TEACHER'S ANSWER KEY
Shape Puzzle Mastery - Homework Exercise

Lesson Topic: Collecting & Disappearing Rules in Shape Puzzles
Total Marks: 44
Website: https://oatutors.co.uk/
Recommended Time: 45-60 minutes

Teaching Notes

Key Concepts Assessed:

- Understanding of Collecting Rule (same shapes join together)
- Application of Disappearing Rule (different shapes cancel out)
- Color differentiation in shape puzzles
- Multi-step problem solving
- Visual interpretation and pattern recognition
- Creative problem construction

Common Student Errors to Watch For:

- Ignoring color differences when applying collecting rule
- Forgetting that different shapes cancel each other out
- Not showing working in multi-step problems
- Misunderstanding that shape + color must both match for collecting

1 Section A: Warm-Up Puzzles (8 marks total - 1 mark each)

Question 1: Same shapes collecting together

Answer: 5 circles
Working: 3 blue circles + 2 blue circles = 5 blue circles
Teaching Point: Emphasize that same shapes collect together (Collecting Rule)

Question 2: Different shapes disappearing

Answer: Nothing left (empty box)
Working: 2 red squares + 2 blue circles = 0 (different shapes cancel out)
Teaching Point: Different shapes always cancel each other out completely (Disappearing Rule)

Questions 3-8: Quick Practice

3. 4 triangles + 2 triangles = **6 triangles**
4. 3 stars + 3 stars = **6 stars**

5. 5 circles + 2 squares = **3 circles** (5-2=3 circles remaining)
6. 4 diamonds + 4 hearts = **Nothing/Empty** (different shapes cancel)
7. 6 rectangles + 1 rectangle = **7 rectangles**
8. 3 hexagons + 3 circles = **Nothing/Empty** (different shapes cancel)

2 Section B: Color Combinations (10 marks total - 1 mark each)

Teaching Reminder

Students must remember: Same shape AND same color = collecting. Any difference = canceling.

Question 1-5: Color Matching

1. 2 red circles + 3 red circles = **5 red circles**
2. 4 blue squares + 2 yellow squares = **2 blue squares** (4-2=2 remaining)
3. 3 green triangles + 3 green triangles = **6 green triangles**
4. 5 purple stars + 2 purple hearts = **3 purple stars** (5-2=3 stars remaining)
5. 1 orange hexagon + 4 orange hexagons = **5 orange hexagons**

Question 6-10: Mixed Colors

6. **Answer:** 3 red circles + 3 blue circles = **6 circles total (3 red + 3 blue) Working:** (2 red + 1 red) + (1 blue + 2 blue) = 3 red + 3 blue
7. 2 red + 1 blue circles PLUS 1 red + 2 blue circles = **3 red circles + 3 blue circles**
8. 3 yellow squares + 2 green squares = **1 yellow square** (3-2=1 remaining)
9. 4 purple triangles + 1 purple + 2 orange triangles = **3 purple triangles** (5-2=3)
10. 2 pink hearts + 3 pink diamonds = **1 pink diamond** (3-2=1 remaining)

3 Section C: Step-by-Step Problems (12 marks total)

Question 1: Multi-step puzzle (2 marks)

Working: - Step 1: 3 circles + 2 circles + 1 square = 5 circles + 1 square - Step 2: (5 circles + 1 square) + 2 squares = 5 circles + 3 squares - Since circles and squares are different shapes: 5-3 = 2 circles remaining

Final Answer: 2 circles

Question 2-4: Pattern Puzzles (3 marks total)

2. **Box 4:** 1 star + 1 heart + 1 circle + 1 triangle (1 mark) **Pattern:** Each box adds one new shape type

3. **Answer:** 2 triangles were added (1 mark) **Explanation:** 5 + something = 3, so 5 - 2 = 3 (2 triangles canceled out 2 of the original)

4. **Answer:** 1 diamond + 3 squares (1 mark) **Working:** 4 diamonds + 1 diamond + 3 squares = 5 diamonds + 3 squares = 2 diamonds + 3 squares

Question 5-8: Real Puzzle Practice (4 marks)

5. **Analysis:** (2 red squares + 1 blue circle) + (2 blue circles + 1 red square) **Result:** 3 red squares + 3 blue circles = nothing cancels, so keep all **Answer:** 3 red squares + 3 blue circles (2 marks)

6. **Answer:** 6 blue stars + 4 red hearts (different shapes, so both remain) (1 mark)

7. **Working:** Started with 7, ended with 2, so 5 disappeared If equal numbers cancel: added 5 different shapes **Answer:** 5 shapes (1 mark)

Question 9-12: Challenge Problems (3 marks)

9. **Sample Answer:** 3 circles + 2 squares = 1 circle **Award marks for:** Correct application of rules (1 mark)

10. **Working:** Box B = 3 circles, Box A = 6 circles **Answer:** 3 + 6 = 9 circles total (1 mark)

11. **Answer:** 3 squares were in the mystery box **Working:** 3 + 4 = 7 squares (1 mark)

12. **Sample Design:** 8 triangles + 3 circles = 5 triangles **Award marks for:** Correct final result of 5 triangles

4 Section D: Visual Puzzles (8 marks total - 1 mark each)

Visual Assessment Guide

Look for: Accurate counting, correct rule application, clear drawings/descriptions

Question 1-4: Shape Counting

1. **Count First Box:** 3 red circles + 2 blue squares **Count Second Box:** 2 red circles + 2 blue squares **Combined:** 5 red circles + 4 blue squares **Result:** 1 red circle (5-4=1) (1 mark)

2. **Sample Drawing:** Show 3 yellow triangles meeting 2 green circles **Result:** 1 yellow triangle remaining (3-2=1) (1 mark)

3. **Answer:** Nothing remains (they all cancel out) (1 mark)

4. **Award marks for:** Creative design using 3+ different shapes with correct rule application (1 mark)

Question 5-8: Advanced Visuals

5. **Sample Answer:** "Shapes in same positions collect, different shapes in same positions cancel" (1 mark)
6. **Sample Puzzle:** 5 circles + 3 squares = 2 circles + 3 squares (1 mark)
7. **Award marks for:** Reasonable attempt at memory + addition (1 mark)
8. **Pattern Analysis:** Circle-square repeating + triangle-triangle **Answer:** Circle, triangle, square, triangle (1 mark)

5 Section E: Problem-Solving Adventures (6 marks total - 1 mark each)

Question 1: The Missing Shapes Mystery

Answer: 5 triangles were in the box originally **Working:** 5 + 3 = 8 triangles total

Question 2: The Disappearing Act

Answer: 6 different shapes (hearts, squares, circles, etc.) **Explanation:** Different shapes cancel with the stars

Question 3: The Shape Factory

Working: - Morning: 5 circles + 3 squares = 2 circles (5-3=2) - Afternoon: 4 triangles + 4 hearts = 0 (cancel out) - Evening: 2 circles + 0 = 2 circles **Final Answer:** 2 circles

Question 4: The Puzzle Master Challenge

Sample Solution: 1. 8 stars + 2 stars = 10 stars (creates 6... wait, this creates 10) **Corrected Sample:** 1. 4 circles + 2 circles = 6 circles 2. 6 circles + 4 triangles = 2 circles 3. 2 circles + 0 = 2 circles

Question 5: The Great Shape Sort

Analysis: Look for pairs (same shape AND color) - 4 red circles (can make 2 pairs) - 3 blue circles (can make 1 pair, 1 leftover) - 2 red squares (can make 1 pair) - 5 blue squares (can make 2 pairs, 1 leftover) - 1 green triangle (no pair) **Answer:** Keep all red circles, 2 blue circles, all red squares, 4 blue squares

Question 6: Invent and Solve

Award marks for: Creative puzzle with correct solution shown

Marking Rubric

Grade Boundary	Percentage	Teaching Action
Excellent (40-44)	91-100%	Extend with more complex multi-step problems
Good (35-39)	80-90%	Review color combinations, practice visual puzzles
Satisfactory (28-34)	64-79%	Reinforce basic rules, more guided practice
Needs Support (¡28)	¡64%	Reteach core concepts, use manipulatives

Extension Activities for Fast Finishers

1. Create a 5-step puzzle that ends with exactly 1 shape
2. Design puzzles using fractions (e.g., half the circles disappear)
3. Invent puzzles with 3D shapes (cubes, spheres, pyramids)
4. Create "reverse puzzles" - given the answer, what was the question?

Differentiation Notes

For Struggling Students: - Use physical manipulatives (colored shapes) - Start with single-step problems only - Focus on one rule at a time - Provide visual aids and step-by-step guides

For Advanced Students: - Introduce algebraic thinking (if 3 + x = 7, what is x?) - Multi-variable problems (shapes with patterns/textures) - Create puzzles for younger students - Investigate mathematical properties (commutative, associative)

Assessment Notes

Look for evidence of: - Systematic approach to problem-solving - Clear communication of mathematical thinking - Ability to check answers for reasonableness - Creative and logical puzzle construction - Understanding of fundamental NVR concepts

Common Misconceptions to Address: - Thinking that any shapes can collect (must be same shape AND color) - Forgetting that cancellation results in complete disappearance - Not recognizing that order doesn't matter in these operations - Confusion between addition and the collecting/disappearing rules

Teacher Notes Section:

Class Performance Summary:

Next Lesson Focus: