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P.D.:7

The Haybaler Problem

POW # 8

1. *Problem Statement:* Not necessary to do.

2. *Process:* I started this POW with a lot of work which I didn't need to do. I wrote down all the combos in the form of $1+2$, $2+3$, etc. I then guess some numbers to fill in. I tried lost of combos, only switching 4 and 5. I couldn't get anything to work. I then started over with changing numbers. When ever I would change a number, lots of combos would change, and I was not having fun. Looking back, I was getting close at the end, but I didn't know that. I spent an hour with this strategy. I put the problem aside for a few days.

I then received the hint sheet on Friday. After getting the sheet, I solved the basic solution to the POW in 20 minutes. I used the hints page that you passed out to us. The first 2 hints were my best friends. I first found what the heaviest and lightest bails weighed. Well actually I did that the other way around.☺ I found that the lightest must be 1 and 2. (Note: 1 is always the lightest and 5 is always the heaviest, and the other numbers are in order) This is because when you combine the 2 lightest, they add up to be the lightest. Likewise the heaviest, must be bails 4 and 5. I then made this chart: I also made a chart of what I thought each bail weighed:

80	1+2
82	
83	
84	
85	
86	
87	
88	
90	
91	4+5

1	?
2	?
3	?
4	?
5	?

Throughout the problem, I updated this chart when I found more info.

Now I wanted to find 1 and 2. I know that they add up to 80. I also know that they both can't be 40 because you told us, and when I add $1+3$ and $2+3$, they would but equal the same thing. I decided to make 1 equal 39, and $2=41$. It could not be the other way around ($1=41$, $2=39$) because then Bale 1 would not be lighter. However, it really makes no difference, but they are easier in order.

I then made these charts of possible combos (without repeating): I also “added” the possible solutions to see how “big” they would be. (ex. 1+2=3) Numbers which are big, in this simple form, would be big when I added the hay bails. I guess this would kind of be like variables. This is what I call a “weight.”

1+2	2+3	3+4	4+5
1+3	2+4	3+5	
1+4	2+5		
1+5			

3	5	7	9
4	6	8	
5	7		
6			

To find these “weights,” I played around. These weights also go onto the combos chart like this: They must go in order. Here is also an updated answer chart:

80	1+2(3)
82	4
83	5
84	5
85	6
86	6
87	7
88	7
90	8
91	4+5(9)

1	39
2	41
3	?
4	?
5	?

Because 90 is the only combo with a “weigh” of 8, 3+5 must be that combination, because it also is the only pair with a “weight” of 8. This can also be done in reverse with 84, which has the exclusive “weight” of 4, so it must be 1+3. I can now find bale 3. It must be 82-39 (Which is Bale 1) =43. Bale 3 weighs 43 kg. Here is a recap so far:

80	1+2(3)
82	1+3(4)
83	5
84	5
85	6
86	6
87	7
88	7
90	3+5(8)
91	4+5(9)

1	39
2	41
3	43
4	?
5	?

I can now find 5. It must be 90(3+5)-43(#3)=47. So, we now have 5. We can also get combinations now. 83, with a “weight” of 5, must be 1+4 or 2+3. I will try 2+3 first. 41+43=88, which is not 83. This means that 83 must be 1+4. However we don’t know bale 4, but we do know that it is 83-39(combined #-1 bale known), which equals 44. Ta-da. Bale 4=44.

80	1+2(3)
82	1+3(4)

83	1+4(5)
84	5
85	6
86	6
87	7
88	7
90	3+5(8)
91	4+5(9)

1	39
2	41
3	43
4	44
5	?

Next up is 84. This must be $2+3$, because our other 5 “weight” is already solved at 83. It works when I check it. $41+43=84$.

Next up, we do the same finding our 6 and 7 “weights.” 85 can be $1+5$ or $2+4$. Lets check, $2+4$, $41+44=85$ Check. Next up is 86, which must be $1+5$. Wait we don’t know 5, but we know that it is $86-39+47$. Bada-Bing Bale $5=47$. We now know all the bails. Lets just finish up, by doing 87 and 88. They are either $2+5$ or $3+4$. $41+47=88$, so 88 is $2+4$. This leaves 87 to be $3+4$ or $43+44=87$. There we go, POW solved.

3. Solution:

80	1+2(3)
82	1+3(4)
83	1+4(5)
84	2+3(5)
85	2+4(6)
86	3+4(6)
87	2+5(7)
88	2+5(7)
90	3+5(8)
91	4+5(9)

1	39
2	41
3	43
4	44
5	47

I then checked all of the weights to make sure they can work. (ex. $1+2$ is $39+41+80$ Check) I know none can repeat because all of the combs are listed here, and all work with none left over.

4. Extension: 1. Are there more weights? 2. Can it be done faster?

Let’s start with 2. I think my way is fast to find answers. It just takes a lot of writing. Someone told me that you can do it with averages of all the numbers, but I know no details. It might not be faster.

1. I don’t think I can find more answers. This all works with a delicate balance of numbers, where if you change one, you change 5 of them. There also is an acceptable range where nothing else would fit. I don’t think there are any more whol numbers that could fit. I also did lots of combos by guess and check where I couldn’t find an answer.

5. Evaluation: Not necessary to do.

Possible Combas

POW X

check is

12	23	34	45
13	24	35	
14	25		
15			

Find a high and low combination (1 vs)
 Guess and check first

Not 89 or 81

- 80
 - 82
 - 83
 - 84
 - 85
 - 86
 - 87
 - 88
 - 89
 - 90
 - 91
- Average 86.6
 total 866

$$\frac{80}{1} = 80$$

$$\frac{91}{5} = 18.2$$

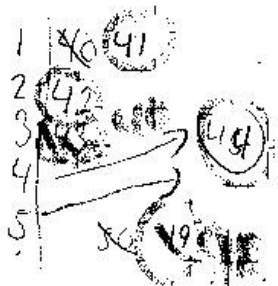
$$\frac{11}{5} = 2.2$$

$$\frac{14}{5} = 2.75$$

11	40 + 48 = 88	23	47 + 43 = 90	34	43 + 49 = 92
13	40 + 43 = 83	24	42 + 49 = 91	35	43 + 50 = 93
12	40 + 42 = 82	25	42 + 50 = 92	45	44 + 50 = 94
15	40 + 51 = 91				

$$\frac{4-5}{44-51} = -0.12$$

$$\frac{46-49}{7} = -0.43$$



15	41 + 42 = 83	25	42 + 49 = 91	35	43 + 49 = 92
14	41 + 44 = 85	24	42 + 44 = 86	34	43 + 44 = 87
13	41 + 43 = 84	23	42 + 43 = 85	45	44 + 49 = 93
12	41 + 42 = 83	22	42		
11	41 + 41 = 82				

N	2x85	92	14+92	85	80
N	80	93	35	92	82
N	82		45	93	88
N	88				

change 3-5
 40 88 82 82 98

POW 8 p2

inf. cm

- ✓ ✓ 80 - most be 1+2
- ✓ 87 - 1+3
- ✓ 88 1+4
- ✓ 89 2+3
- ✓ 89 2+4
- ✓ 86 1+5
- ✓ 87 3+4
- ✓ 88 2+5
- ✓ 90 - 3+5
- ✓ 91 - must be 4+5

1+3
1+4
2+3

- 1-39
- 2-41
- 3-43
- 4-454
- 5-487