# Number and Shape Patterns

Apply the skill to decisions and designs

**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.** Design a five-term growing pattern starting at $4$ and ending at $28$, with equal increases.

**2.** A bead design repeats red, red, blue. How many blue beads are in the first $15$ beads?

**3.** A child plans $8, 12, 16, 21$ tiles for an add-$4$ design. Repair design $4$.

**4.** Draw the next two groups in a pattern of $2, 4, 6$ dots. State their sizes.

**5.** A savings jar starts with $7$ dollars and receives $5$ dollars each week. Give the totals after weeks $1, 2, 3$.

**6.** A machine doubles its input. Find the missing inputs for outputs $14, 22, 30$.

**7.** Can an add-$10$ pattern starting at $6$ reach $47$? Use the last digits.

**8.** An art table uses $3$ squares in design $1$, $5$ in design $2$, and $7$ in design $3$. Complete designs $4$ and $5$.

# Answer Key

1. $4, 10, 16, 22, 28$; add $6$.
2. $5$ blue beads.
3. $20$ tiles.
4. $8$ and $10$ dots.
5. $12, 17, 22$ dollars.
6. $7, 11, 15$.
7. No.
8. $9$ and $11$ squares.

## Step-by-Step Solutions

Follow each calculation, then check your own work.

### Problem 1

1. There are $4$ equal increases.
2. The total increase is $28 - 4 = 24$; each increase is $24 \div 4 = 6$.
3. $4 + 4 \times 6 = 28$ checks the endpoint.

### Problem 2

1. Each block of $3$ beads has $1$ blue bead.
2. $15 \div 3 = 5$ complete blocks.
3. $5 \times 1 = 5$ blue beads.

### Problem 3

1. $12 - 8 = 4$ and $16 - 12 = 4$.
2. $16 + 4 = 20$, not $21$.
3. $20 - 16 = 4$ checks the repaired step.

### Problem 4

1. The groups grow by $4 - 2 = 2$ dots.
2. The next group has $6 + 2 = 8$ dots.
3. The following group has $8 + 2 = 10$ dots.

### Problem 5

1. Week $1$: $7 + 5 = 12$.
2. Week $2$: $12 + 5 = 17$.
3. Week $3$: $17 + 5 = 22$.

### Problem 6

1. $14 \div 2 = 7$.
2. $22 \div 2 = 11$.
3. $30 \div 2 = 15$; doubling these gives the stated outputs.

### Problem 7

1. The first terms are $6, 16, 26, 36, 46$.
2. Adding $10$ preserves the ones digit $6$.
3. $47$ has ones digit $7$, so it cannot occur.

### Problem 8

1. The increase is $5 - 3 = 7 - 5 = 2$.
2. Design $4$: $7 + 2 = 9$.
3. Design $5$: $9 + 2 = 11$.

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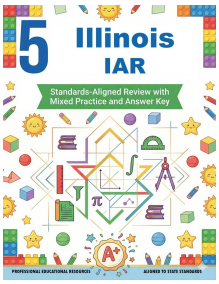


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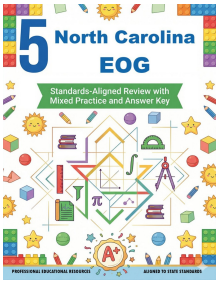


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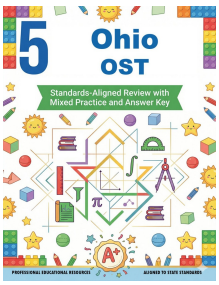


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