PACKING THE CARDINALS

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Take the integers ONE through TEN, and pack them as compactly as possible in three formats: crossword, word-search, and king's move. The best answers appear to be

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E                 S I X      e i g h T f       W T
N I N E     F I V E          f   x   w o       O U H
  G     T W O     V          n I N e O u     F N G R
T H R E E     U     E        $ E V e n r     X I E T
  T       N   R   O N E      T h r E E         S V

    6x10 = 60                 6x5 = 30         5x4 = 20
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The third diagram is the Lee Sallows template from "Incompatible Strings" (May 1994) with one extra T. It is not clear that there is any advantage in using all eight directions in the word-search mode (only four were actually used).

Here is a neat illustration of a phenomenon that occurs fairly often in puzzle solving. Note the remarkable agreement in the number of words per cell in the minimum rectangular area needed to place ONE to EIGHT, ONE to NINE, ... ONE to TWELVE in word search fashion.

```
E I G H T   O N E E R H T   E I G H T F   E L E V E N S   S E V E N O W
F O U R W   S E V E N I N   F   X   W O   I   F S O I E   F I V E E R H
X I S   O   E I G H T W O   N I N E O U   G   O I T N V   O G X N E N I
S E V E N   F O U R X I S   S E V E N R   H W U X V E E   U H E V L E W
T H R E E               T   T H R E E     T H R E E N   R T N E V E L
```

8 words	9 words	10 words	11 words	12 words
32 letters	36 letters	39 letters	45 letters	51 letters
25 cells	28 cells	30 cells	35 cells	40 cells
(1.28)	(1.29)	(1.30)	(1.29)	(1.28)

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T W E L V E
F N E X S L
O F I V E E
U S G N V V
R T H R E E
O W T E N N
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The letters-per-cell ratio is remarkably constant, varying only from 1.28 to 1.30. But there is a joker in the deck. ONE to TWELVE can be packed in 6x6 for 1.42 letters per cell, as shown at the left. It is one of maybe a few dozen solutions, but is difficult to find. It is too easy for the solver to let the earlier agreement lull him into accepting the 8x5 frame!