

## Are You Smarter Than A Fifth Grader?

Sarah bought a bag of marbles.  $\frac{1}{3}$  of the marbles were blue,  $\frac{1}{6}$  of them were green,  $\frac{1}{3}$  of the remainder was yellow. If there were 24 yellow marbles, how many marbles did Sarah buy altogether?

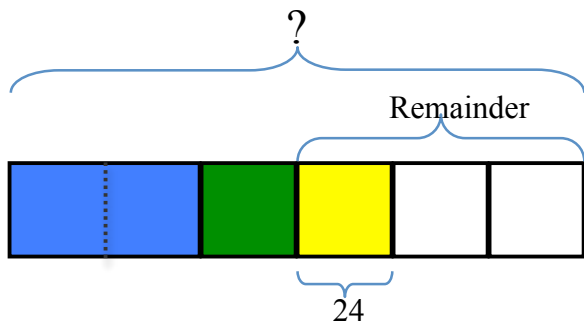
Did you try it? Doesn't seem easy, does it? Without visualization, this problem becomes a labyrinth of fraction operations and often ends up making no sense at all. Algebra works, but the solution is convoluted:

Fig 9: 
$$\frac{1}{3} \left[ 1 - \left( \frac{1}{3}x + \frac{1}{6}x \right) \right] = 24$$

Hmmm... on the other hand, could a child solve it using a *drawing* instead of an equation? Even better, can a child visualize it, and solve it *without* a pencil?

Look at this set of six rectangles (called "units"). Can you *see* the answer now?

Fig 10



*Answer:*  
 $24 \times 6 = 144$   
 Sarah bought 144 marbles altogether.

In this diagram (called a "word problem model" in Singapore math texts),  $\frac{1}{3}$  of the total is blue,  $\frac{1}{6}$  is yellow, and  $\frac{1}{3}$  of the remainder is yellow. Given 24 marbles are yellow, the answer is that there are  $6 \times 24$  marbles altogether, which should be computed *mentally*.

*Mentally... as in with no pencil . . . ???* Well, sure....  $6 \times 24$  can be thought of as six 20's plus six 4's (120 plus 24), or as  $6 \times 12 \times 2$  (since 24 is  $12 \times 2$ ) or by doubling the 6 and halving the 24 (*times 2* and *divide by 2* doesn't change the product), so it becomes  $12 \times 12$ . Or.... how about  $2 \times 24$  three times? Any other methods? Courage... just give it a try!

One of the goals of a teacher using this curriculum is to challenge (and praise) a class of children for finding *as many ways as possible* to mentally calculate any given problem.

Speed is NOT the goal. We're raising thinkers, not computers. I'd rather have a student who needs an extra second to do  $7 \times 8$  but can equally quickly do  $132 \div 6$  mentally (132 is  $120 + 12$ , which is easy to divide by 6!). The student with mental math skills has *number sense* – perhaps the greatest prerequisite to success in math. With a solidly developed number sense, decimals are easy, percents are not mysterious, and algebra is just arithmetic with letters instead of numbers.