# Number and Shape Patterns

## Dear Family,

### This week your child is learning about number and shape patterns.

Your child might see a number pattern like the one below. He or she is learning how to find the next numbers in the pattern.

3, 6, 9, 12, _____ , _____

The **rule** in the number pattern is "add 3." So, the next numbers in the pattern are 15, 18.

Another way to describe the pattern is to say that the numbers alternate in an odd/even pattern. The first number is odd, the second number is even, the third number is odd, and so on.

Your child is also learning about shape patterns such as the one below.



The pattern of shapes is:
    pentagon, square, triangle, pentagon, square, triangle,
    pentagon, square, triangle

So, the next two shapes in the pattern are pentagon, square.

Another way to describe the shape pattern
is to say that the pattern has shapes with:
    5 sides, 4 sides, 3 sides, 5 sides, 4 sides, 3 sides, and so on.

Invite your child to share what he or she knows about patterns by doing the following activity together.
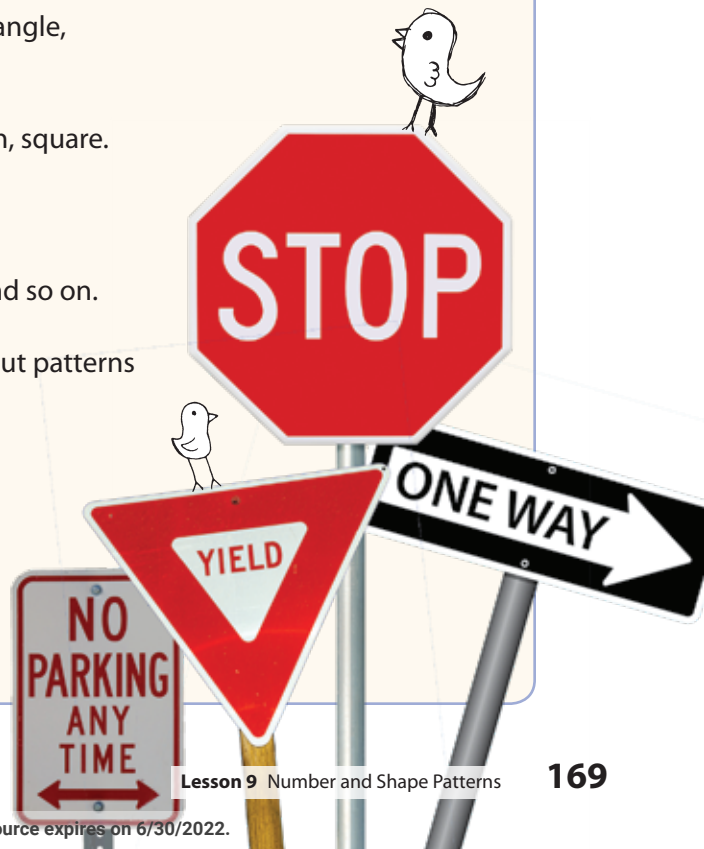
# ACTIVITY  NUMBER PATTERNS

**Do this activity with your child to find patterns in numbers.**

- Look at the number pattern below with your child.

  11, 22, 33, 44, 55, 66, 77, 88, 99, . . .

- Work together to identify the rule for the pattern.

- Talk about other patterns you notice in the numbers.

  For example:

  - *The numbers alternate between odd and even: the first number is odd, the second number is even, and so on.*

  - *The tens and ones digits are the same in each number.*

  - *The tens and ones digits each go up by 1 in the next number in the pattern.*

- Next, look at another number pattern and work together to identify the rule for the pattern.

  12, 23, 34, 45, 56, 67, 78, 89, . . .

- Talk about other patterns you notice in the numbers. Discuss how this pattern and the first pattern are alike and different.

- Challenge your child to think about the kind of number pattern you would get using the rule "subtract 11."
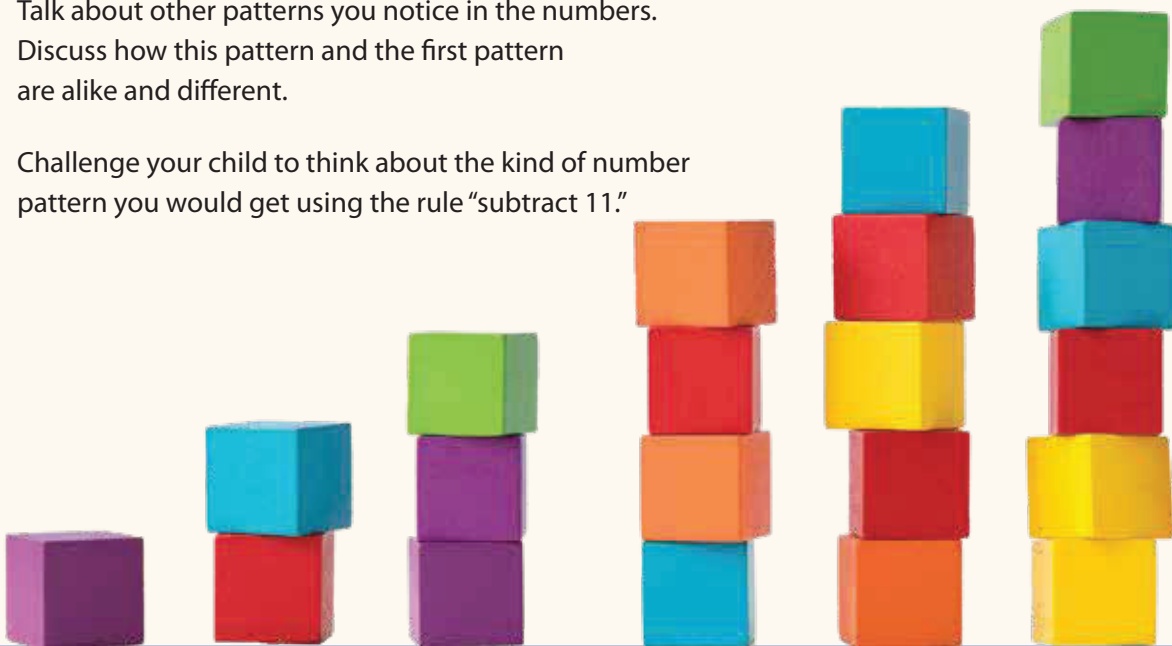
# Explore Number and Shape Patterns

You have used rules to describe patterns in numbers. In this lesson, you will explore patterns further. Use what you know to try to solve the problem below.
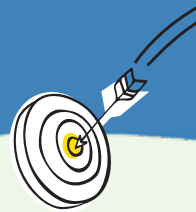
**Learning Target**
- Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

**SMP** 1, 2, 3, 4, 5, 6, 7, 8

**What are the next two numbers in the pattern below?**

5, 10, 15, 20, 25, _____ , _____

## TRY IT

**Math Toolkit**
- counters
- unit tiles
- hundred charts
- number lines
- index cards

### DISCUSS IT

**Ask your partner:** How did you get started?

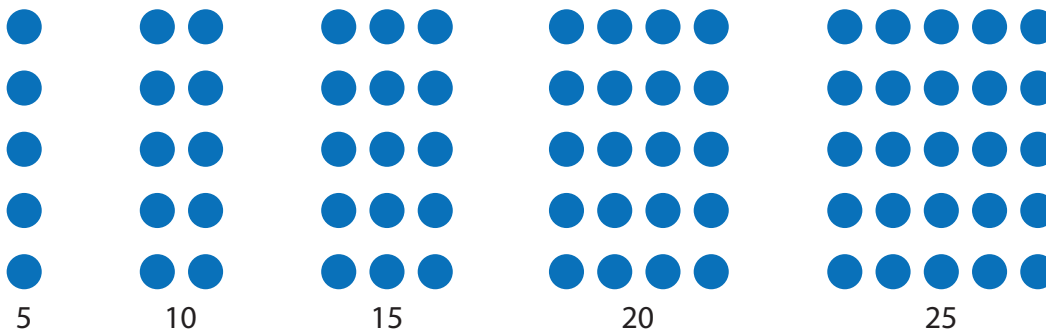**Tell your partner:** I knew . . . so I . . .

# CONNECT IT

**1 LOOK BACK**

Explain how you found the next two numbers in the pattern.

**2 LOOK AHEAD**

Sometimes there are other patterns you can find. Look at the number and dot model patterns below.



| 5 | 10 | 15 | 20 | 25 |

**a.** What pattern do you see in the digits in the ones places of the numbers?

**b.** Is there an even and odd pattern in the numbers and dots? If so, what is it?

**c.** Look at the number patterns 5, 10, 15, 20, 25 and 17, 22, 27, 32, 37, 42. How are they the same? How are they different?

**3 REFLECT**

Describe a pattern that you have noticed in the real world.

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# Prepare for Number and Shape Patterns

**1** Think about what you know about patterns. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

| What Is It? | What I Know About It |
|---|---|
| | |

**pattern**

| Examples | Examples | Examples |
|---|---|---|
| | | |

**2** What patterns can you find in the number pattern below?

10, 25, 40, 55, 70

**3** Solve the problem. Show your work.

**What are the next two numbers in the pattern below?**

**1, 7, 13, 19, 25, ____ , ____**

*Solution* ............................................................................................................

**4** Check your answer. Show your work.

# Develop Number Patterns

Read and try to solve the problem below.

> **Orlando swims laps in a pool every day. This week he swims 4 more laps each day than the day before. He swims 20 laps on Monday. Find how many laps Orlando swims each weekday this week.**

## TRY IT

### 🧰 Math Toolkit
- counters
- unit tiles
- hundred charts
- number lines
- index cards

## DISCUSS IT

**Ask your partner:** Do you agree with me? Why or why not?

**Tell your partner:** I disagree with this part because . . .

Explore different ways to identify and use number patterns.

> **Orlando swims laps in a pool every day. This week he swims 4 more laps each day than the day before. He swims 20 laps on Monday. Find how many laps Orlando swims each weekday this week.**
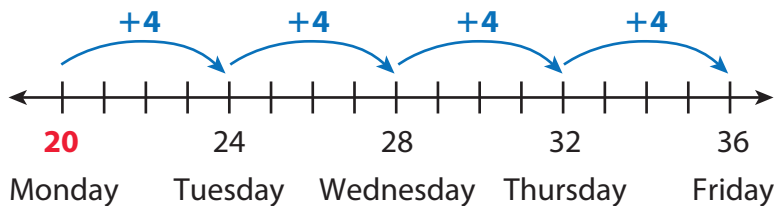
## PICTURE IT
**You can use a table to help understand the problem.**

| Day | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|
| Number of Laps | 20 | | | | |

+4      +4      +4      +4

## MODEL IT
**You can also use a number line to help understand the problem.**

+4      +4      +4      +4

20      24      28      32      36
Monday   Tuesday   Wednesday   Thursday   Friday

Start at 20, which is the number of laps Orlando swims on Monday.
Then count on 4 more for each weekday.

# CONNECT IT

**Now you will use the problem from the previous page to help you understand how to identify and use number patterns.**

**1** How many laps does Orlando swim each day?

Monday: _____ Tuesday: _____ Wednesday: _____ Thursday: _____ Friday: _____

**2** What is the **rule** you follow to get from one number to the next in the pattern?

...................................

**3** What does the pattern show you about what happens when you start with an even number and add an even number?

**4** Describe another pattern you see in this set of numbers.

**5** Explain how you found the additional pattern(s).

**6** **REFLECT**

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for solving a problem about a number pattern? Explain.

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## APPLY IT
**Use what you just learned to solve these problems.**

7   The first time Lori plays a new game, she scores 100 points. Each of the next 3 times she plays the game, she doubles her previous score. What are Lori's scores for the first 4 times she plays the game? Show your work.

*Solution* ...........................................................................................................

8   What is another pattern in Lori's scores?

*Solution* ...........................................................................................................

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9   Start with the number 16. Use the rule "divide by 2." Write the next three numbers in the pattern. Show your work.

*Solution* ...........................................................................................................
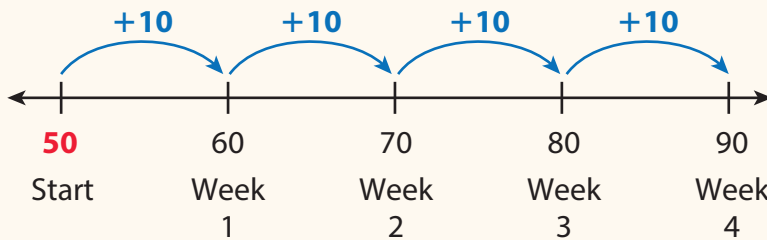
# Practice Number Patterns

**Study the Example showing how to use a pattern on a number line to solve a word problem. Then solve problems 1–8.**

## EXAMPLE

Riley saves $10 from her weekly babysitting job for 4 weeks. She starts with $50 in savings. How much does Riley have in savings at the end of 4 weeks?
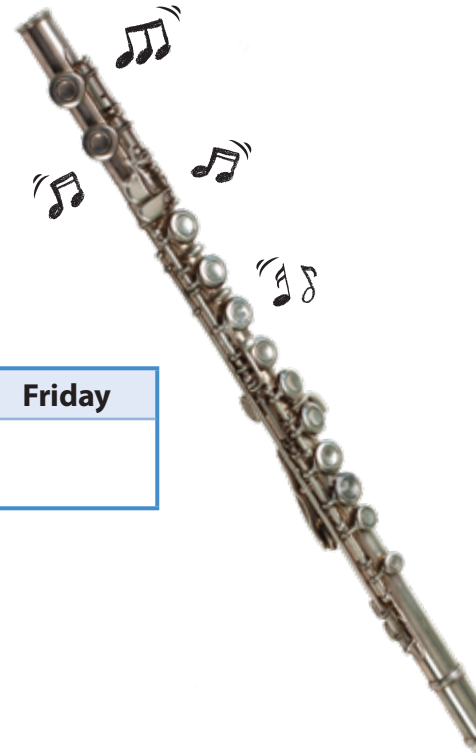


**Rule:** add 10

**Pattern:** 50, 60, 70, 80, 90

Riley has $90 in savings at the end of 4 weeks.

**Eduardo practices the flute each weekday. His music teacher wants him to practice 5 minutes longer each day this week. Eduardo practices for 20 minutes on Monday. How many minutes does Eduardo practice on Friday?**

1  Complete the table to show how many minutes Eduardo practices each day this week.

| Day | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|
| Number of Minutes | 20 | | | | |

2  Complete the sentence.

Eduardo practices for ............................. on Friday.

**3** Eric starts with $18 in savings. Then he saves $15 each month. Use the table below to answer the questions.

| Month | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Eric's Savings | $18 | $33 | $48 | $63 | $78 |

**a.** What will Eric's total savings be at the end of Month 5 and Month 6? Show your work.

**b.** What are two different patterns in Eric's monthly savings amounts?

**Eve's soccer team has 48 water bottles in the locker room. Each of the 12 players takes a water bottle before a game.**

**4** Complete the table to show how many water bottles are left in the locker room at the end of each of the first three games.

| Game | | 1 | 2 | 3 |
|---|---|---|---|---|
| Number of Bottles | 48 | | | |

**5** Use words and numbers to explain how to find the number of water bottles left after Game 1.

**6** What is the rule for the pattern? ...............................................................

**7** What number would come after 12 in the pattern? ..................

**8** What does this number mean?

# Develop Shape Patterns

Read and try to solve the problem below.

**Camille made a shape pattern with pattern blocks that goes back and forth between a triangle and a square. Show the pattern that Camille made.**

## TRY IT

### Math Toolkit
• pattern blocks
• pattern block templates
• rulers
• sticky notes

## DISCUSS IT

**Ask your partner:** Can you explain that again?

**Tell your partner:** At first, I thought . . .

Explore different ways to understand and model patterns with shapes.

> **Camille made a shape pattern with pattern blocks that goes back and forth between a triangle and a square. Show the pattern that Camille made.**

## PICTURE IT
**You can use drawings to show the pattern.**

Start by describing the pattern with words.
Repeat the pattern at least three times.

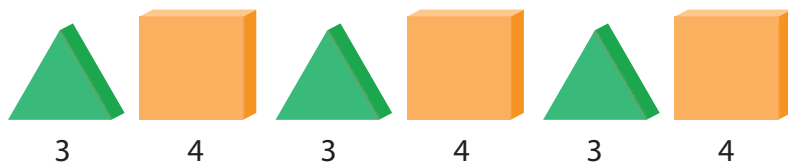triangle     square     triangle     square     triangle     square

Now draw the shapes in the order you named them.

## MODEL IT
**You can also use pattern blocks to show the pattern.**

Use pattern blocks in the shapes Camille used to make her pattern.
Use numbers to describe each shape.
Count the number of sides each shape has to label the shapes.

3     4     3     4     3     4

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# CONNECT IT

**Now you will use the problem from the previous page to help you understand and further explore shape patterns.**

**1** How many sides does a triangle have? ................

**2** How many sides does a square have? ................

**3** How could you describe the pattern using the number of sides the shapes have?

**4** What would the 10th shape in the pattern be, and how many sides would

it have? ....................................................................................................................

**5** Explain how you can figure out what the 85th shape in the pattern would be and how many sides it would have without drawing all 85 shapes.

**6** REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for exploring shape patterns? Explain.
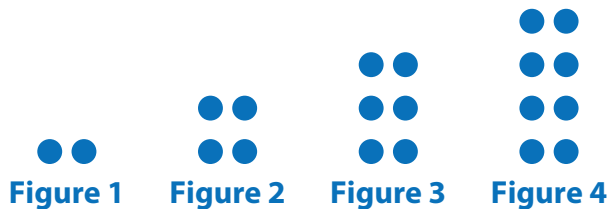
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## APPLY IT

**Use what you just learned to solve these problems.**

7  The pattern below follows the rule "add a row of two circles each time." Describe how the total number of circles in each figure of the pattern is related to the number of the figure.

**Figure 1     Figure 2     Figure 3     Figure 4**

*Solution* ......................................................................................................

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8  Draw a shape pattern that goes back and forth between a 5-sided shape and a 6-sided shape. Then describe the shape pattern in another way.

*Solution* ......................................................................................................

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9  The shapes in Sarah's pattern go back and forth between having an even number of sides and an odd number of sides. Which pattern is Sarah's pattern?

Ⓐ

Ⓑ

Ⓒ

Ⓓ

## Practice Shape Patterns

**Study the Example showing ways to describe a shape pattern.**
**Then solve problems 1–6.**

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### EXAMPLE

A banner has the shape pattern below. What will the next shape in the pattern be?

You can describe the pattern in words:
**triangle, square, pentagon, triangle, square, pentagon, triangle, square, pentagon**
You can describe the pattern by the number of sides in each shape:
3, 4, 5, 3, 4, 5, 3, 4, 5

The next shape in the pattern will be a triangle.

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**1** Draw the next two shapes in the shape pattern shown below.

**2** What two ways could you describe the shape pattern below?

**3** Look at problem 2. The 3rd, 6th, and 9th shapes are the same. Explain how to figure out what the 27th shape will be without drawing all 27 shapes.

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**4** Sasha draws a shape pattern that goes back and forth between a 5-pointed star and 4-pointed star.



What is another way to describe the pattern?

**5** Look at the shape pattern in problem 4. Tell whether each statement is *True* or *False*.

|  | True | False |
|---|---|---|
| The 7th spot has a 4-pointed star. | Ⓐ | Ⓑ |
| The 8th spot has a 5-pointed star. | Ⓒ | Ⓓ |
| The 99th spot has a 5-pointed star. | Ⓔ | Ⓕ |
| The 100th spot has a 4-pointed star. | Ⓖ | Ⓗ |

**6** Jamel used pattern blocks to make the shape pattern shown below. Tell whether each statement about Jamel's pattern is *True* or *False*.



|  | True | False |
|---|---|---|
| ◆ will always be in an even spot. | Ⓐ | Ⓑ |
| ▱ will always be on a multiple of 3. | Ⓒ | Ⓓ |
| The 16th spot is a ◆. | Ⓔ | Ⓕ |
| ▮ is in every 5th spot. | Ⓖ | Ⓗ |

# Refine Number and Shape Patterns

**Complete the Example below. Then solve problems 1–9.**

## EXAMPLE

**Hungry Heath's sells four different sizes of sandwiches: small, medium, large, and jumbo. The small sandwich costs $3. Each size after that costs $2 more than the next smaller size. How much does each sandwich cost?**

Look at how you could show your work using a picture.

small    medium    large    jumbo
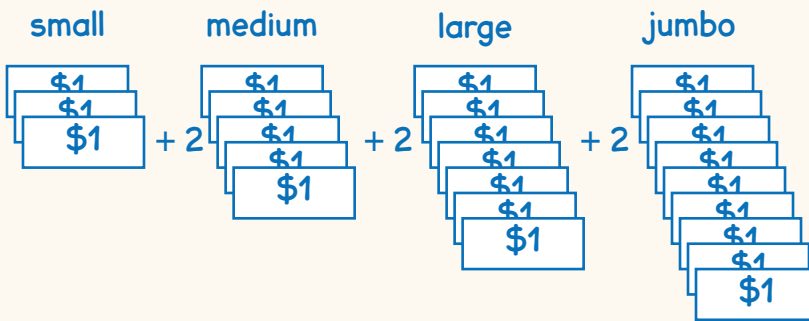
*Solution* ........................................................................

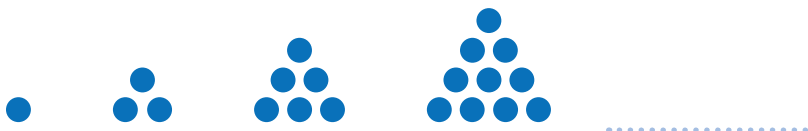The student used the rule "add 2" because each sandwich costs $2 more than the next smaller size.

**PAIR/SHARE**
Are there any other patterns in this set of numbers?

## APPLY IT

1  Write a rule for the pattern below. Draw the next figure in the pattern. How many circles will the next figure in the pattern have?

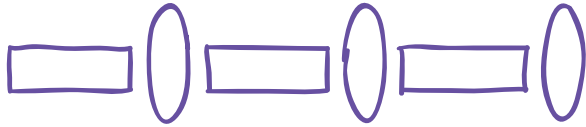What shape do the circles form in each of the group of circles after the first group?

*Solution* ........................................................................

**PAIR/SHARE**
Is your rule the same as your partner's?

**2** Eva drew a shape pattern that goes back and forth between rectangles and ovals.

There are several ways to describe a pattern!

What are two other ways you can describe this set of shapes?

*Solution*

**3** Lana used the rule "multiply by 2" to write the number pattern shown below.

10, 20, 40, 80

If the pattern continues, what would be the next number in the pattern?

How can you check your answer?

Ⓐ  82

Ⓑ  90

Ⓒ  160

Ⓓ  180

Diego chose Ⓐ as the correct answer. How did he get that answer?

**4** The rule for the pattern shown below is "add 10." What would be the 99th number in the pattern?

10, 20, 30, 40, 50

Ⓐ  99

Ⓑ  900

Ⓒ  909

Ⓓ  990

**5** Khadija drew the shape pattern shown below.



Select all the statements that correctly describe the pattern.

Ⓐ  Each shape has one more side than the shape before it.

Ⓑ  The shapes in the odd-numbered spots have an odd number of sides.

Ⓒ  The shapes in the even-numbered spots have an even number of sides.

Ⓓ  The hexagon only appears in spots that are multiples of 4.

Ⓔ  A square appears in all the spots that are multiples of 2.

**6** Tell whether each pattern follows the rule "add 7."

|  | Yes | No |
|---|---|---|
| 7, 17, 27, 37 | Ⓐ | Ⓑ |
| 1, 7, 49, 343 | Ⓒ | Ⓓ |
| 3, 10, 17, 24 | Ⓔ | Ⓕ |
| 9, 17, 25, 33 | Ⓖ | Ⓗ |
| 7, 14, 21, 28 | Ⓘ | Ⓙ |

**7** Draw a shape pattern that follows the rule that the shapes go back and forth between four sides and five sides. Show your work.

*Solution* ........................................................................................................

**8** Write a number pattern that follows the rule "subtract 6" and also has all odd numbers. Show your work.

*Solution* ........................................................................................................

**9** MATH JOURNAL

Rich says that a number pattern with the rule "add 2" always has even numbers. Is Rich correct? Explain.

☑ SELF CHECK Go back to the Unit 2 Opener and see what you can check off.