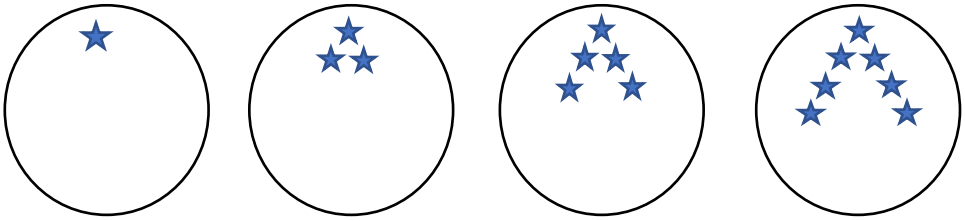
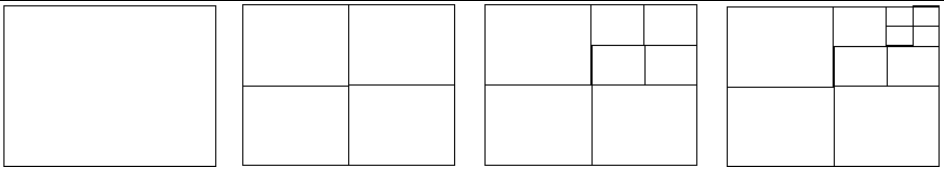
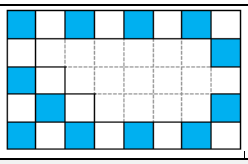
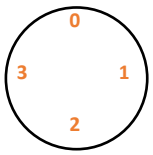
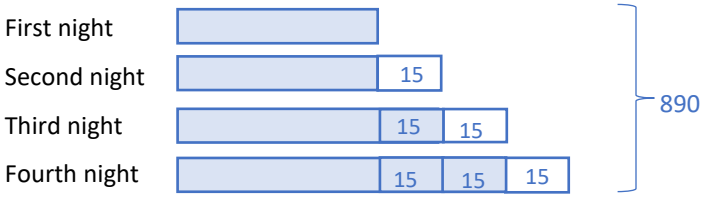
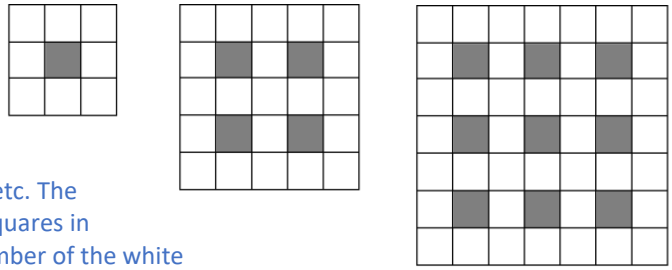
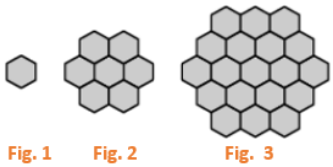
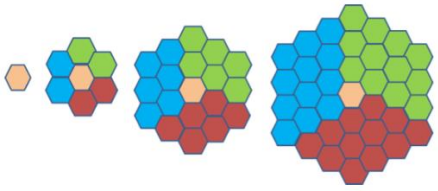
First Name: _____ **Last Name:** _____ **Grade:** _____

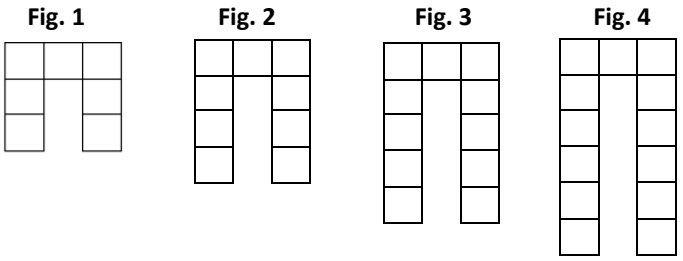
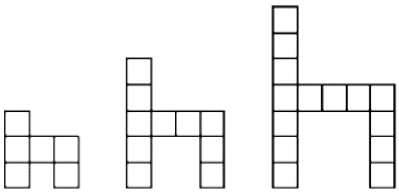
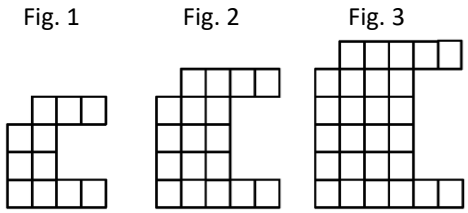
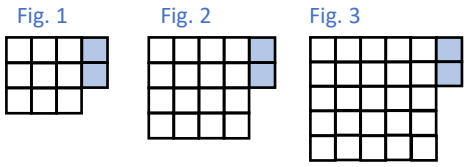
Teacher: _____ **Parent's email:** _____

Pattern

Kinder & First Grade: solve <u>at least</u> 3 problems.
Second & Third Grade: solve <u>at least</u> 7 problems.
Fourth Grade and above: solve <u>at least</u> 12 problems.

		Answer
1.	Josiah arranged the pool balls as shown below. Assuming there are no hidden balls, how many pool balls are there in total?  1+2+3+4+5 =**15**	*15*
2.	Jerry bought 12 apples on Sunday and put them in the fridge at home. He brings 1 apple to school on Monday, 2 apples on Tuesday, 3 apples on Wednesday, 4 apples on Thursday, and none on Friday. How many apples will he have left at home by end of the day on Friday? 12 – 1 – 2 – 3 – 4 – 0 = 2 apples Or you can subtract (1+2+3+4) from 12: 12 – (1+2+3+4) = 12 – 10 = **2 apples**	*2 [apples]*
3.	If the pattern continues, how many stars will be in Circle 6?  **Circle 1** **Circle 2** **Circle 3** **Circle 4** Each circle has 2 more stars than the previous one. In Circle 5, there will be 7+2 = 9 stars, and in Circle 6, there will be 9+2 = **11 stars.**	*11[stars]*
4.	Tyrone skip-counts by 4 starting with 10. What is the largest number he will say that is less than 50? 10, 14, 18, 22, 26, 30, 34, 38, 42, **46**, 50	*46*
5.	30+40+50+60+70+80 = **330**	330 [words]
6.	 **Fig. 1** **Fig. 2** **Fig. 3** **Fig. 4** The pattern has a difference of 3 between each number: 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, …. Figure 10 will have **28 tiles.**	*28 [tiles]*

7.	Notice that every row had 4 blue tiles and 4 white tiles. Now we count how many missing in each row: 3 + 3 + 2 = **8 tiles.** 	*8 [tiles]*
8.	It will happen this millennium, so will start on 20_ _. The two other digits have to add up to 5. The two digits can be: 2 + 3, 3 + 2, 1 + 4, 4 + 1, 0 + 5, 5 + 0. The year after 2023 when the sum of the digits is 7 again is **2032**.	*2032*
9.	Sonja climbs 5×5 = 25 feet in 15 minutes, while Sawyer climbs 4×3 = 12 feet in 15 minutes. Sonja climbs 25 – 12 = **13 ft** more than Sawyer	*13 [feet]*
10.	 This clock has a cycle of 4 hours. 50÷4 = 12 R2, so this would be the same as 2⊕2 = **0** Another way to solve it is to act it out (start at 2 and move 50 steps around the clock.	*0*
11.	 890 – (15×6) = 800 800÷4 = 200 mosquitoes on the first night Third night: 200 + 15 + 15 = **230 mosquitoes**	*230 [mosquitoes]*
12.	MATHISFUNMATHISFUNMATHISFUN… The pattern repeats after every 9 letters. A multiple of 9 that is the closest to 1002 is 999, which is 111×9. The 1000th letter is M, the 1001st letter is A, and the 1002nd letter is **T.**	*T*
13.	The side of the big squares increases by 2 (in the figures we have squares with a side of 3, 5, 7, etc.). The black squares (combined) form a smaller square of side 1, 2, 3, etc., so the pattern for the number of the black squares is 1×1, 2×2, 3×3, etc. The next square will have a side of 9 (81 squares in total) with 4×4 black ones. So, the number of the white ones is 81-16 = **65.** 	*65*
14.	1st figure has 1 hexagon, 2nd figure: 1 + 6 = 7 hexagons; 3rd figure: 7 + 12 = 19 hexagons. Notice that we add multiples of 6 each time. Figure 4th: 19 + 6×3= 37, and figure 5th: 37 + 6×4 = **61**  You may draw it out or notice another pattern.  There is one center piece and 3 identical pieces wrapped around. In the 5th figure you'll have 3×5×4 = 3×20 = 60 plus 1 centerpiece, or **61** in total.	*61*
15.	We can look at the pattern that is created on the ones digit: 9×9 = 81 ends on 1, 1×9 = 9, ends on 9, 9×9 = 81 ends on 1 again; it repeats. The pattern is alternating 1 and 9. If we multiply 9 even number of times, we'll get 1 in the ones digit, otherwise 9. We have multiplication of 8 nines, so, it will end on 1.	*1*

16.	Each time we are adding 2 square tiles to the previous figure. To get 150th figure we'll need to add 149×2 to the original figure 1. So, there will be 7 + 149×2 = 305 square tiles in the 150th figure.  	*305 [tiles]*
17.	One way is to find the pattern. Notice that we add 4 new square tiles from one 'h' to the next one. The pattern is 6, 10, 14, and so on. To get to the 4th 'h', we add 4×3 to the first number of tiles, to get to the 5th 'h', we add 4×4 tiles to the first number of tiles, and so on. To get to the 100th 'h, we add 6 to 4×99: 6+ 4×99 = 402 	*402 [square tiles]*
18.	 The pattern is +7 , then +9, +11, +13, … What if we rearrange the shapes (using the same number of tiles):  The first figure has a square with 3 tiles on its sides plus 2 tiles. Figure 2 has a square with 4 tiles on its sides plus 2 tiles, and so on. The 100th figure has a square with 102 tiles on its sides plus 2 tiles. The pattern starting with figure 1 will be: $3^2 + 2$, $4^2 + 2$, $5^2 + 2$, and so on. Figure 100 will be: $102^2 + 2$ = 10,406 tiles.	*10,406 [tiles]*

Solution is available on March 17, 2023

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