Geometric Analogies

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Introspective Observations

- **Identification and isolation of different shapes in the image, even if they are overlapping**

- **Creation of generic logical rules such as "the shape inside of the bigger shape is removed"**

- **The different operations manipulating the images include: rotation, flipping, adding, and subtracting shapes (moving shapes are considered adding then subtracting)**

- **Edge detection must explore every pixel neighboring a non-zero one in order to find the entire boundary of the shape, but will fail when shapes are overlapping**

# System Description

- **Idea: Solve the problems without having to isolate the different shapes**

- **Algorithm first attempts to find the correct answer if the only change is a simple rotation or flip of the entire image**

- **Operates under the theory that whatever changes happen between images A and B, they will be congruent to the changes between C and the correct answer**

- **The difference maps between images are created by subtracting B from A and all possible answers from C**

- **Added pixels are valued as +1 and removed pixels are valued as -1**

- **Pixels changed within each quadrant is compared between the A-B and C-options difference maps**

- **Whichever C-option image has the closest number of quadrant differences on average to the A-B quadrants, is chosen as the correct answer**
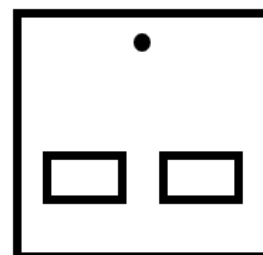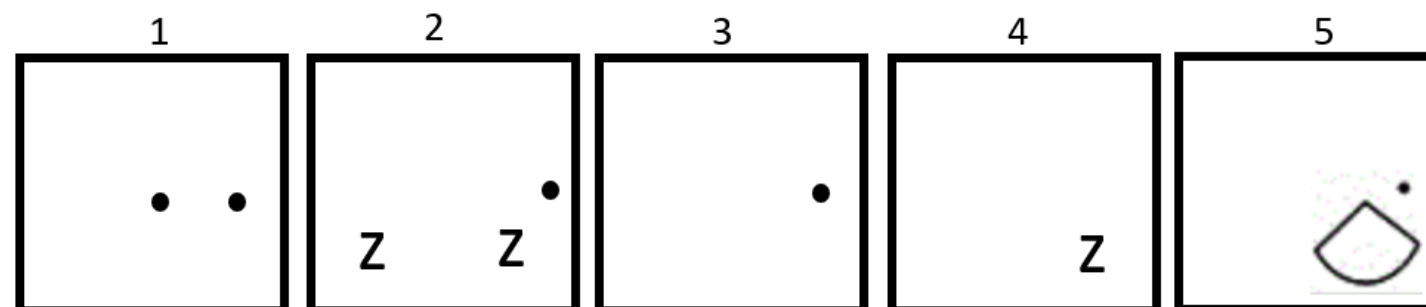
Example Problem 1
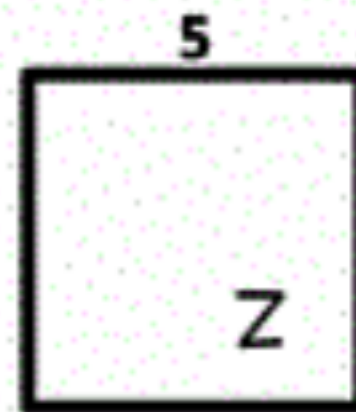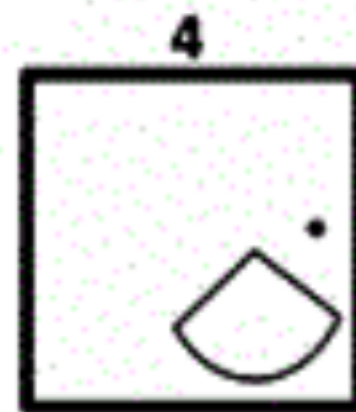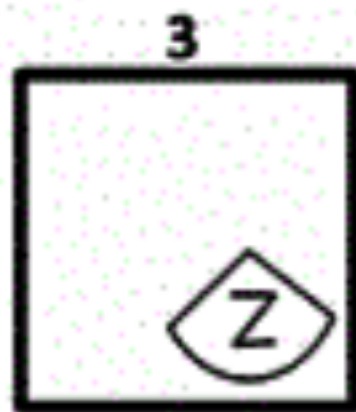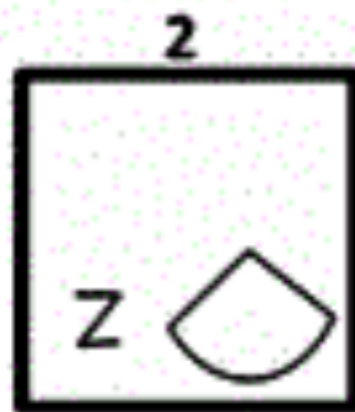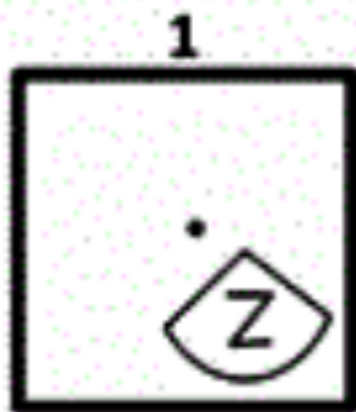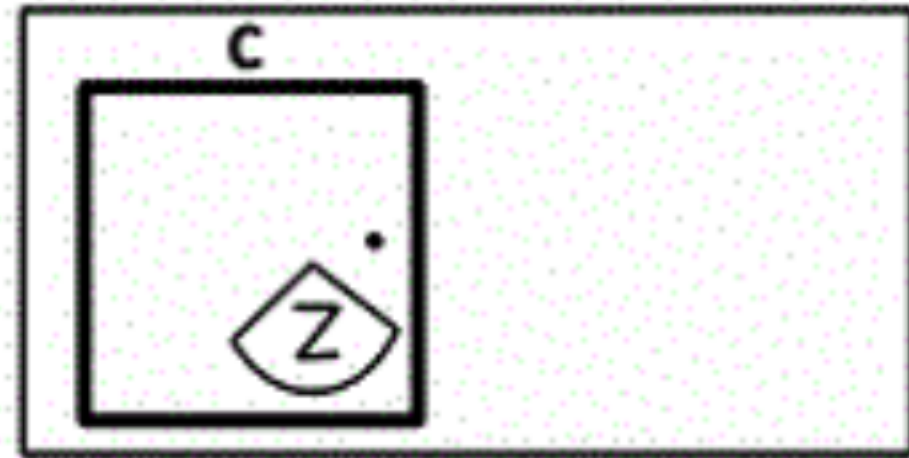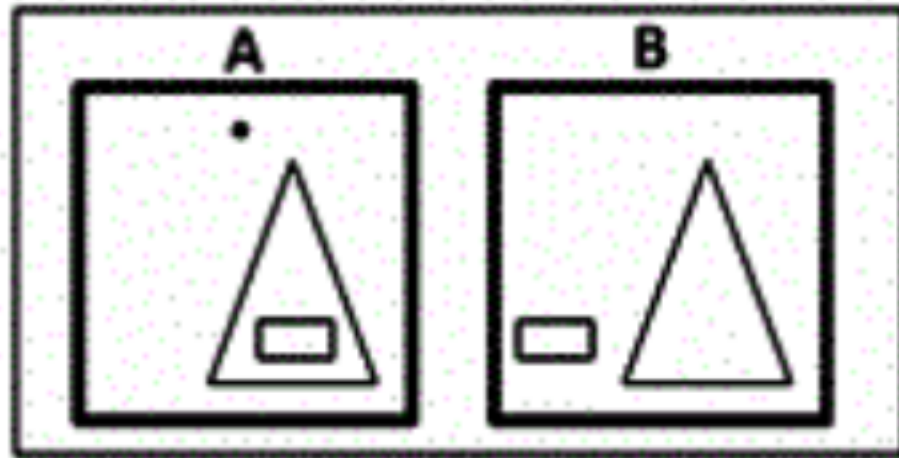
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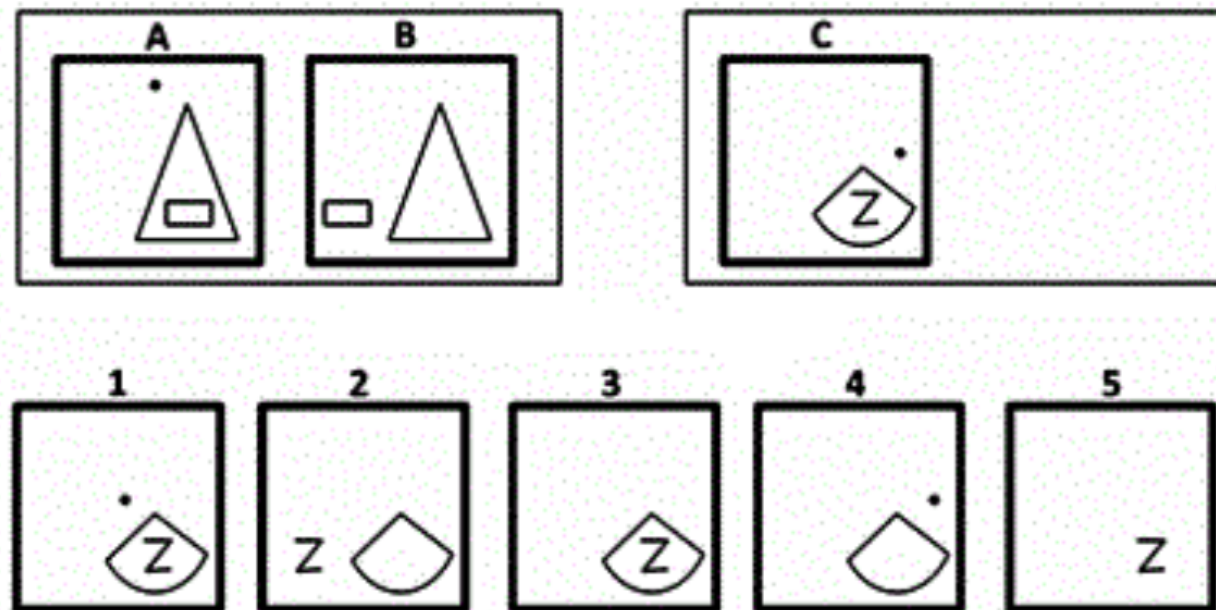
(A - B)

(C - options)

Results

- **Part 1:**
- **Solves 8 problems correctly for 53% accuracy: 1, 2, 5, 6, 8, 9, 11 and 12**
- **Solves two additional problems in top two answers for 67% accuracy: 7 and 15**
- **Solves three additional problems in top three answers for 13/15 problems (87% accuracy): 3, 10 and 14**

Part 2:
- **Solves 3 of the 5 additional problems correctly for 60% accuracy rate: 16, 17, and 19**
- **Solves one additional problem in top two answers for 80% accuracy: 13**

- **Only problems that our system does not come close to the correct answers are 4, 13 and 20**

Conclusion

- **Main idea: What is easy for us to do is not easy to program the computer to do**

- **We are are versatile while computers are not - we have to consider every possible case when creating a system**