S+M=10+O
* C2+S+1=10+O as M=1
* C2+S+1 cannot be 11 as 1 is already assigned to M it cannot be assigned to O *Strengthening*

*Constraint*

* Hence C2+S+1=10 and O=0
* For C2+S+1=10 C2 can be 0 or 1 and S2 = 9 or 8
* If C2= 1 addition C3+E+O=10 + N (must be greater than 10 to generate carry C2 as 1)
  + As O=0 this addition can generate a maximum sum of 10 ( E=9 and C3=1)
  + Then N=0 ….***a contradiction as O=0***
* Hence C2=0 then S=9 and C2+S+M=10 (C2=0,S=9,M=1)
* As O=0 and C3+E+O=N if C3=0 then E=N … ***a contradiction***
* Hence C3=1 and E+1=N
* Till Now M=1; O=0; S=9; C1=0; C2=0; C3=1
* Remaining values={2,3,4,5,6,7,8}

***Guess***

E=2 E=5

Let E=5 then N=6

* C4+N+R=10+E
* C4+E+1+R=10+E
* C4+R=9
* C4=0 R=9 (contradiction as S=9)
  + hence C4=1 R=8
* As C4=1 D+E>10 D+E=10+Y
* E=5 if D>6 let D=7 the D+E=7+5=12(10+2) hence Y=2
* ***A solution***
* Let E=2 Then N=3
* C4+N+R=10+E
* C4+E+1+R=10+E
* C4+R=9
* C4=0 R=9 (contradiction as S=9)
  + hence C4=1 R=8
* As C4=1 D+E>10
* E=2 D can be 8 or 9
  + ***Contradiction***

Final Output

Variables

S=9;M=1;O=0;E=5;O=0;N=6;R=8;D=7;Y=2

C1=1;C2=0;C3=1;C4=1

All constraint satisfied as

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C1 | 1 | C2 | 0 | C3 | 1 | C4 | 1 |  |  |
|  |  | S | 9 | E | 5 | N | 6 | D | 7 |
|  | + | M | 1 | O | 0 | R | 8 | E | 5 |
| M | 1 | O | 0 | N | 6 | E | 5 | Y | 2 |

Or Solution can be represented as given below: