

Grade 3 – Algebraic Relationships

3-digit Numbers

How many 3-digit numbers can you find using only the digits 1, 3, 5, and 7 once in each answer?

I think that an easy, thorough way to get all of the 3-digit numbers is to start with 100, then do 135 'cause that is the smallest number and so on:

135 - 137 - 153 - 157 - 173 - 175

315 - 317 - 351 - 357 - 373 - 375

513 - 517 - ~~523~~ ~~527~~ 531 - 537 - 571 - 573 - ~~577~~

713 - 715 - 731 - 735 - 751 - 753

4 hundreds with 6 numbers is (24)

Proof

1 $\begin{matrix} \nearrow 3 \\ \searrow 5 \\ \quad 7 \end{matrix}$

135, 137, 153, 157, 173, 175

3 $\begin{matrix} \nearrow 1 \\ \searrow 5 \\ \quad 7 \end{matrix}$

315, 317, 351, 357, 371, 375

5 $\begin{matrix} \nearrow 1 \\ \searrow 3 \\ \quad 7 \end{matrix}$

513, 517, 531, 537, 571, 573

7 $\begin{matrix} \nearrow 1 \\ \searrow 3 \\ \quad 5 \end{matrix}$

713, 715, 731, 735, 751, 753

4 sets of 6 numbers is (24)
it checks

2 – Algebraic Relationships

3-digit numbers

How many 3-digit numbers can you find using only the digits 1, 3, 5, and 7 once in each answer?

3 – 2 – 1

- | | | |
|------|---|---|
| CU | 5 | The translation of the key concepts (4-digits made into 3-digit numbers, no repeating digits in a number, finding the combinations) is thoroughly developed by the values of the numbers being used as an organizer (then do 135 'cause that is the smallest number and so on). |
| PS | 5 | Creating an organized list by the values of the numbers, each row with a different hundreds value, and realizing there would be 6 numbers in each of the 4 rows makes the strategy complete. Recording the process in a different way in the verification moves the process up to being thoroughly developed. |
| V | 5 | The review includes translating the 4-digits into 3-digit numbers, with no repeating digits (the key concepts), an organized approach to listing all combinations (strategy), and finding 4 sets of 6 numbers for a total of 24 answers. This review is thoroughly recorded using a different perspective. |
| C | 4 | The connecting path between the explanation during the translation, the organization of the list in the original approach, the different organization in the proof and the summary is complete. The path might have been stronger if s/he had shown how the trees helped create the lists. |
| Acc. | 5 | 24 numbers is a mathematically justifiable solution to the task. |

1 3 5 7
1 3 5

1 3 5 7
1 5 7

1 3 5 7
1 5 3

1 3 5 7
1 7 5

1 3 5 7
1 3 7

1 3 5 7
1 7 3

ANSWER CHART

- ① 1 3 5
- ② 1 5 7
- ③ 1 5 3
- ④ 1 7 5
- ⑤ 1 3 7
- ⑥ 1 7 3

STEP 7 TAKE THE NEXT NUMBER AND DO THE SAME

1 3 5 7
3 5 7

1 3 5 7
3 7 5

1 3 5 7
3 1 5

1 3 5 7
3 1 7

- ⑦ 3 5 7
- ⑧ 3 7 5
- ⑨ 3 1 5
- ⑩ 3 1 7

CHECK I KNOW THERE ARE 6 THAT START WITH 1, AND
~~8~~ THAT START WITH 3, SO THERE MUST BE 2 MORE
 4

$$6 - 4 = 2$$

$$6 + 4 + 2 = 12$$

$$6 + 4 + 2 = 12 \text{ ANSWERS}$$

2 – Algebraic Relationships

3-digit numbers

How many 3-digit numbers can you find using only the digits 1, 3, 5, and 7 once in each answer?

$$\frac{3-2-2}{\text{CU}}$$

4

The translation of the key concepts (4-digits made into 3-digit numbers, no repeating digits in a number, finding the combinations) is complete.

PS 3

The strategy creating an organized list focusing on one value for the hundreds place at a time was only partially useful for this student as s/he didn't carry it all the way out.

V 1

Showing the pattern of 6 to 4 to 2 and then recalculating the sum of 6, 4, and 2 is a minimal review of the original solution.

C 3

The path connecting the pieces of the start to the solution (finding all 6 numbers with a 1 in the hundreds place) and the steps 7 to 10 is fine, but gaps develop when s/he stops at 4 numbers with a 3 in the hundreds place and the gaps become significant with the explanation for why there must be 12 answers.

Acc. 1

Although the work starts with the reader having confidence that no instruction is needed, the check raises questions. That requires the reader to score this a 1, since we don't know that s/he doesn't need further instruction in finding all combinations.

They want to know how many you can make

① 1, 3, 7

7, 5, 3^②

③ 1, 7, 5

④ 5, 3, 7

⑤ 7, 3, 1

1, 5, 7^⑥

⑦ 7, 5, 1

⑧ 5, 3, 7

⑨ 5, 7, 3

I found 9 ways

Proof

1	1, 3, 7
2	7, 5, 3
3	1, 7, 5
4	5, 3, 7
5	7, 3, 1
6	1, 5, 7
7	7, 5, 1
8	5, 3, 7
9	5, 7, 3

that is 9 I made

2 – Algebraic Relationships

3-digit numbers

How many 3-digit numbers can you find using only the digits 1, 3, 5, and 7 once in each answer?

3 – 2 – 3

- | | | |
|------|---|--|
| CU | 3 | The translation of the key concepts (4-digits made into 3-digit numbers, no repeating digits in a number) is completed. However, s/he does not seem to understand that s/he needs to find all combinations. |
| PS | 2 | The process of finding 3-digit numbers using the 4-digits provided is underdeveloped due to a lack of organization (s/he would not know if s/he had found all of the combinations or not) and a repeat in the numbers s/he found (4 and 8) |
| V | 2 | Listing the 3-digit numbers found from the 4-digits provided is more than a minimal re-engagement with the task, but is lacking details as to where the numbers came from (recopying or rethinking)? |
| C | 2 | The student does little to help the reader move from one part of his/her solution to another. This sketchy path helps the reader see that there is at least a partial understanding of what the task is asking, but little more. |
| Acc. | 1 | 9 numbers is not a mathematically justifiable solution. |