

[Illustrative Mathematics](#)

5.NF How many marbles?

[Alignment 1: 5.NF.B.7.b, 5.NF.B.7.c](#)

Julius has 4 blue marbles. If one third of Julius' marbles are blue, how many marbles does Julius have? Draw a diagram and explain.

Commentary:

This task is intended to complement "5.NF How many servings of oatmeal?" and "7.RP Molly's run." All three tasks address the division problem $4 \div \frac{1}{3}$ but from different points of view. "How many servings of oatmeal" presents a how many groups version of $4 \div \frac{1}{3}$ while "Molly's run" approaches this division problem from the point of view of rates. This task provides a how many in each group version of $4 \div \frac{1}{3}$.

To recall in this setting the difference between a how many groups version and a how many in each group version of the equation

$$4 \div \frac{1}{3} = 12$$

notice that there are two different multiplication equations which can give rise to this division equation:

$$12 \times \frac{1}{3} = 4$$

$$\frac{1}{3} \times 12 = 4.$$

In the first of these equations 12 groups of $\frac{1}{3}$ make 4 and so 12 is the answer to how many thirds there are in 4. In the second equation $\frac{1}{3}$ of a group of 12 make 4 and so 12 is the answer to how much is in a group if one third of that group is 4.

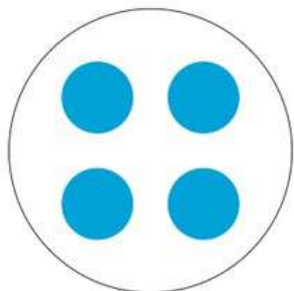
This task should be done together with the "How many servings of oatmeal" task with specific attention paid to the very different pictures representing the two situations. A good picture will determine which version of division, how many groups or how many in each group, is being modeled in a given situation.

This task is appropriate for assessment or for instruction.

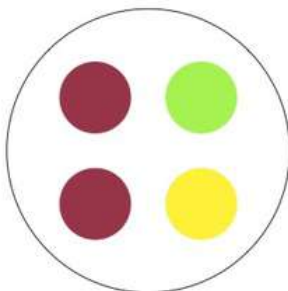
Solution: 1

If one third of Julius' marbles are blue, this means that $\frac{2}{3}$ of his marbles are colors other than blue. This means that Julius has two times as many marbles of colors other than blue than he has blue marbles. Since Julius has 4 blue marbles, this means that he has 8 marbles of other colors and so he has 12 marbles total.

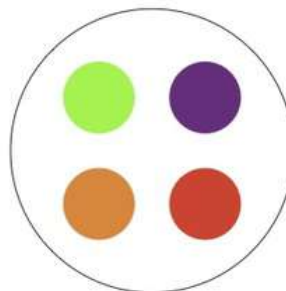
Below is a picture representing Julius' marbles:



$\frac{1}{3}$ of Julius' marbles



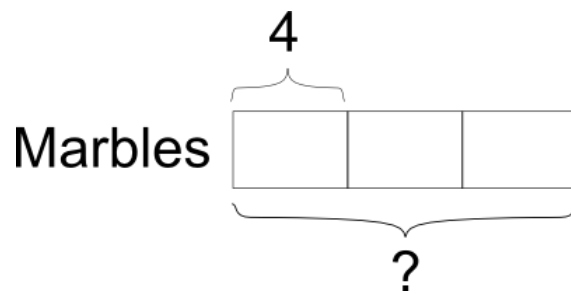
$\frac{1}{3}$ of Julius' marbles



$\frac{1}{3}$ of Julius' marbles

Since $\frac{1}{3}$ of Julius' marbles are blue, we can also record this as a missing factor problem: $\frac{1}{3} \times \underline{\hspace{1cm}} = 4$. This missing factor problem is equivalent to the division problem: $4 \div \frac{1}{3} = \underline{\hspace{1cm}}$. In either case, the answer is 12 marbles, as we saw in the picture.

Solution: Using a tape diagram



The number of blue marbles is represented by 1 unit. We can find the total using the missing factor sentence:

$$4 = \frac{1}{3} \times \underline{\hspace{2cm}}.$$

This missing factor sentence is equivalent to the division problem:

$$4 \div \frac{1}{3} = \underline{\hspace{2cm}}.$$

As the diagram shows, this is equivalent to solving:

$$4 \div \frac{1}{3} = 4 \times 3 = 12.$$

Julius has 12 marbles.



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