Mystery operations

1. A two-digit number multiplied by a two-digit number yields a four-digit product, to which is added a three digit number starting with 1, yielding a five digit number:

```
    xx
*   xx
------------
   xxxx
+  1xx
------------
  xxxxx
```

Replace the x's with numbers 0 to 9 inclusive, repeated numbers and left out numbers are acceptable. The solution is unique.

2. A two-digit number multiplied by a one-digit number yields a two digit number, to which is added a two-digit number yielding another two-digit number.

```
    xx
*    x
----------
    xx
+   xx
----------
    xx
```

In this one the numbers 1 to 9 are used inclusive with no repeats. The solution is also unique.

3. This might be a bit hard for single students but in a group setting might be interesting to work on for a while.
Superbrain 1985 question 10.

```
          x 7 x x x
       ------------------------
x x x | x x x x x x x x
        x x x x
        -----------
            x x x
            x x x
           ---------
            x x x x
              x x x
             ---------
                x x x x
                x x x x
               ------------
                     0
```

Hints:

1. The top two numbers have to be very large while the five digit number has to be very small.

2. This one is a bit longer but the main step is seeing that the single digit number can only be 3 or 4, then testing the various other permutations of numbers.

3. Here the 3 digit number multiplied by 7 is only a three digit number, meaning it is between 100- 142.
And then the second last digit of the answer has to be a 0, etc.

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References:

Scientific American Mathematical games by Martin Gardner,

Des McHale, Diarmuid Early “The first twenty-five years of the Superbrain”.