Number and Shape Patterns

Spot mistakes, reason, and work backward

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

A rule must fit every step. For $4, 9, 14, 19$, add 5 each time; the next term is 24. In a repeating circle–square–triangle pattern, every third position is a triangle.

Worked example

The rule is start at 6, add 4. Write five terms and explain their parity.

1. $6 + 4 = 10$ and $10 + 4 = 14$.
2. $14 + 4 = 18$ and $18 + 4 = 22$.
3. The start 6 is even and adding even 4 keeps every term even.
Answer: $6, 10, 14, 18, 22$; all even.

Practice Problems

Show your thinking.

1. Find the mistake in the doubling pattern $3, 6, 12, 25, 48$.

2. A subtract-5 pattern ends $\square, \square, 22$. Find the first of these three terms.

3. Find a rule and two missing terms: $2, 6, 18, \square, \square$.

4. Triangle, circle, square, circle repeats. Name positions 10 and 12.

5. Complete a rule table: inputs $1, 3, 5$ give outputs $5, 9, 13$. State a rule that fits.

Input	Output
1	5
3	9
5	13

6. A fence pattern starts with 6 posts and adds 4 per section. How many posts after 3 additions?

7. Give two different add the same number patterns whose third term is 20.

8. The rule adds 3 starting at 2. Are the first six terms all even?

Answer Key

1. 25 must be 24.
2. 32.
3. Multiply by 3; $54, 162$.
4. Circle; circle.
5. Multiply by 2, then add 3.
6. 18 posts.
7. For example, $10, 15, 20$ and $16, 18, 20$.
8. No; parity alternates.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. $3 \times 2 = 6$ and $6 \times 2 = 12$.
2. $12 \times 2 = 24$, not 25.
3. $24 \times 2 = 48$ checks the repair.

Problem 2

1. One step backward adds 5: $22 + 5 = 27$.
2. Another step gives $27 + 5 = 32$.
3. $32, 27, 22$ follows the rule.

Problem 3

1. $6 \div 2 = 3$ and $18 \div 6 = 3$.
2. $18 \times 3 = 54$.
3. $54 \times 3 = 162$.

Problem 4

1. The repeating block has 4 shapes.
2. $10 = 2 \times 4 + 2$, so position 10 matches position 2: circle.
3. $12 = 3 \times 4$, so position 12 matches position 4: circle.

Problem 5

1. $1 \times 2 + 3 = 5$.
2. $3 \times 2 + 3 = 9$.
3. $5 \times 2 + 3 = 13$ verifies the rule on every row.

Problem 6

1. The three additions contribute $3 \times 4 = 12$ posts.
2. $6 + 12 = 18$ posts.
3. The terms $6, 10, 14, 18$ check all three additions.

Problem 7

1. Starting at 10 and adding 5 twice gives $10 + 2 \times 5 = 20$.
2. Starting at 16 and adding 2 twice gives $16 + 2 \times 2 = 20$.
3. The starts and step sizes differ, but both third terms are 20.

Problem 8

1. The six terms are $2, 5, 8, 11, 14, 17$.
2. $2, 8, 14$ are even; $5, 11, 17$ are odd.
3. Adding odd 3 changes parity each time.

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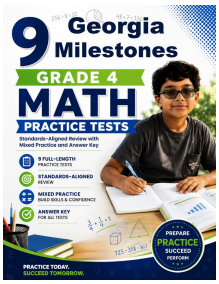

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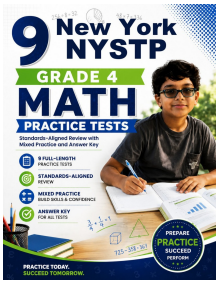

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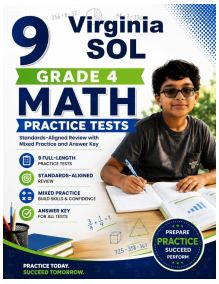

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