Prisoner

How should you place your prisoners in the cells so that you can release them as quickly as possible?

Cell No. 0	Cell No. 1	Cell No. 2
Cell No. 3	Cell No. 4	Cell No. 5

Equipment Needed (for each player)

- a playing board of 6 cells, 6 counters (prisoners), 2 dice (per pair of players)

Rules

- Each player can place their prisoners into any cells on their own game board. You can place one in each cell, or two in some cells and none in others, or even all six in one cell.
- Take turns to roll the two dice. Calculate the difference between the two numbers. You can release **one** prisoner **(only one !)** from the cell with that number. For example, if the difference is 2, you can release **one** prisoner from cell 2.
- The winner is the first to release all their prisoners.
- Keep a record of where you place your prisoners for each game, then record, e.g. with an asterisk, **the ones that were winners**, as shown in the table below.

	Cell						Winners
	0	1	2	3	4	5	
Prisoners	1	1	1	1	1	1	x
	2	2	1	1	0	0	*

Teacher Notes

1. If you have never used this activity before, you might be surprised at what appears to be the best answer.

2. This activity could be used with year 8 students in an introduction to probability, or with year 12 Maths C students in the study of expected value and probability distributions, or with any group in between.

3. The theoretically best answer still leaves room for some discussion as the theoretical answer as to how to best place prisoners in cells is not an integer.

A Possible Solution

The grid showing all possible outcomes is given below:

	1	2	3	4	5	6
1	0	1	2	3	4	5
2	1	0	1	2	3	4
3	2	1	0	1	2	3
4	3	2	1	0	1	2
5	4	3	2	1	0	1
6	5	4	3	2	1	0

The proportion of each value is:

Value	Fraction	Frac / 6
0	6/36	1 / 6
1	10/36	1.7 / 6
2	8/36	1.3 / 6
3	6/36	1 / 6
4	4/36	.7 / 6
5	2/36	.3 / 6

Based on the above fractions, one good solution would be to put one prisoner in each of 0, 2, 3 and 4, and two prisoners in 1. Since 5 occurs so rarely , put no prisoners in cell 5.