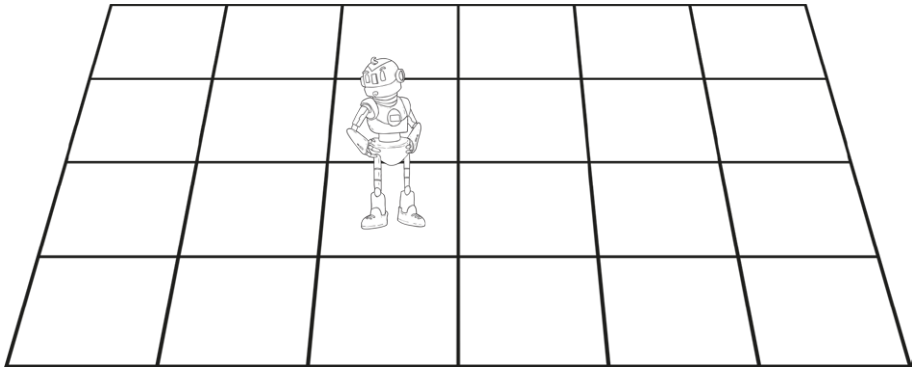
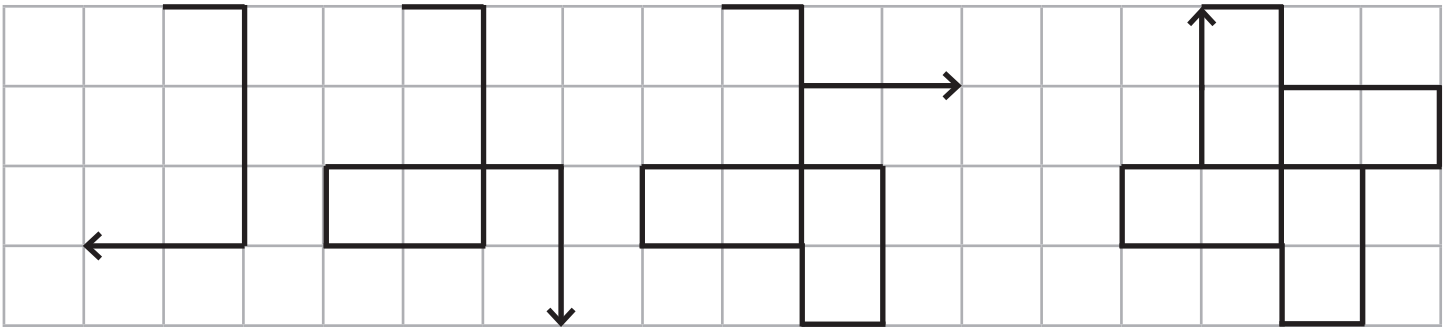
Spirals

A robot draws spirals on square grids. The robot follows an algorithm of numbers. After each number in the algorithm, the robot turns 90° to the right.



Here is how the pattern (1, 3, 2) can be drawn:



The arrow is only to indicate how the shape is drawn.

Here are some of the patterns drawn by different algorithms.
On square paper, try these spirals:

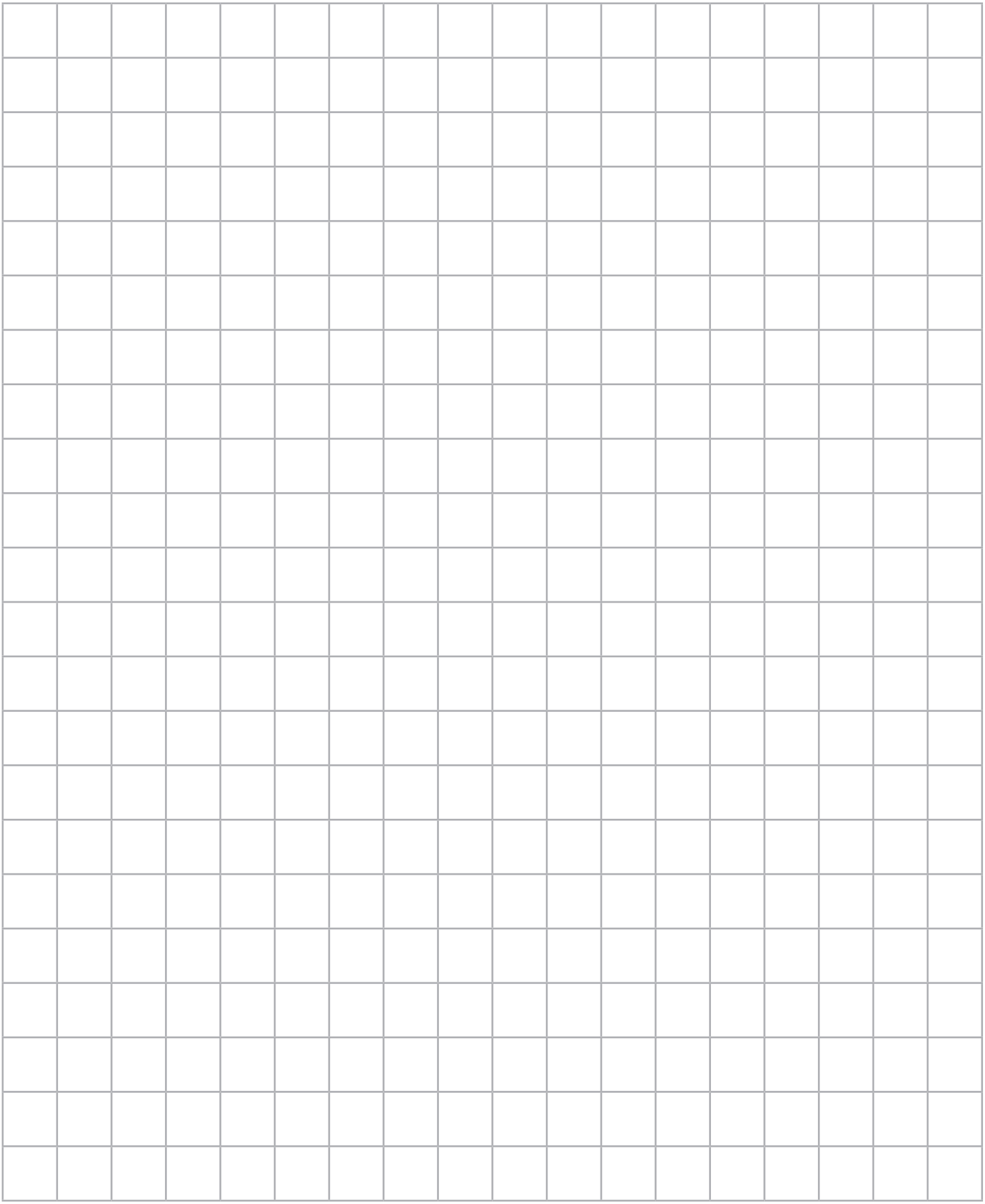
- (2)
- (3, 1, 1)
- (2, 3, 1, 1)
- (3, 2, 1, 1, 2)

Investigate:

1. Some spirals are closed, while others go on and on. Can you explain why?
2. Can you find sets of numbers that give the same spirals?
3. Try on isometric paper and turn 120°.

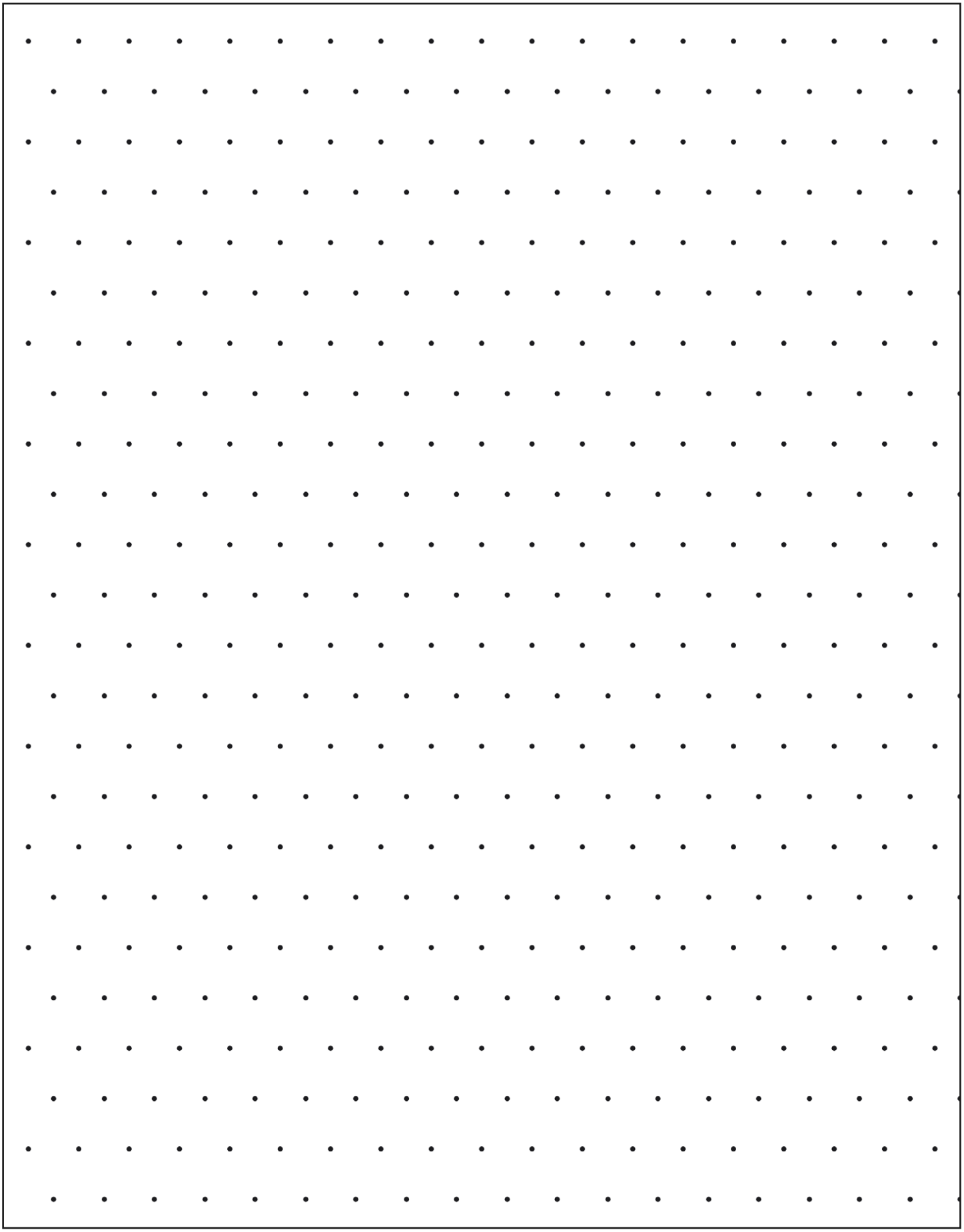
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Spirals



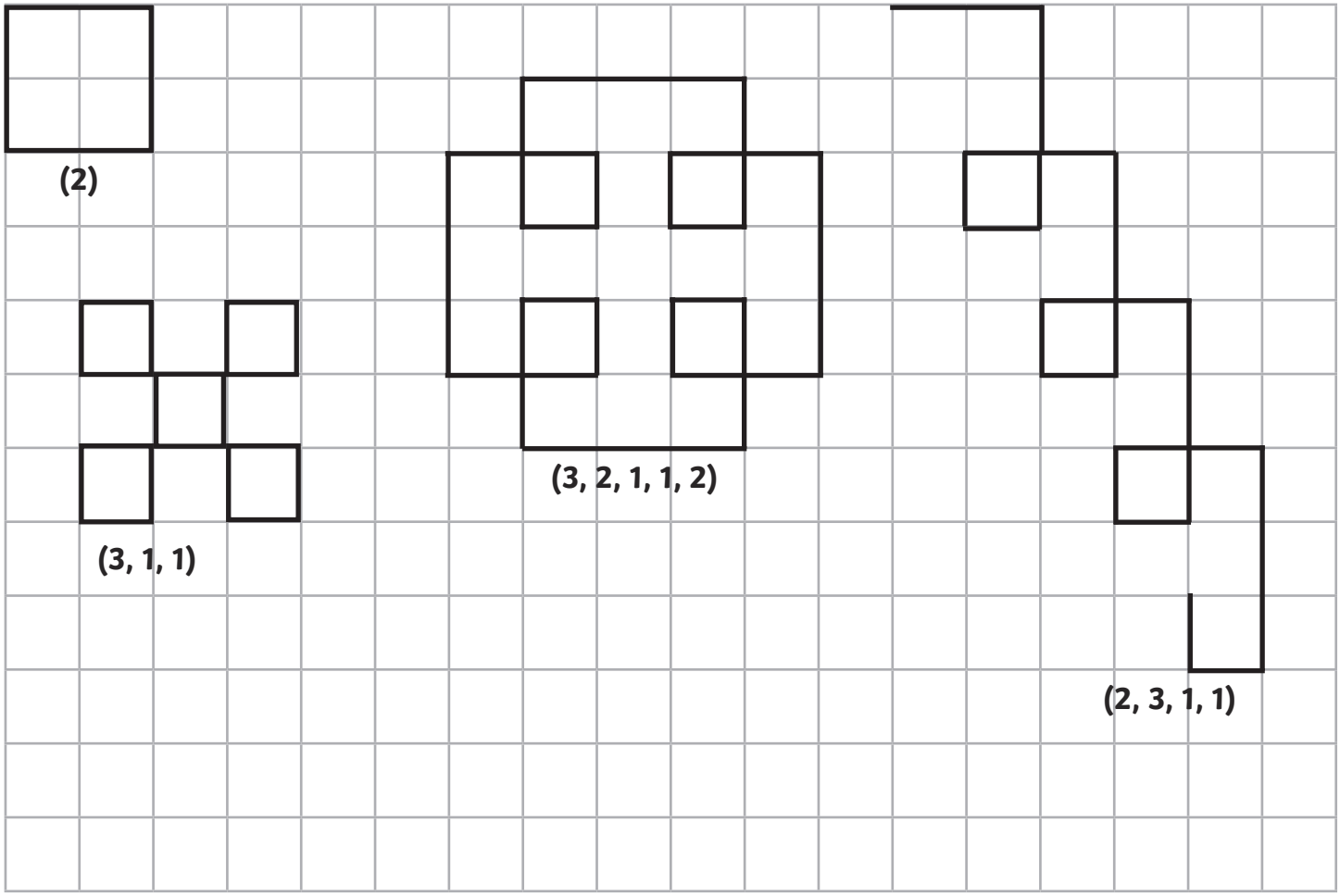
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Spirals



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Answers



1. An odd set of numbers in the algorithm closes a spiral. An even set of numbers in an algorithm goes on and on.
2. The reverse of an odd set of numbers will give the same pattern.
3. Even sets will be closed, odd sets will go on and on.

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