Math Challenge #7

| First Name: _____ | Last Name: _____ | Grade: _____ |
| Teacher: _____ | Parent's email: _____ | |

Patterns

Welcome to Math Challenge #7. In this challenge, we are discovering patterns and rules, and solving math problems involving patterns. Patterns exist everywhere – from the rhythmic beats of your favorite music, the beautiful designs on a butterfly's wings, to the daily routines that structure our lives. In mathematics, a pattern can be described as a repeated design or recurring sequence. An arrangement of numbers, shapes, or objects that follow a specific rule or set of rules. For instance, if you have a sequence of numbers like 2, 4, 6, 8, 10, you'll notice that every number is 2 more than the previous one.

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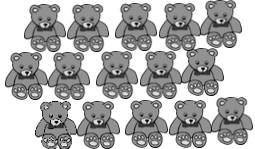**Fourth Grade and above: solve <u>at least</u> 12 problems.**

Answer

1.	Look at the following pattern. The pattern is alternating between a square and a circle.	
	▪ 1st ● 2nd ▪ 3rd ● 4th 5th 6th 7th **?** 8th	
	What would be the 8th shape?	
	Extra: *Without drawing it out, what would be the 12th shape?*	

2.	The following is part of a 100s chart. What are the two numbers covered by the stars?	
	23 24 25 26 / 33 ★ 36 / 45 / 55 / ★	

3.	What is the **next** insect in this pattern?	
	🦋 🦋 🐝 🐝 🐝 🦋 🦋 🐝 🐝 🐝 🦋 ____	
	Extra: *Without drawing it out, what would be the 15th insect?*	

4.	The following number is subtracted by the same number (covered by the owl) three times. What is the number covered by each owl? $$17 - 🦉 - 🦉 - 🦉 = 8$$	

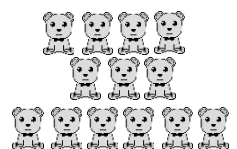**5.** Alex and Galina have some bears to share. Which group of bears can be shared equally between the two of them?

Group A   Group B   Group C

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6. Find the missing numbers in the following sequences:

a. 1, ___, 7, 10, ___, 16, 19   *a.*

b. 3, 13, ___, 33, ___, 53.   *b.*

c. 1, 6, ___, 16, 21, ___, 31.   *c.*

d. 20, ___, 12, 8, ___, 0.   *d.*

7.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

A hundreds chart has been printed on both sides of a piece of paper. One square is directly behind the other. The number 10 will be behind the number 1.

a. What number is behind the number 100?   *a.*

b. What number is behind the number 19?   *b.*

c. What number is behind the number 23?   *c.*

d. What number is behind the number 67?   *d.*

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8. In the sequence below, the rule to get from one number to the next one is "times 2 minus 3". Find the next number in the sequence: 10, 17, 31, ___.

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9. Study this pattern:

$$4+5+6+7+8 = 30$$
$$5+6+7+8+9 = 35$$
$$6+7+8+9+10 = 40$$

Fill in the missing numbers based on the pattern above.

____+____+____+____+____= 75

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10. Lydia makes a recurring pattern from the letters in her name.

L Y D I A L Y D I A L

a. How many letters will have been written before the sixth A appears?   *a.*

b. What would be the 38th letter in this pattern?   *b.*

11.	Amira used 3 sticks to make one small triangle. She added more sticks to create three more small triangles.
	
	    a. If she decided to add another row of small triangles, how many total sticks would she use in total?
	
	    b. If she continues with the pattern, how many rows of triangles would she have made if she used 84 sticks?
		a.
		
		b.

12.	 Nicholas makes a recurring pattern from the letters in his name **backward** (S, A, L, O, H, C, I, N, S, A, etc.…) What would be the 787th letter in this pattern?	

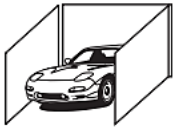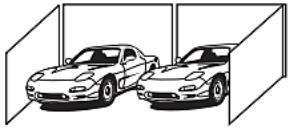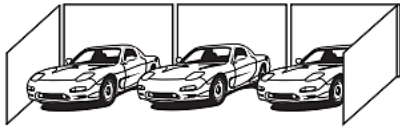|		
13.	In a geometric pattern, each square has a side length that is half of the side length of the previous square. The first square has a side length of 4 cm. If this pattern continues, what is the side length of the 5th square in the pattern?	

14.	Look at the following pattern. What is the sum of the digits of **z**? $$121 = \frac{22 \times 22}{1 + 2 + 1}$$ $$12321 = \frac{333 \times 333}{1 + 2 + 3 + 2 + 1}$$ $$z = \frac{4444 \times 4444}{1 + 2 + 3 + 4 + 3 + 2 + 1}$$	

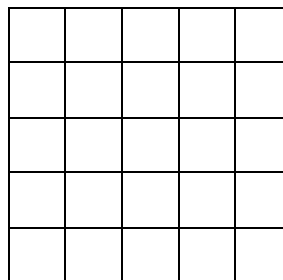|		
15.	Sanjay began building garages for his toy cars, using pieces of cardboard for the walls. For 1 car he used 3 wall pieces. For 2 cars he used 4 wall pieces. His garage for 3 cars is shown as follow: If he has 75 cars and plans to build 3 equal size garages and split the cars evenly between them, how many wall pieces would he need?	

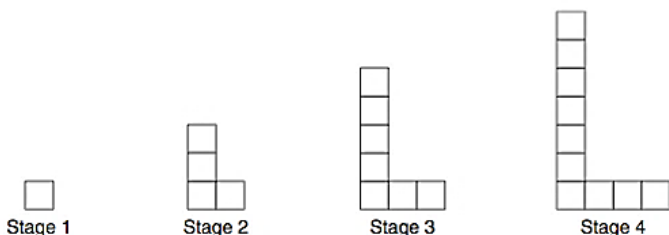| 16.	Use the clues below to create a colorful pattern with 25 square tiles.	
	• The ratio of green to red is 5 to 4.	
	• The ratio of green to blue is 10 to 1.	
	• The ratio of red to yellow is 4 to 3.	
	• The pattern has vertical and horizontal lines of symmetry.	
	• The first column (from left to right) does not have any red tiles.	
	• The last column (from left to right) does not have any yellow tiles.	
	• There are no red tiles on the center row, but there are two red tiles on the bottom row.	

Once the pattern is created, answer the questions below.

a. How many more red squares than the blue square?

a.

b. What fraction of the tiles are yellow?

b.

c. What fraction of the tiles are not red?

c.

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17. Mr. Crane has 100 blocks. He uses 22 of these blocks to make the pattern shown below (4 stages). How many stages will Mr. Crane be able to complete with the 100 blocks?

Stage 1   Stage 2   Stage 3   Stage 4

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18. The multiples of 3 are arranged in the following manner:

A	B	C	D
3	6	9	12
15	18	21	24
27	30	33	36
39	42	45	48
…	…	…	…

In which column will the number 2025 appear?