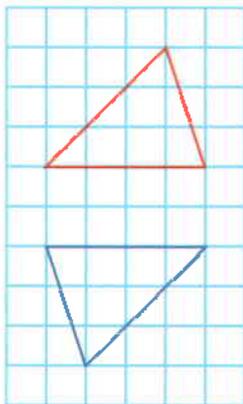


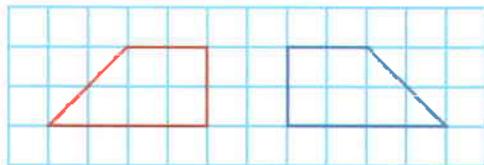
Multiple Choice

For questions 1 to 4, select the correct answer.

1. The transformation that relates the figures is
- A** a translation
B a reflection
C a rotation
D a translation and a reflection



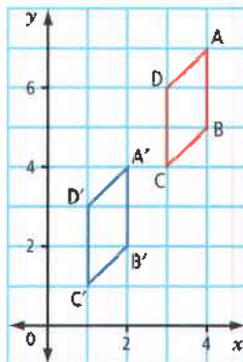
2. The transformation that relates the figures is



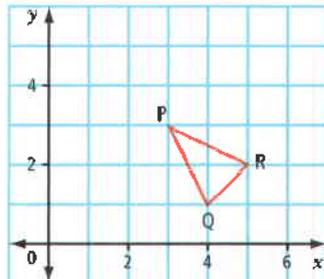
- A** a translation
B a reflection
C a rotation
D a translation and a rotation
3. Point $P(3, 4)$ is translated 1 unit left and 2 units down. The coordinates of its translation image, point P' , are
- A** $(2, 2)$
B $(1, 3)$
C $(4, 2)$
D $(5, 5)$
4. You can tile the plane using
- A** any figure
B any irregular figure
C any regular figure
D some figures, but not others

Short Answer

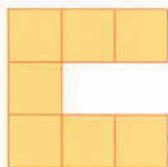
5. a) Design a frieze pattern that involves the translation and reflection of an irregular figure.
 b) Describe how you used the transformations to create your design.
6. What effect does the translation, reflection, or rotation of a figure have on the side lengths and angle measures of the figure? Explain why.
7. Describe the translation that moves parallelogram $ABCD$ onto its image, parallelogram $A'B'C'D'$.



8. $\triangle PQR$ is translated 2 units left and 3 units up. Draw the translation image, $\triangle P'Q'R'$.

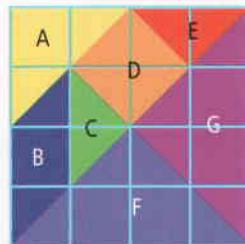


9. Does a regular pentagon tile the plane? Explain why or why not.
10. Does a scalene triangle tile the plane? Explain why or why not.
11. Create a tiling pattern using parallelograms that are not rectangles or squares. Colour or shade the pattern to create a design.
12. Seven square tiles have been arranged in a C-shape. Use grid paper to find out if this shape will tile the plane.



Extended Response

13. A tangram is an ancient Chinese puzzle. It includes 7 geometric pieces.



- a) Can you find pairs of pieces that are related by a translation? If so, describe the translation that relates the pieces in each pair.
- b) Can you find pairs of pieces that are related by a rotation? If so, describe the turn centre and turn angle for each pair.
- c) Can you find pairs of pieces that are related by a reflection? If so, describe the mirror line for each pair.

Chapter Problem Wrap-Up

In question 16 on page 432, you used identical squares to make all the possible tetrominoes. In question 8 on page 444, you chose a tetromino and used it as a tessellation tile to make a design.

Now, make or draw a pentomino by joining 5 congruent squares along whole edges. The simplest one is shown.



- How many different pentominoes are there? Draw them on grid paper.
- Choose any pentomino except the simplest one. Make the shape from construction paper or cardboard. Use your shape to tile the plane.
- Describe the transformations you used to tile the plane.
- Colour your design and create a display to explain what you did.

Chapter 13

1. **Answer: C**
2. **Answer: A**
3. **Answer: D**
4. **Answer: C**
5. **Examples Ans:**
 - a. frieze pattern idea: pick an irregular shape, **translate** it repeatedly to the right, and after each translation **reflect** it across a horizontal line (so it alternates “upright / flipped”).
 - b. “I slid the shape ___ units right each time (translation), then flipped it across a horizontal line.”
6. **No effect** on side lengths or angle measures. Translations, reflections, and rotations keep the figure the same size/shape, but change their position.
7. From the graph, each point moves **2 units left and 3 units down** to go from ABCD to A'B'C'D'.
8. From the graph: PQR = P(3,3), Q(4,1), R(5,2). Translate 2 left, 3 up. New coordinates of P'Q'R' = **P'(1,6) Q'(2,4) R'(3,5)**
9. **No.** A regular pentagon doesn't tile the plane because its interior angle is 108° , and $360^\circ \div 108^\circ$ is not a whole number.
10. **Yes.** Any triangle (including a scalene triangle) can tile the plane by repeating it and using rotations/reflections to fill gaps.
11. **Example:** tiling idea (parallelograms that aren't rectangles/squares): draw one parallelogram and **translate** it right to make a row; start the next row by shifting (translating) the same shape so the slanted sides interlock. Shade alternating shapes to make a pattern.
12. The 7-square “C” shape **does tile the plane**. One way: alternate the shape with a **reflected** version so the “gaps” interlock, forming repeating rectangles/strips across the plane.
13. Only **congruent** pieces can be paired by transformations. In a tangram, the guaranteed congruent pairs are: the **two large triangles** (a pair) the **two small triangles** (a pair).
 - a. **No, congruent pieces were related by translations**
 - b. **Rotation pairs:** The two large triangles can be matched by a **rotation** at the centre point and the two small triangles can also be matched by a rotation on the point to the left of letter G.
 - c. **Reflection pairs:** The mirror line between C and E would be right in the middle of square D. The mirror line for F and G is from the centre point to the bottom right corner point.