Smart Cub Learning

11+ TOPIC PACK

Rotations and Reflections

Non-verbal Reasoning

60 questions from warm-up to exam level, with worked solutions

SAMPLE

Smart Cub Learning topic packs are original practice material. We are not affiliated with GL Assessment, CEM, Quest Assessments, Kent County Council or any school.

How to do it

A shape can be changed in two ways. You can turn it, or you can flip it in a mirror. Each question tells you the change, and you pick the picture that shows the result.

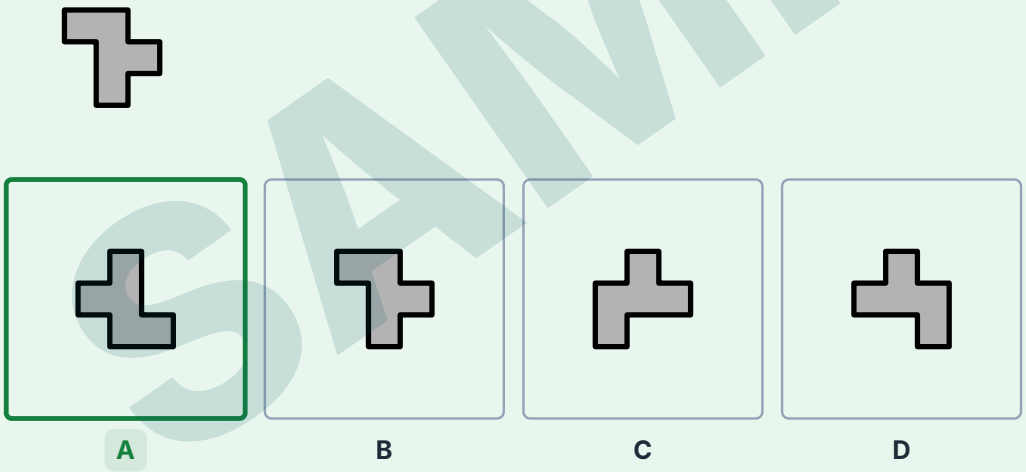
Learn the method

1. Read the change. Is it a turn or a flip? A question may have one change or two, so do them one at a time, in order.
2. Pick one corner of the shape that is easy to spot. Mark it in your head. Follow only that corner.
3. For a turn, clockwise means the way a clock's hands move. A quarter turn is 90 degrees. A half turn is 180 degrees. 270 degrees clockwise is the same as a quarter turn anticlockwise.
4. For a flip, the mirror line stays still. A vertical line swaps left and right. A horizontal line swaps top and bottom. One flip changes which way round the shape faces. A turn never does.
5. Find where your corner has gone. Cross out any picture where it is in the wrong place. Check the picture that is left against the shape.

Worked example 1

Choose the picture that shows the shape after the change described. A quarter turn is 90 degrees, a half turn is 180 degrees, and 270 degrees is three quarter turns. A horizontal mirror line goes across, so it flips the shape top to bottom. A vertical mirror line goes up and down, so it flips the shape left to right.

Rotate the shape 180 degrees.



How to work it out

1. A turn of 180 degrees is a half turn. The top of the shape moves to the bottom.
2. A turn never flips the shape over, so the answer is not a mirror image.
3. Before the change, the bottom edge is half as long as the top edge.
4. After the change, the short edge that was at the bottom is at the top.
5. Only one answer shows that.

The answer is A.

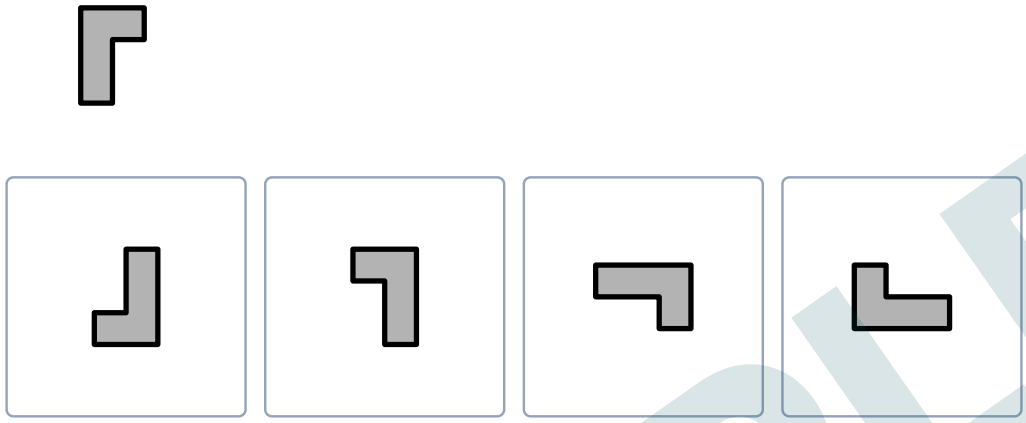
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Part 1 Warm up: single turns and flips

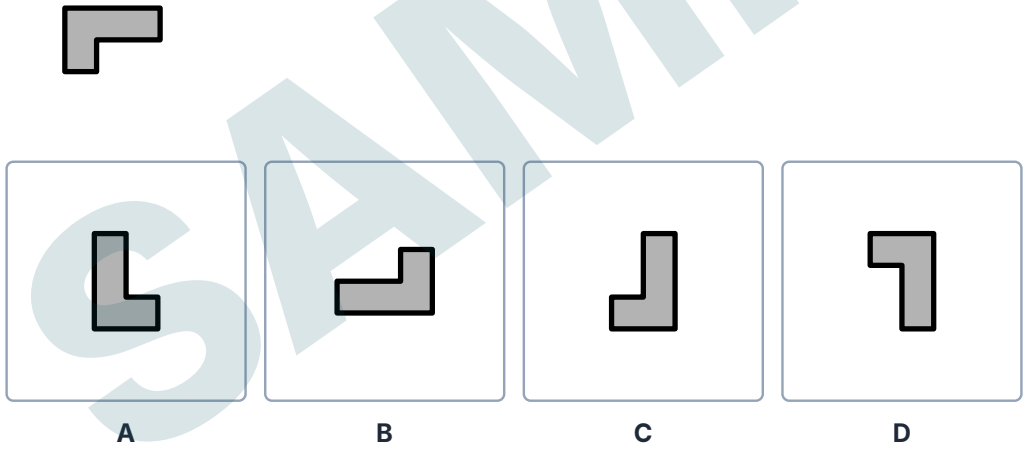
15 questions. Circle the letter of your answer. Use spare paper for your working.

Choose the picture that shows the shape after the change described. A quarter turn is 90 degrees, a half turn is 180 degrees, and 270 degrees is three quarter turns. A horizontal mirror line goes across, so it flips the shape top to bottom. A vertical mirror line goes up and down, so it flips the shape left to right.

1 Rotate the shape 90 degrees clockwise.



2 Rotate the shape 180 degrees.



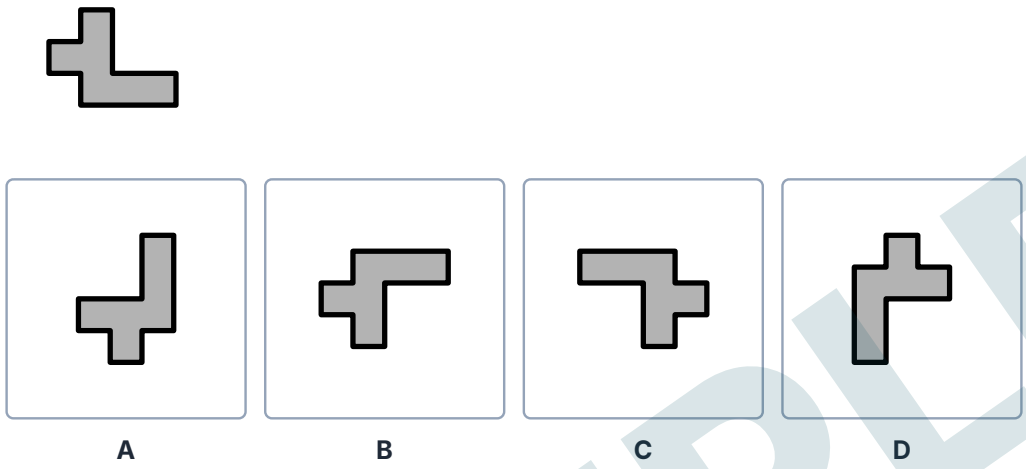
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Part 3 Stretch: harder shapes, one or two changes

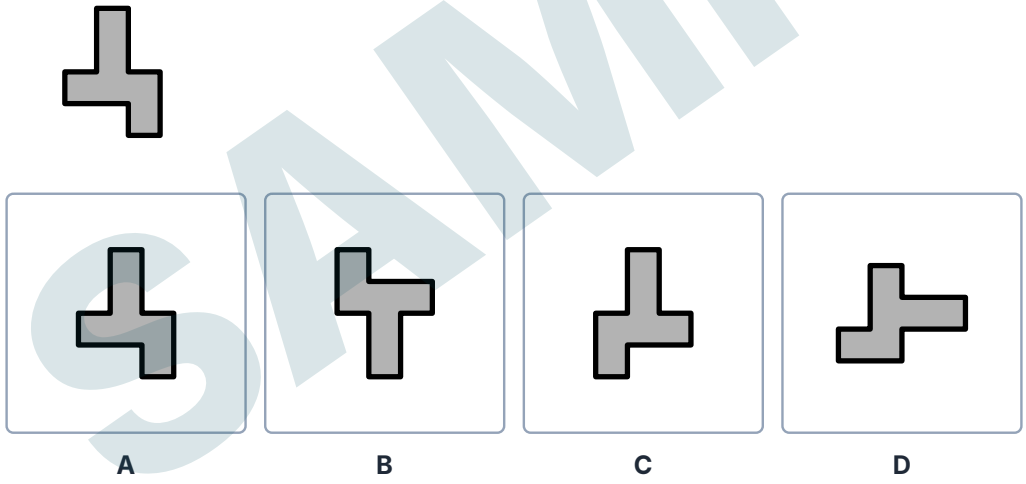
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Choose the picture that shows the shape after the change described. A quarter turn is 90 degrees, a half turn is 180 degrees, and 270 degrees is three quarter turns. A horizontal mirror line goes across, so it flips the shape top to bottom. A vertical mirror line goes up and down, so it flips the shape left to right.

31 Rotate the shape 90 degrees clockwise.



32 Rotate the shape 90 degrees clockwise.



SAMPLE