Math Challenge #8

Patterns

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. Identify and draw the missing figures.

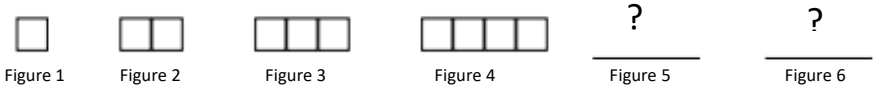


Figure 1 Figure 2 Figure 3 Figure 4 Figure 5 Figure 6

Figure 5 Figure 6

2. Identify and draw the missing figures.

Figure 1 Figure 2 Figure 3 Figure 4 Figure 5 Figure 6 Figure 7 Figure 8 Figure 9

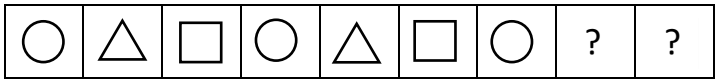


Figure 1 Figure 2 Figure 3 Figure 4 Figure 5 Figure 6 Figure 7 Figure 8 Figure 9

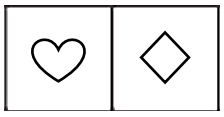


Figure 8 Figure 9

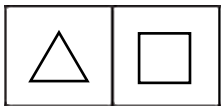


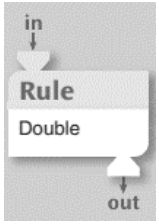
Figure 8 Figure 9

3. Identify and draw the missing figures.

Figure 1 Figure 2 Figure 3 Figure 4 Figure 5 Figure 6 Figure 7 Figure 8 Figure 9 Figure 10

Figure 9 Figure 10

4. A function machine is turning every number to a new number. Each time the number is dropped into the machine, the machine changes each number according to a rule. The rule for this particular machine is '***double the number***.' The table below displays what numbers are being dropped into the machine and the new numbers that come out the other end.
Find the missing numbers.



In	Out
2	4
3	?
5	?
10	?

In	Out
2	4
3	6
5	10
10	20

5. Look at the figures on problem number 3. If the pattern continues, draw the missing figures on Figure 15 and Figure 20.

The pattern repeats every 3 shapes

15÷3 = 5 no remainder, which means 15th figure will be small triangle
20÷3 = 6 R2, which means it will be 6 full cycles of the patterns plus the second shape from the beginning or big triangle

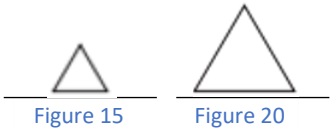
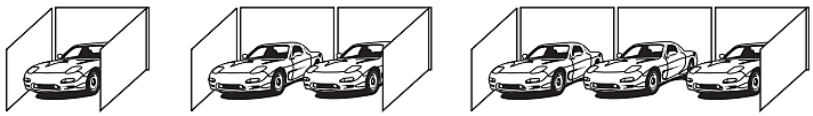


Figure 15 Figure 20

6.	If this pattern continues, what would the next term look like? a.  Figure 1 Figure 2 Figure 3 Figure 4 b.  Figure 1 Figure 2 Figure 3 Figure 4	*a.*  Figure 5 *b.*  Figure 5
7.	Look at the figures on problem number 6. If the pattern continues, a. How many hearts are there on Figure 6 and Figure 10? Rule: (figure #) x 2 → 6 x 2 = 12 and 10 x 2 = 20 b. How many stars are there on Figure 10 and Figure 20? Rule: (figure #) x 3 → 3 × 10 = 30 and 3 × 20 = 60	*a. Fig. 6: 12 ; Fig. 10: 20* *b. Fig. 10: 30; Fig. 20: 60*
8.	Marco, Pete and Hayley each made a list of numbers. Marco started at 60 and counted backwards by 3 to 0. Pete started at 60 and counted backwards by 4 to 0. Hayley started at 60 and counted backwards by 2 to 0. What numbers are in Marco's list that are also in Pete's and Hayley's list? Marco's list: **60**, 57, 54, 51, **48**, 45, 42, 39, **36**, 33, 30, 27, **24,** 21, 18, 15, **12**, 9, 6, 3, **0**. Pete's list: **60**, 56, 52, **48**, 44, 40, **36**, 32, 28, **24**, 20, 16, **12,** 8, 4, **0**. Hayley's list: **60**, 58, 56, 54, 52, 50, **48,** 46, 44, 42, 40, 38, **36,** 34, 32, 30, 28, 26, **24**, 22, 20, 18, 16, 14, **12,** 10, 8, 6, 4, 2, **0.** **Or** Find the least common multiple LCM(3, 4, 2) = 12 **60,** 60-12 = **48,** 48-12 = **36,** 36-12 = **24,** 24-12 = **12,** 12-12 = **0**	*0, 12, 24, 36, 48, 60*
9.	Henry baked cookies over the weekend. Each day during the week he took three cookies to school for his lunch. On Saturday he had 18 cookies left. How many cookies did he bake? There are 5 schooldays in a week. Henry took 3 x 5 or 15 cookies to school. If he had 18 cookies left, he baked 18 + 15 or 33 cookies.	*33 [cookies]*
10.	Tom 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 below.  1 car 2 cars 3 cars If he continues with this pattern, how many wall pieces would he need for 100 cars? Examine the pattern. There is one wall piece behind each car plus 2 wall pieces on the ends. So, for 100 cars he will need 100 + 2 or 102 wall pieces.	*102 wall pieces*

11. If the following pattern continues, how many triangles and how many trapezoids will there be in Figure 8? Figure 20?
Hint: create a table or chart, identify the pattern rule and use it to solve the problem.

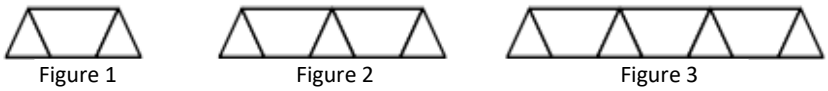


Figure 1 Figure 2 Figure 3

Figure number	Number of simple trapezoids	Number of triangles
Figure 1	1	2
Figure 2	2	3
Figure 3	3	4

Examine the chart. Number of trapezoids coincide with the figure number; number of triangles is one more than the number of trapezoids.
Figure 8 will have 9 triangles, 8 trapezoids
Figure 20 will have 21 triangles and 20 trapezoids

Figure 8:
9 triangles and 8 trapezoids

Figure 20:
21 triangles and 20 trapezoids

12. A robin comes to the birdfeeder every 5 days and a blue jay comes by every 3 days. Today, the robin and blue jay both came to the birdfeeder. How many days will it be before the robin and the blue jay both come on the same day again?
The robin will come on Day 1, Day 6, Day 11, Day 16, and so on. The blue jay will come on Day 1, Day 4, Day 7, Day 10, Day 13, Day 16, and so on. They next time they come on the same day is in 15 days.
Or find the least common multiple of 5 and 3. It is 15. So, 15 days is the answer.

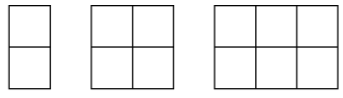
15 [days]

13. The baseball tickets at the stadium were going on sale at 4:00 p.m. At 1:00 p.m. 15 people were in line waiting to buy tickets. Every 15 minutes 10 more people got in line.
a. At what time were 75 people waiting in line?
b. How many people were in line at 4:00 p.m.?
You can create a table or:
a. 75-15 = 60 people were getting in line in increments of 10 people. Thus, we have 6 × 15min = 90 min after 1 pm is 2:30 pm
b. 4pm-1pm =3 hours, 3×4 = 12 increments of 15 minutes, thus 120 people got in line additionally. 15+120 = 135 people

Time	People
1:00 pm	15
1:15 pm	25
1:30 pm	35
1:45 pm	45
2:00 pm	55
2:15 pm	65
2:30 pm	75
…	…

a. 2:30 p.m.
b. 135 [people]

14. Gordon used toothpicks to make the pattern below. He used 7 toothpicks to make the first shape. Gordon said that he needed 51 toothpicks to make the tenth shape in the pattern. Was he right?
Use a chart to support your conclusion.



Shape 1 Shape 2 Shape 3

Shape	1	2	3	4	5	6	7	8	9	10
Toothpicks	7	12	17	22	27	32	37	42	47	52

Or shape 10 will have 3 horizontal lines of 10 picks and 11 vertical lines of 2 picks. 30+11×2 = 52 toothpicks

No. He needs 52 toothpicks.

15. Look at the repeating pattern below.
RRRBBGGYYRRRBBGGYY
If the pattern continues, what will be the 85th letter?
The pattern repeats after 9 letters: **RRRBBGGYY** **RRRBBGGYY.**
85÷9 = 9 R4. 9 full repetition of the pattern plus the 4th symbol from the beginning is **B.**

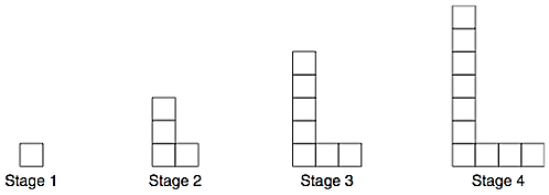
B

16. Sheila collects coins each day. She collects 3 coins on Day 1, and the number of coins she collects each day is double the number of coins she collected the day before. On what day will Sheila collect exactly 96 coins?

Day	1	2	3	4	5	6
Coins	3	6	12	24	48	96

6 or Day 6

17. Mr. Mahendran has 50 blocks. He uses 22 of these blocks to make the pattern shown below (4 stages). How many stages will Mr. Mahendran be able to complete with the 50 blocks? Notice that each stage is increasing by 3 blocks.

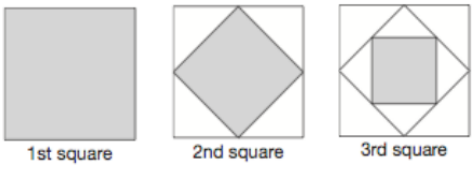


Stage	Blocks	Total Blocks
1	1	1
2	4	5
3	7	12
4	10	22
5	13	35
6	16	51

He will be able to complete 5 stages.

5 [stages]

18. Ms. Lewis draws shaded squares on separate identical square pieces of paper. The areas of the first three shaded squares are shown below. If this pattern continues, what will the area of the 7th shaded square be?



Area =144 cm² Area =72 cm² Area =36 cm²

The 4th shaded square = 36 ÷ 2 = 18 cm²
The 5th shaded square = 18 ÷ 2 = 9 cm²
The 6th shaded square = 9 ÷ 2 = 4.5 cm²
The 7th shaded square = 36 ÷ 2 = **2.25 cm²**

2.25 cm²

Solution is available on February 7, 2020 at www.mathinaction.org