

My Problem-Solving Journal

Rich mathematical tasks for 21st century learners

Problem of the Week Challenge

WEEK 3

3rd & 4th Class

Use the maths problem and
Teaching Notes below to set your
class a fun and engaging challenge
this week!

Enter our competition on Instagram



16. Puzzling Patterns

A These are the first three shapes in a pattern.

Continue the pattern by drawing the next two shapes.

Shape 1 Shape 2 Shape 3

Write the pattern for the number of **blue** squares.

Write the pattern for the number of **red** squares.

Write the pattern for the **total** number of squares.

Maths Talk

What do you notice about the patterns?

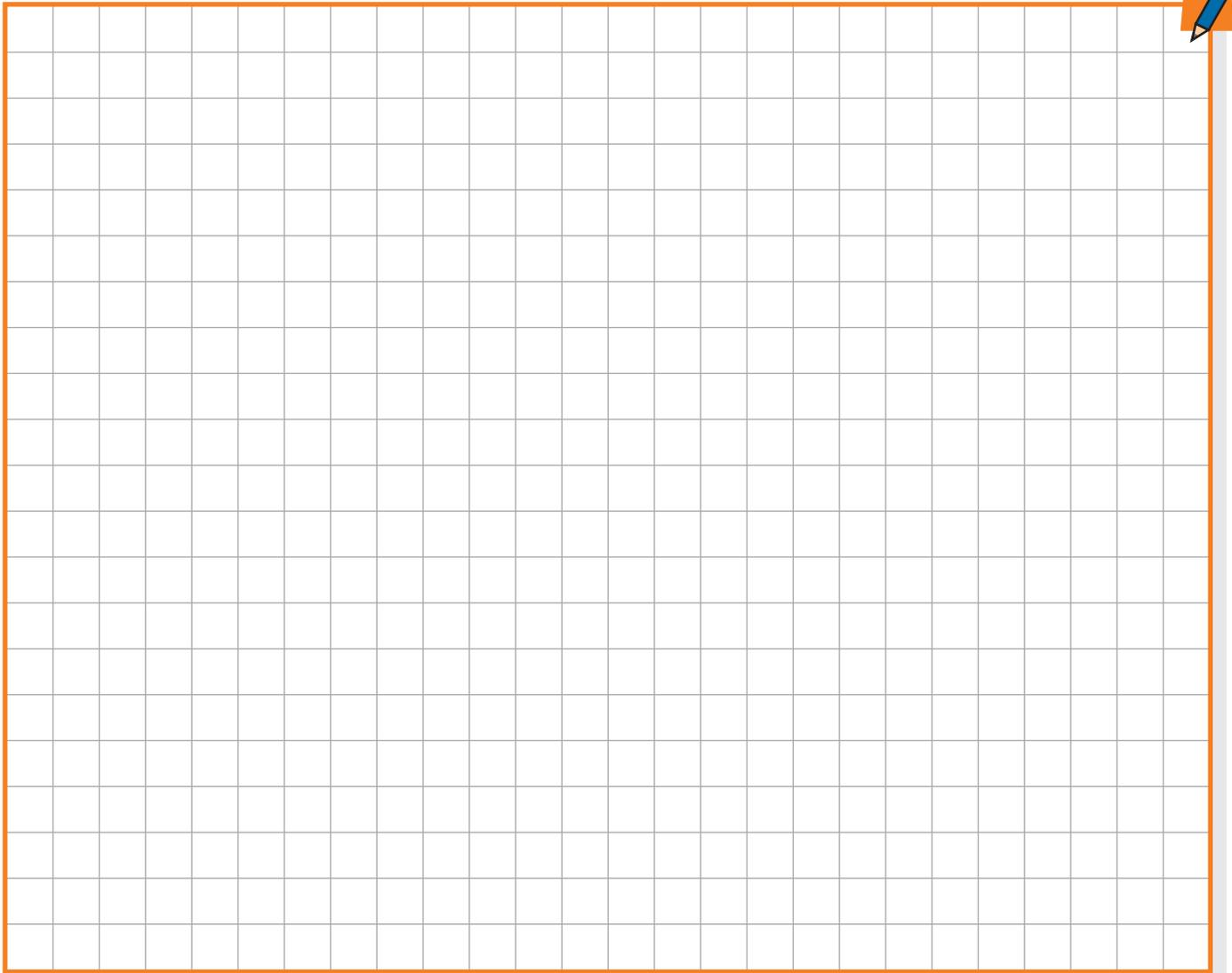
Red squares: _____

Blue squares: _____

Total squares: _____

B One of the shapes in this pattern uses 28 squares altogether.

Draw the shape. In the pattern, this is Shape number what?



C Describe what you think Shape 15 in the pattern would look like.

A large empty box for describing Shape 15. A small blue pencil icon is in the top right corner of the box.

Extension

Describe what you think Shape 20 and Shape 50 in the pattern would look like.

Algebra: Number Patterns and Sequences**16. Puzzling Patterns**

This task focuses on recognising and extending patterns and exploring the relationship between visual patterns and number patterns.

Focus Skills:

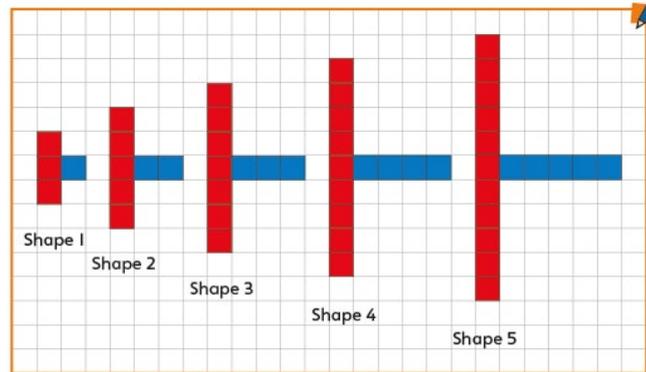
- *Applying and problem solving:* Select and apply a variety of strategies to solve problems.
- *Communicating and expressing:* Discuss problems presented verbally or diagrammatically and carry out analyses.
- *Reasoning:* Explore and investigate mathematical patterns and relationships.

Teaching Points:

- Ask students to look carefully at the shapes in Part A. Encourage them to compare the shapes, observing what stays the same and what changes. Remind them that patterns follow rules and ask them what they think the rule is for this pattern.
- Students may notice different things about the patterns in Part A, for example:
 - A red square is added to the top and bottom of the vertical column to make the next shape in the pattern.
The number of red squares in a shape is always double the shape number, plus one
i.e. The number of red squares in Shape $n = 2 \times n + 1$
 - A blue square is added to the right of the horizontal row to make the next shape in the pattern.
The number of blue squares in a shape is always the same as the shape number
i.e. The number of blue squares in Shape $n = n$
 - Three squares are added to a shape to make the next shape in the pattern.
The total number of squares is always three times the shape number, plus one
i.e. The total number of squares in Shape $n = 3 \times n + 1$
 - The red square in the middle of the vertical column has three arms coming out of it – one at the top, one at the bottom and one to the right – the number of squares in each arm is always the same as the shape number.
- Remind students that the pattern in Part B is continued from the pattern in Part A. Ask them how they can use what they know about the pattern to work out which shape in the pattern has 28 squares?
- Again, remind students that the pattern in Part C is continued from the pattern in Part A and B. How can they use what they know to describe Shape 15? They may choose to describe the pattern in terms of the number of red squares and blue squares and / or the total number of squares.
- Some students may benefit from physically making the pattern using blue and red cubes.
- Some students may require additional support to recognise and extend the pattern. To help them, ask questions such as 'What do you notice?', 'How many red squares are in each shape?' and 'What does that mean for the next shape – how many red squares will it have?'
- Encourage students to share their strategies for solving Part B and C with the class so that students may see more efficient methods.
- After completing this task, students could create their own patterns and share them with a partner. Their partner must then work out the rule and extend the pattern.

Anticipated Student Responses:

Part A



The pattern for the number of blue squares: 1, 2, 3, 4, 5

The pattern for the number of red squares: 3, 5, 7, 9, 11

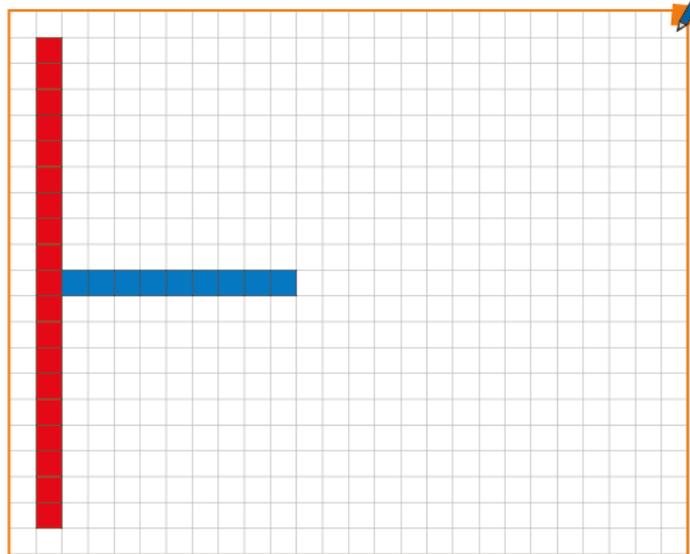
The pattern for the total number of squares: 4, 7, 10, 13, 16

Part B

Students may use different strategies to solve this. These may include:

- Drawing out the next shapes in the pattern until they find one that uses 28 squares.
- Drawing one shape in the pattern and continuing to add to it until 28 squares are used in total.
- Using their knowledge of the sequence of the numbers in the pattern to work out what shape will have 28 squares and how many red and blue squares will be in that shape: 4, 7, 10, 13, 16, 19, 22, 25, 28
- Using the rule that the total number of squares will always be three times the shape number, plus one: $(3 \times 9) + 1 = 28$

The answer is Shape 9:



Part C

Again, students may use different strategies to solve this, including those listed above. They may try a different strategy this time to see if it is more efficient, learning from the strategies used by their peers to solve Part B.

Shape 15: 31 red squares; 15 blue squares; 46 total squares

Extension

As per Part B and C, students may use different strategies, including those listed above.

Shape 20: 41 red squares; 20 blue squares; 61 total squares

Shape 50: 101 red squares; 50 blue squares; 151 total squares