PUZZLING CARTOON

- THE COLORED CRAYONS -

The Puzzle

Theo is putting away his art materials. During his cleaning, he notices that he possesses, in his pencil case, 2 more red crayons than yellow crayons. He has 3 more blue crayons than red crayons. He has 5 more green crayons than blue crayons. He also notices he has 6 times more green crayons than yellow crayons.

He has 2 more red crayons than yellow crayons.

He has 3 more blue crayons than red crayons.

He has 5 more green crayons than blue crayons.

He has 6 times more green crayons than yellow crayons.

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How many crayons in total does Theo have in his pencil case?

Source : Inspired by MAZZA, Fabrice, *Le grand livre des énigmes,* « Un million de cheveux », Marabout, p.229.

The answer:

Theo has 25 crayons in his pencil case.

Possible solution:

Since the number of crayons of each colour is unknown, let's ask:

R := number of red crayons,

B := number of blue crayons,

G := number of green crayons,

Y := number of yellow crayons.

With the information "*there are 2 more red crayons than yellow crayons*", we can write the following equation:
$$R = Y + 2.$$

With the information "*there 3 more blue crayons than red crayons*", we can write the following equation:
$$B = R + 3.$$

With the information "*there are 5 more green crayons than blue crayons*", we can write the following equation:
$$G = B + 5.$$

With the information "*there are 6 times more green crayons than yellow crayons*", we can write the following equation:
$$6 \times Y = G.$$

Since each equation has 2 unknown quantities, it is possible to isolate one of the unknown quantities and replace it by the other.

For example, let's take the equation $6 \times Y = G$.

Our goal will be to isolate the variable *Y*. We simply need to replace the variable *G* in this equation. We know that $G = B + 5$. We then obtain $6 \times Y = B + 5$.

Next, to isolate the variable Y, we want to replace B. We know that:

$B = R + 3$. So, we obtain $6 \times Y = (R + 3) + 5$.

To isolate Y, we now need to replace R. With the previous pieces of information, we know that $R = Y + 2$. We then obtain $6 \times Y = ((Y + 2) + 3) + 5$.

Finally, we obtain an equation with one unknown: $6 \times Y = Y + 2 + 3 + 5$.

We simply shorten this equation and solve it:
$$6 \times Y = Y + 2 + 3 + 5$$
$$\Rightarrow 6 \times Y = Y + 10$$
$$\Rightarrow 5 \times Y = 10$$
$$\Rightarrow Y = 2$$

PUZZLE SOLUTION

The solution (continued):

We found that the number of yellow crayons is 2. Knowing this, we are able to find the number of crayons for each colour.

We simply need to replace the variable Y by 2 in our equations with two unknowns used earlier.
$$6 \times Y = G$$
$$\Rightarrow 6 \times (2) = G$$
$$\Rightarrow G = 12.$$

Next, since we found the variable G, we can use the following equation:
$$G = B + 5$$
$$\Rightarrow 12 = B + 5$$
$$\Rightarrow B = 7.$$

Finally, since we found the variable B, we can use the following equation:
$$B = R + 3$$
$$7 = R + 3$$
$$\Rightarrow R = 4.$$

To find the total number of crayons in his pencil case, we simply add up the value of each colour.
$$Y + G + B + R = total\ number$$
$$2 + 12 + 7 + 4 = 25$$

The number of crayons Theo has is 25.

There are many ways to find this answer. Indeed, since there are many equations with two unknowns to start with, it makes no difference which one is chosen. We simply need to isolate one unknown quantity, the same one for all the operations, to find its value. Then, we simply need to replace this unknown's value and progressively substitute the values found in the other equations (as shown previously) to find the number of crayons for each colour.