**Fun with Puzzles\**

**ANSWERS TO PUZZLES**

**EASY**

The combination is 042. From the fourth clue, we know that none of the numbers 7, 3, or 8 are anywhere in the code. Moving to the first clue, since we know the 8 can’t be correct, either the 6 or the 2 is correct *and* in the right place. Then with the last clue, we know that the code must have a 0 in it (since the 7 and the 8 are wrong), and the 0 cannot be in the third slot (since the clue says the correct number is in the wrong place).

Next, looking at the second clue, it says that one number is correct, but in the wrong place. Comparing this with the first clue, we see that 6 can’t be a number since it can’t both be in the correct place and the wrong place at the same time (since it’s listed first both times). So now looking back at the first clue, it can’t be the 6 or the 8, so it must be a 2 in the third slot. Our code is xx2 at the moment.

Then looking at the third clue, we know it can’t be a 6, so it is a 0, but the 0 is in the wrong place. The 0 can’t be in the middle (otherwise it would be in the correct place), and it can’t be in the last place since we already have a 2 there. So, the 0 must come first. Our code is 0x2 at the moment.

Finally, looking back at the second clue, it says that one number is correct, but it’s in the wrong place. We know that 6 isn’t correct, so it must either be the 1 or the 4. If it were the one, it would be in the correct place, so it must be the 4. Our code is 042.

**MEDIUM**

The combination is 763. With the second clue, we know that none of the numbers 4, 9, or 1 are anywhere in the code. Then moving to the last clue, since 1 and 4 can’t be in our code, it must be 3, but the 3 cannot be in the middle slot.

Then looking at the third clue, it says that two numbers are correct, but in wrong places. We already know that 3 is correct, and now we know it can’t be in the first slot either, so it must be in the third slot. Our code is xx3 at the moment.

Then we are going to compare the first and the fourth clue. They are almost identical codes (265 vs 275), but this is the key. If either the 2 or the 5 were correct, then it could not be well placed for one clue and wrongly placed for the other clue. So, the numbers must be 6 and 7. Since it says the 6 is well placed and the 7 is wrongly placed, our code is 763.

**HARD**

The combination is 358. Now we get to some trickier puzzles. One of the statements is false. Since the third clue and the fifth clue contradict each other, we know that the false clue must be either the third or the fifth clue, and clues 2, 4, and 6 are true.

We know that none of the digits are multiples of each other, so that means we can’t repeat any digits and we can’t have 1 as a digit. Since 7\*1 = 7 means that 7 and 1 are multiples of 7, for example.

With the third digit being even, we know that 2 cannot be the first or the second digit, since 2 is a multiple of even numbers.

From here you could probably guess-and-check your answers, but we will approach it from a more logical perspective. Looking at the third clue (which could be false), if the first digit is 1 more than the second digit, what does that mean? Let’s call the first digit A and the second digit B. So, A = B + 1. With the fourth clue (which we know is true), the 2nd digit is equal to the 3rd digit minus the 1st digit. We’ll call the third digit C.

So B = C - A

But A = B + 1, so we have

B = C - (B + 1)

B = C - B - 1

2B = C - 1

We know that any number multiplied by 2 must be even, but from clue number 6, we know that C is even. And when you subtract 1 from an even number, you get an odd number. So, the third clue is false, which means the fifth clue must be true, since only one clue is false.

With the fifth clue being true, B must be greater than A (being equal would violate the second clue).

We also know that A cannot be 1 or 2 since that would violate the second clue as well. So, A must be at least 3, B must be at least 4, and we know C is even (so either 2, 4, 6, or 8).

B = C - A

C = A + B

So C must be greater than B, which is greater than A. That leaves us with C being 6 or 8. Since we know that A is at least 3 and B is at least 4, A+B will be at least 7, so C must be 8. So far, our code is xx8.

Our only two options left to equal 8 if A is 3 or greater is 3+5 or 4+4. 4+4 violates clue number 2, so it must be 3+5. So, our code is 358.

**VERY HARD**

The combination is 119. One of our clues is false, so we have to keep that in mind. Starting with the last 3 clues, the only digits that have integer square roots are 1 (square root of 1 is 1), 4 (square root of 4 is 2), and 9 (square root of 9 is 3). So at least 2 of the numbers (since one clue is false) consist of the digits 1,4, and 9.

Technically one of the digits could be 0, but that would violate the first clue of the product being greater than 5. So, we should keep 0 in the back of our mind.

For now, let’s attempt to satisfy all of the rules. Starting with all the square root clues, the numbers we have to choose from are 0, 1, 4, and 9. But since 0 already doesn’t satisfy the first clue, let’s work with 1, 4, and 9 for now

If the first digit is less than 4, it must be 1. If the second digit is less than or equal to the first digit, it must also be 1. Now we want to satisfy the first clue, where the product is between 6 and 79, and the second clue where the sum is greater than 14.

No matter the third number we pick, we violate the second clue, because if we have 1+1+C, C must be at least 13 to make the sum greater than 14. So, we’ll violate the second clue for now.

Assume the first digit is 4. Then the second digit could be 0, 1, or 4. The third digit could be 0, 1, 4 or 9. But since any 0 digit would violate the first rule of the product being above 5, none of the digits can be zero since we are already violating one clue. So we have: 4[1,4][1,4,9]. Say we do 419. The problem with this is that 4+1+9 = 14, so it is not *greater than* 14. 4+1+1 and 4+1+4 also don’t work. So the second number can only be 4. So we have 44[1,4,9]. 4+4+9 is the only one greater than 14, but 4\*4\*9 = 144, which violates the first clue since it is greater than 80.

Then to satisfy the first clue, the number must be at least 6, so we have 1\*1\*6 > 5. But since the numbers we have to choose from are only 1, 4, and 9, the only option that is left greater than 6 is 9. So, our code is 119.

Now you might say that this path to the answer is too convenient, so let’s approach the problem from some other ways. The key is to look at clues 3 through 6. Let’s violate these rules one at a time. First, assume that the first digit *isn’t* less than 4. So, it must be either 4 or 9, so we don’t violate the 5th clue.

Assume the first digit is 4. Then the second digit could be 0, 1, or 4. The third digit could be 0, 1, 4 or 9. But since any 0 digit would violate the first rule of the product being above 5, none of the digits can be zero since we are already violating one clue. So we have: 4[1,4][1,4,9]. Say we do 419. The problem with this is that 4+1+9 = 14, so it is not *greater than* 14. 4+1+1 and 4+1+4 also don’t work. So, the second number can only be 4. So we have 44[1,4,9]. 4+4+9 is the only one greater than 14, but 4\*4\*9 = 144, which violates the first clue since it is greater than 80.

So, we’ve proven the first digit can’t be 4. The only other option if it is untrue is 9. So we have 9[1,4,9][1,4,9]. We’ve already proven that 9+1+4 doesn’t work, and 9\*4\*4 doesn’t work. 9\*1\*9 also doesn't work because 81 > 80. So, clue number 3 must be true. If that is the case, the first number can only be 1 or 0. If the first number is a 0, we violate the first rule (but so far that’s okay, since we’re only violating one rule). The second number has to be less than or equal to the first number, so the only possible digit for that is 0. But we also need the sum to be greater than 14, and we can’t do that if the first two digits are 0. That means the first number **MUST** be 1.

Now look at the fourth clue, where the second digit must be less than or equal to the first digit. If we violate this rule, we still have to obey the rule where the second digit has a square root, so the second digit can be either a 4 or a 9 if we are purposefully violating the fourth clue. So we have 1[4,9][1,4,9]. These are the same possibilities as before, where they either violate not being above 14 or not between 6 and 79, so the fourth clue must be true. Meaning the second number **MUST** be a 0 or a 1. And it **MUST** be 1 since if it is a 0, we violate *both* the first and second rules.

So, we know our first two numbers are both 1’s. No matter what, we are violating the second rule, since no single digit will add up greater to 14. So then we cannot violate any other rules. So, the third digit must have a square root, so it must be 0, 1, 4, or 9. 0 and 1 violate both the first and second rule. 114 is close, but 1\*1\*4=4 is still less than 5, so our only option for the third number is 9. So, our code is 119.