

# Problem 10: Tricky Thanksgiving Triples

USMA D/Math Problem of the Week

Submission Deadline: November 29, 2007 at 1600

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Circle one: [non-usma faculty]

## Problem Statement:

Every Thanksgiving my family adds more and more dishes to the table.

Being a rather peculiar mathematician, I refuse to eat unless the dishes are all placed along the intersections of a grid and no three dishes are colinear, no matter whether the line is horizontal, vertical, or some kind of diagonal.

This year, I've drawn a grid on the table, and suggested the following layout of dishes:

Unfortunately, there's no room for dessert! Find a better arrangement of dishes (satisfying the rules above) allowing for as many desserts as possible to be placed on the table. What is the maximum number of dishes?

Answer: 10

Solution: Certainly there can be no more than 10 dishes since 11 dishes (or more) would require more than 3 in a horizontal (and in a vertical) line.

I exhaustively enumerated all 100,000 possibilities with 10 dishes searching for those that had no three falling in a line including diagonals of any kind) and came up with 32 solutions that met all criteria. They are:

```
1 1 0 0 0
1 0 0 1 0
0 0 0 1 1
0 1 1 0 0
0 0 1 0 1
```

```
1 1 0 0 0
0 1 0 1 0
1 0 0 0 1
0 0 1 0 1
0 0 1 1 0
```

```
1 0 1 0 0
1 1 0 0 0
0 0 0 1 1
0 1 0 0 1
0 0 1 1 0
```

```
1 0 1 0 0
0 1 0 0 1
0 0 0 1 1
1 1 0 0 0
0 0 1 1 0
```

```
1 0 1 0 0
0 0 1 1 0
1 1 0 0 0
0 1 0 0 1
0 0 0 1 1
```

```
1 0 1 0 0
```