Plugging Away

While investigating a cave on the island, you discover a surprisingly advanced undersea lab. But you are dismayed to discover that the control panels have all sprung leaks! Fortunately, you brought your extensive collection of plumbing equipment from manufacturers across the country.

Each of the seven empty grids represents a control panel, which should be solved as a Kropki (see rules below). Once solved, each panel contains seven leaks, represented by the seven occurrences of one digit, as well as seven crucial readouts, represented by the seven occurrences of another digit. One of the seven plugs, shown on the last page, can cover all of the leaks without covering any of the readouts. Plugs may not be rotated or reflected, each plug is used exactly once, and each plug is labeled with the name of the city you collected it from.

Once you've chosen the correct plugs, union regulations indicate that you should record the plug's city of origin, the number representing leaks, and the number representing readouts for each panel. A table has been provided for this data.

Kropki Rules

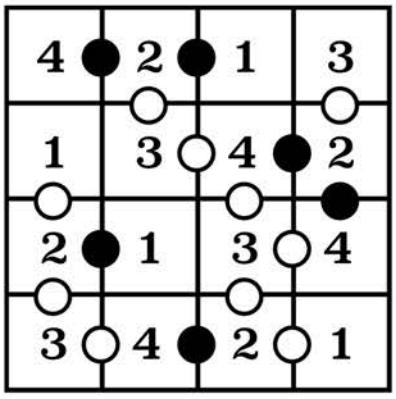
Place digits from 1 to 7 into the grid so that every square contains a digit, and no digit is repeated within any row or column. Any two squares connected by a white dot contain consecutive digits; any two squares connected by a black dot contain two digits such that one is two times the other. Any two adjacent squares not connected by a dot contain a pair of digits with *neither of the above properties*. (Note that a 1-2 pair may be connected by either a black or white dot.)

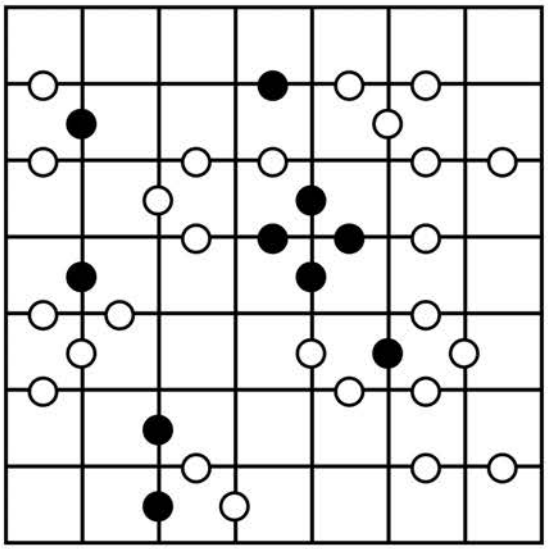
Some tips if you've never solved a Kropki before:

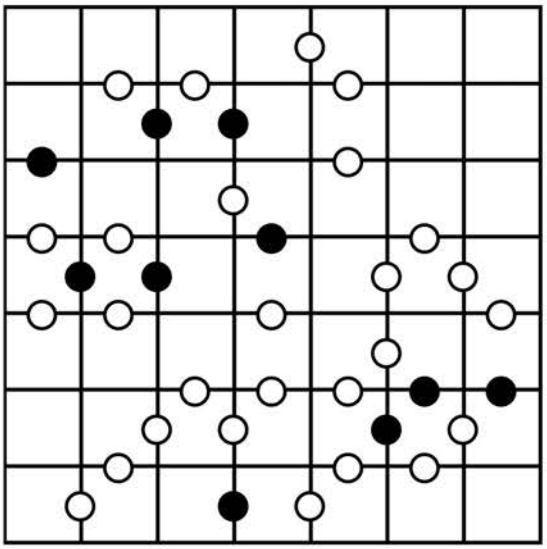
• Unbroken vertical or horizontal chains connected by dots are often a good place to break in. In particular, only one number in a 7x7 Kropki can have black dots on opposite sides.

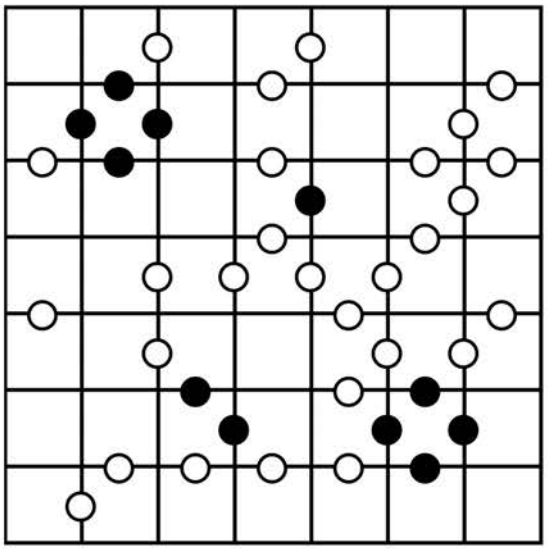
• Don't forget that edges with no dots tell you that the numbers are neither consecutive nor doubles! The dots clearly give information, but new solvers often overlook how much a missing dot can narrow down options.

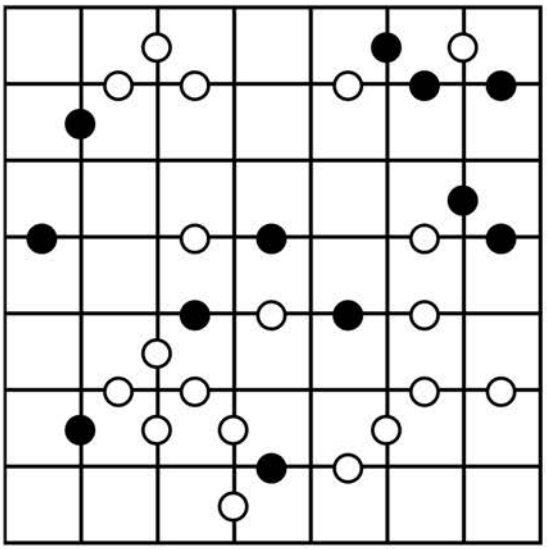
• Here's a sample of a completed 4x4 Kropki:

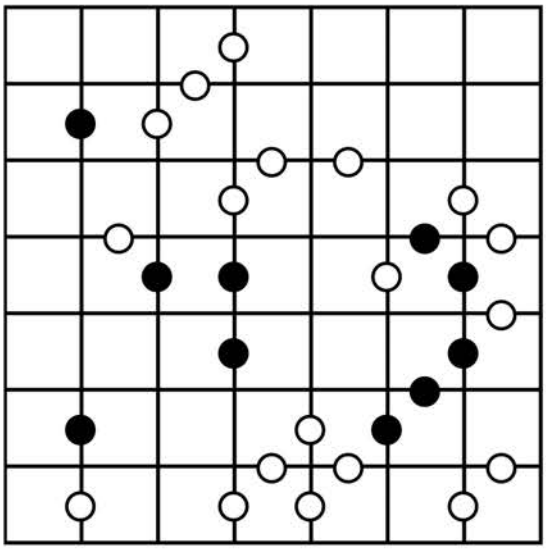


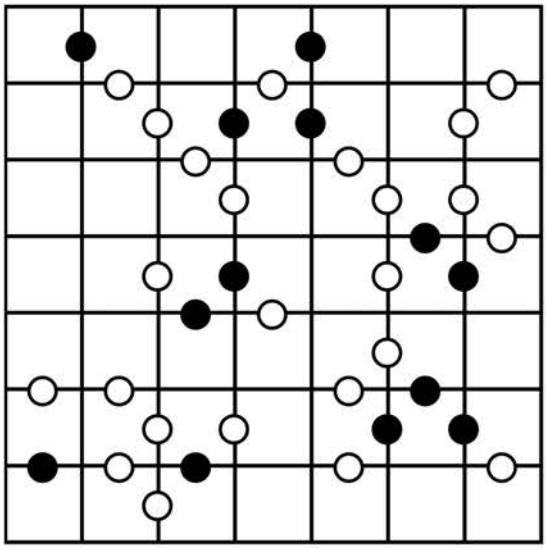


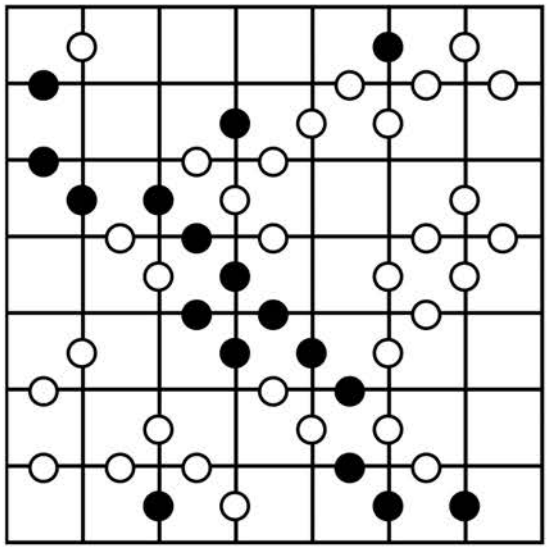






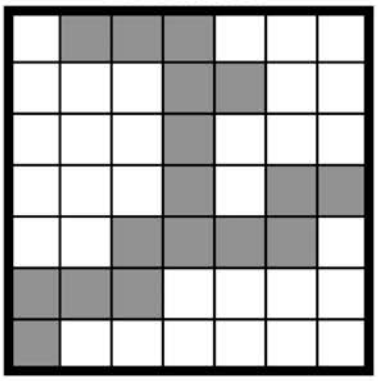




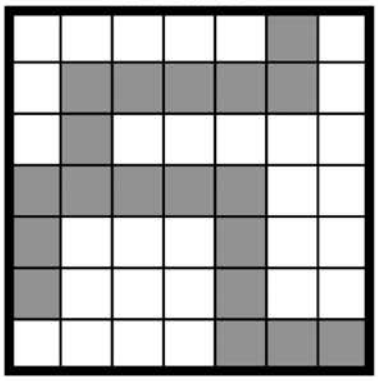


Plugs

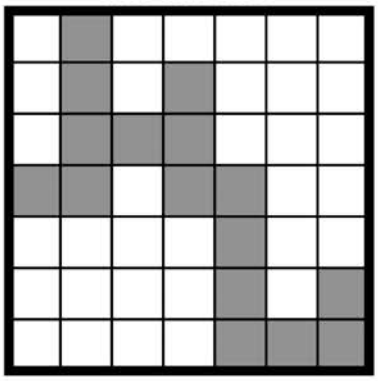
DETROIT



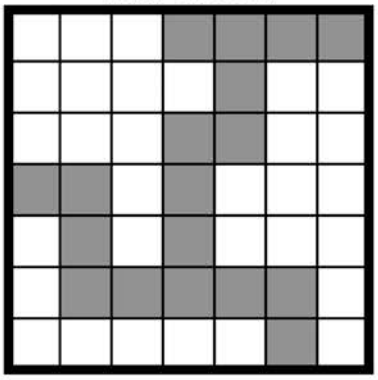
EVERETT



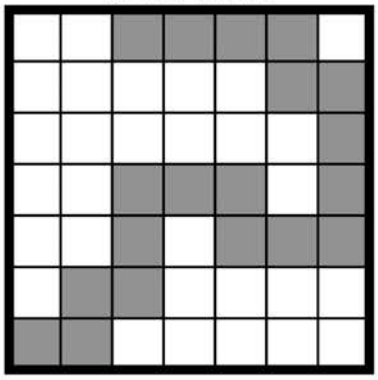
HOUSTON



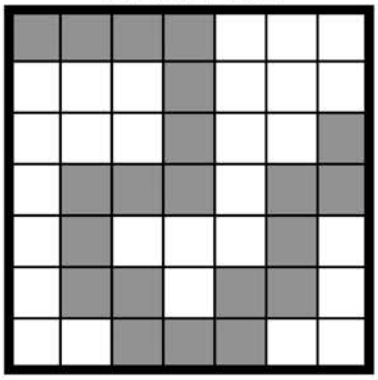
MADISON



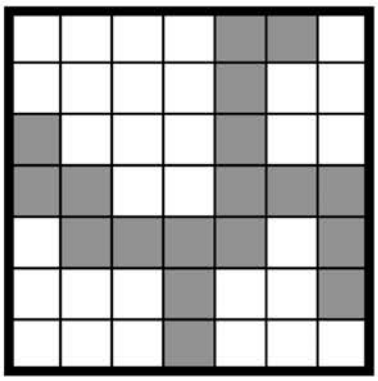
PHOENIX



WEST EGG



WICHITA



	Leak #	Readout #
DETROIT		
EVERETT		
HOUSTON		
MADISON		
PHOENIX		
WEST EGG		
WICHITA		