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Fibonacci

Subject: Solving simple linear equation, E.g.: $-5x+3=17$ ➔ $x=?$.

Leonardo of Pisa, Italy.

(This is a 7th-8th-9th grade subject, dependent on the class level)

Conventional 'drilling' method:

Learn the rules (adding, subtracting, multiplying and dividing both sides of the equations), and then drilling on examples.

'Problem-Solving' approach:

Setting the stage

1. Make sure they are familiar with series completion:
    a. What's the next term in the series: 1 , 2 , 3 , 4 , 5 , __ ?
    b. Can you express it as 'new_term = previous_term+ (something)' ?
    c. What's the next term in the series: 1 , 3 , 5 , 7 , 9 , __ ?
        i. Note: Increment is 2.
    d. What's the next term in the series: 10 , 8 , 6 , 4 , __ , __ , __ , __ ?
        i. Note: Increment can be negative.
    e. What's the next term in the series: 1 , 1 , 1 , 1 , 1 , __ ?
        i. Note: Increment can be zero.
    f. Make your own series for me to solve!

2. Introduce a new kind of series: Fibonacci series. Each element is the sum of the previous two.
    a. Here is an example, complete the next term: 1 , 1 , 2 , 3 , 5 , 8 , __ ?
    b. Another example: 5 , 1 , 6 , 7 , 13 , 20 , __ , __ , __ ?
    c. Another example: 5 , 0 , 5 , 5 , 10 , 15 , __ ?
    d. Make your own example for me to solve!

Our problem to solve:

We are missing some of the terms in a Fibonacci series: Can you find the missing ones?!?

Partial series: 3 , __ , __ , __ , 24 , __ , 63

How do we go about it?

Understanding the problem

Let's try with guessing the first number after 3. Choose a number (let's say student chose 2). So let's build the series:

3 , 2 → next one is 5 , then 7 , then 12 . Oh, but it should have been 24! (see the problem given)

So we probably need to choose something larger than 2.

Note: The first number we chose determine the whole series!!

Let's try 8 now (the student can choose of course):

3 , 8 → next one is 11 , then 19 , then 30 . Oh, but it should have been 24! (see the problem given).

So the solution is probably between our original guess (2), and our second guess (8).

As we observed, it is all dependent on the first number we choose.

Solution process

Let's denote this first number as an unknown, 'x', and see how we can proceed.

3 , x → next one is 3+x → then next one is 3+x+x = 3+2x → and then the next one is 3+2x + 3+x = 6 + 3x . Oh, and this should be equal to 24! (see the problem given).

So, we can write the equation: 6+3x = 24

How do we solve this? We need to get the 'x' on its own, so we subtract 6 from both sides to get

$$3x = 24-6$$

$$3x = 18$$

So how much is 'x' ? → x= 6 .

Reflect on the solution

Checking results:

3 , 6 , 9 , 15 , 24 , 39 , 63

Yes, it's working!!

Reflection on the problem itself

Here are a few new problems, which can lead to solving with fractions, with negative numbers, etc.

Partial series: 3 , __ , __ , 4 , __ , __ , 19

(solution 3 , 0.5 , 3.5 , 4 , 7.5 , 11.5 , 19)

Partial series: 3 , __ , __ , __ , 3 , __ , 7

(solution 3 , -1 , 2 , 1 , 3 , 4 , 7)

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