

PENNSYLVANIA
PSSA
ASSESSMENT
ANCHORS

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Mathematics

**Aligned to the
2007
Assessment
Anchors**



GRADE 4



**Developed in Consultation
with Pennsylvania Educators**

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Lesson 27 Geometric Patterns



- D.1.1.1 Extend or find a missing element in a numerical or geometric pattern (+, −, or × may be used—numerical patterns must be whole numbers).
- D.1.1.2 Identify/describe the rule for a numerical or geometric pattern shown (+, −, or × may be used—numerical patterns must be whole numbers).
- D.1.1.3 Create or replicate a numerical or geometric pattern showing 3 repetitions (+, −, or × may be used—numerical patterns must be whole numbers or money).

Patterns are made up of repeating groups of shapes or numbers. There are many different kinds of patterns.

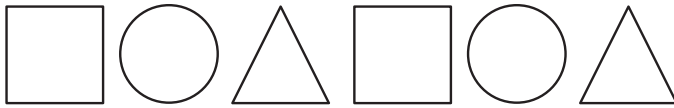
Some patterns have letters:

a b a b a b...

Some patterns have numbers:

1 2 3 1 2 3...

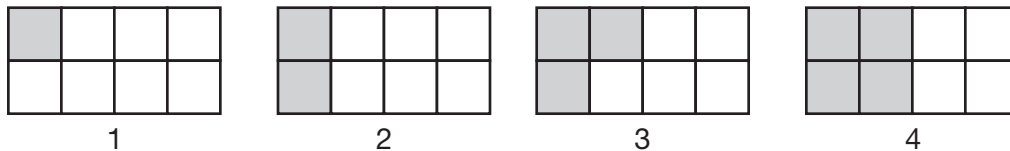
Some patterns have shapes:



Patterns with shapes are called **geometric patterns**.

EXAMPLE 1

The shaded parts in these four rectangles represent fractions. From one rectangle to the next rectangle, how much does each fraction increase?



STRATEGY Describe the pattern.

STEP 1 List the fractions for the shaded parts.

Rectangle 1: $\frac{1}{8}$

Rectangle 2: $\frac{2}{8}$

Rectangle 3: $\frac{3}{8}$

Rectangle 4: $\frac{4}{8}$

STEP 2 Find the difference between the amount shaded in each rectangle.

The shaded portions of the rectangles increase by $\frac{1}{8}$ of a rectangle each time.

SOLUTION The fractions increase by $\frac{1}{8}$ from one rectangle to the next rectangle.

EXAMPLE 2

Look at the rectangles in Example 1. How many shaded parts will the next rectangle in the pattern have?

STRATEGY Identify and extend the pattern.

STEP 1 Identify the pattern.

The number of shaded parts increases by 1 from one rectangle to the next rectangle.

STEP 2 Extend the pattern.

The last rectangle in the pattern has 4 shaded parts.

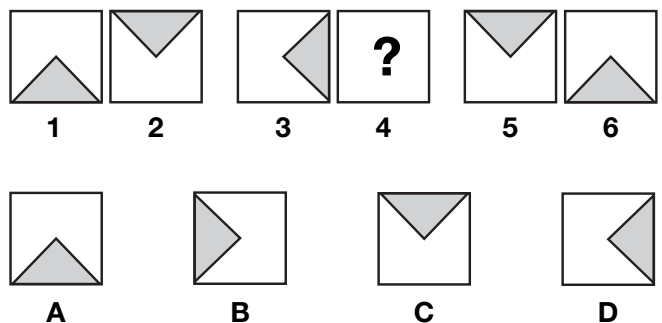
The next rectangle will have 1 more shaded part.

$$4 + 1 = 5$$

SOLUTION The next rectangle will have 5 shaded parts.

EXAMPLE 3

Which figure would replace the question mark in this pattern?



STRATEGY

Find the rule that describes the pattern. Then find the missing figure.

- STEP 1** How would you describe Figures 1 and 2?
In Figures 1 and 2, the shaded triangles are opposite each other.
- STEP 2** How would you describe Figures 5 and 6?
The shaded triangles are opposite each other.
- STEP 3** Describe the rule.
In each pair, the shaded triangles are opposite each other.
- STEP 4** Apply the rule to Figure 4.
Look for a shaded triangle opposite the triangle in Figure 3.

SOLUTION

The answer is B.

Which shape comes next in this geometric pattern?



Let's check it out.

How many flowers start the pattern? _____

How many triangles follow the flowers? _____

How many stars follow the triangles? _____

What is the last shape shown? _____

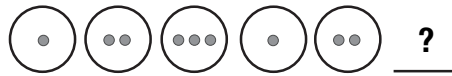
What shape comes next? _____

The next shape in the pattern is a _____.



Sample Test Questions

1. What is the next figure in this pattern?

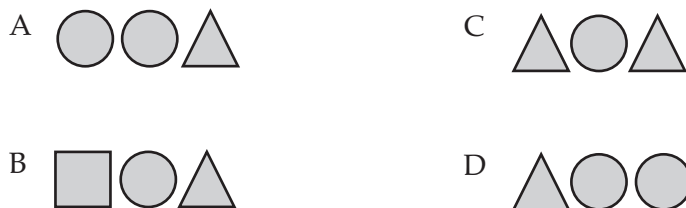


2. Which figure comes next in this pattern?

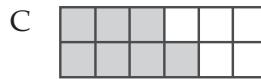
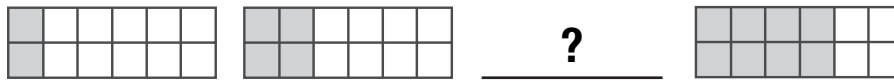


- A circle
- B rectangle
- C square
- D triangle

3. What are the next three figures in this pattern?



4. What is the missing figure in this pattern?



5. Which two letters come next in this pattern?

A B A C A B A C A B A C A B

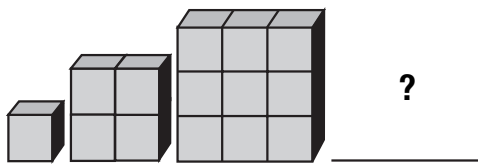
- A **A B**
- B **B A**
- C **B B**
- D **A C**

7. Which letter is missing from this pattern?

X Y X Z X Y ___ Z X Y X Z

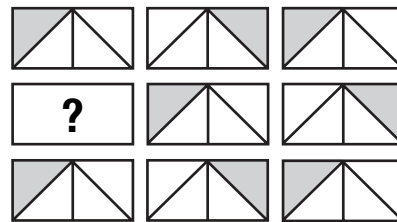
- A **X**
- B **Y**
- C **Z**
- D **W**

6. How many cubes will be needed to build the next figure?



- A 12
- B 15
- C 16
- D 25



8. Which figure would replace the question mark in this pattern?



- A
- C
- B
- D

9. The pattern below is made from the letters J and K.

J K J J J K J J J K J J

Which choice shows the same pattern if J is a  and K is a .



10. Gary made this pattern with squares, triangles, and circles. Julie wants to show the same pattern using 1 for each square, 2 for each triangle, and 3 for each circle. Which choice shows Julie's pattern?



- A 1, 2, 3, 1, 1, 2, 3, 1
 B 1, 2, 1, 2, 3, 1, 2, 3
 C 1, 1, 2, 3, 1, 1, 2, 3
 D 1, 2, 2, 3, 1, 2, 2, 3

Open-Ended Question

11. This diagram shows a pattern of stars, hearts, and triangles.



A. Describe the rule for the pattern. Use words and/or pictures in your description.

B. Show the same pattern using 1 for each star, 2 for each heart, and 3 for each triangle.