The rectangle below consists of eight squares. The length of each side of each square is 1 unit. The length of the shortest path from A to C using the lines shown is 6 units.

A

C
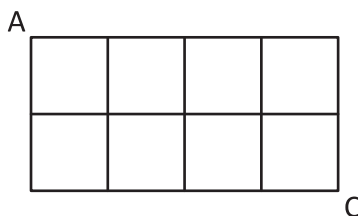
How many different six-unit paths are there from A to C?

Solution: 15.

Any of the six-unit paths will consist of two vertical segments and four horizontal segments, so this problem reduces to determining the number of ways that two vertical segments can be chosen. However, the vertical segment selected in the upper half must be to the left of the vertical segment chosen in the lower half. Otherwise, the path will be longer than 6 units.

For instance, in the figure below, if *p* is chosen as the vertical segment in the upper half, then only *y* or *z* could be chosen as the segment in the lower half. If any of *v*, *w*, or *x* were chosen, the path would have to "backtrack" and thus be longer than 6 units.

A
| *m* | *n* | *o* | *p* | *q* |
| *v* | *w* | *x* | *y* | *z* |
C
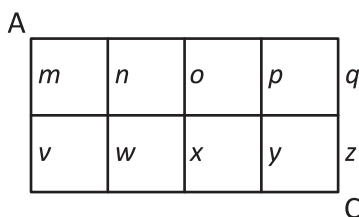
Thus, we have the following:

If this segment is chosen in the upper half...	Then only these segments can be chosen in the lower half...	Yielding this many paths...
m	*v, w, x, y, z*	5
n	*w, x, y, z*	4
o	*x, y, z*	3
p	*y, z*	2
q	*z*	1

That gives a total of 5 + 4 + 3 + 2 + 1 = 15 paths.