

Solution for "Making sticks" NRICH primary live problem

Hello NRICH team,

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I worked on Making sticks (<https://nrich.maths.org/problems/making-sticks>) NRICH primary live problem as part of the STEPS IN MATH program conducted by The GYM Foundation. (<https://thegymfoundation.com/stepsinmath>). Here is the scanned copy of my handwritten solution.

How can they make lines of the same length?



I am taking one set of red blocks, and blue blocks. They are not same length.



So this time I am taking 2 sets of red and blue blocks. Again they are not same length. It is two blue cubes less.



2 red block sets and 3 blue block sets make same length.



So this time 3 red and 4 blue not same length.



This time one more red and two more blue blocks.





Again same matching length.



Now I see a pattern. If there are a odd amount of red not same length. If very even amount of red same length. If there are 2, 4, 6 or 8 red block sets same length.

When there are an even amount of red which is in both 3 and 2 times table matching length. Also the first value for which the red and blue blocks are in equal length are 2 red and 3 blue block sets. So, for eight blocks of red set, we need

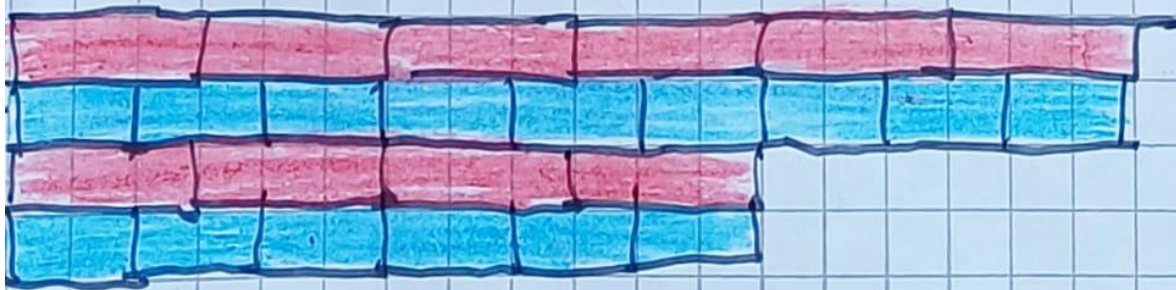
		so it is always
8 = 2	3 × 1 = 6	3 sets of blue blocks
red + 2	+ 3 = 12	for every 2 red block
block set 2	3 = 18	set of blocks
<u>2</u>	<u>3</u> = 24	
8	12	

2  = 3  sets

can I apply this logic to ten red block sets

10 	
2	3
+ 2	+ 3
2	3
2	3
<u>2</u>	<u>3</u>
10	15

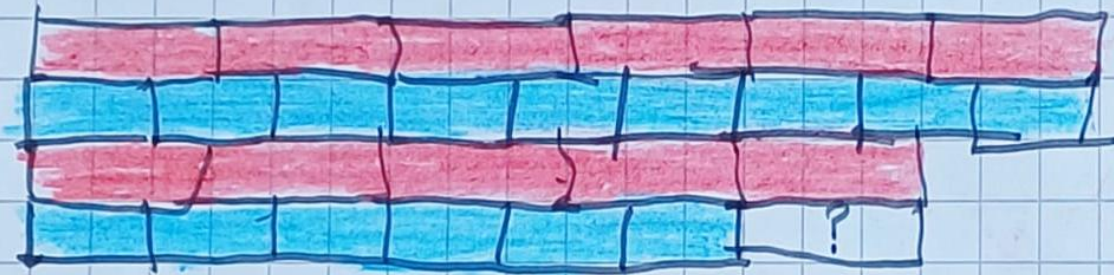
10 sets of red blocks and 15 sets of blue blocks should be equal length. Let's check



It worked! remember that it doesn't work if there are an odd amount of red and even blue let's verify.

Can I apply this logic with 11 red sets?

11		+		=	6
	2		3		
	+ 2		+ 3		= 12
	2		3		= 18
	2		3		= 24
	2		3		= 30
	1		?		= 33
	11		15?		



now, for the last one red set if I take one blue block set. There will be one extra red block.

If I add one more blue block set there will be one extra red block that is no possibility of same length to be got between red block sets and blue block set if there are an odd amount of red not equal length verified.

Conclusion

if there is an even number of red block sets equal length with blue block sets. If there are an odd amount + will not match length

Making specific cube length with both red and blue block sets.
 using biggest sets of red and blue block sets.
 Try making a total of 10 blocks

Let's start with red block sets

1 2 3 4 5 6 7 8 9 10



$$3+3+3+1=10$$



$$3+3+2+2$$



$$3+2+2+2+1=10$$



$$2+2+2+2+2=10$$

Conclusion

Because 10 is an even number, so if there is an odd amount of red block sets it won't work.

I was able to make 10 block length when there is an even amount of red block sets or when there is 0 red block set because 0 is even

Let's try make 12 block length

1 2 3 4 5 6 7 8 9 10 11 12



$$3+3+3+3=12$$



$$3+3+3+2=11$$



$$3+3+2+2+2=12$$



$$3+2+2+2+2=11$$



$$2+2+2+2+2+2=12$$

Ob Solution

Again 12 is a even number. The length 12 can be made of even amount of red black sets

Observation for all even length

even numbers like 10/12 can be made with even amount of red and odd/even blue block set
 $10 = 3+3+2+2$; $12 = 3+3+2+2+2 = 12$

Now lets observe the pattern for odd length let's take 15 and 19.
Again start with red.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 1

$$3+3+3+3+3=15$$



$$3+3+3+3+2=14$$



$$3+3+3+2+2+2=15$$



$$3+3+2+2+2+2=14$$



$$3+2+2+2+2+2+2=15$$



$$2+2+2+2+2+2+2=14$$



Observation

15 is a odd number the length 15 can be made from odd amount red and blue block sets. 6 blue block sets work because

12 is in 2 and 3 Times Table. So, 12 need 3 to make 15.

Lets try 19, Let's the possibilities

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

$$3+3+3+3+3+3=18$$



$$3+3+3+3+2+2=17$$



$$3+3+3+3+3+2+2=19$$



$$3+3+3+3+2+2+2=18$$



$$3+3+3+2+2+2+2+2=19$$



$$3+3+2+2+2+2+2+2$$



$$3+2+2+2+2+2+2+2+2=19$$



$$2+2+2+2+2+2+2+2+2=18$$



Observation

19 is a odd number so Is there are odd red odd/even blue
It will work.

Observation

$$19 = 3 + 16 \quad 19 = 6 + 13 \text{ cannot form} \quad 19 = 9 + 10$$

So odd number = odd times red blocks + even times blue blocks.

odd times red = odd

even times blue = even

So odd + even = odd