

### Realism, Antirealism, and penetrating the "black box"

The classic Parker Brothers game *Black Box*<sup>TM</sup> sets out rules for a game of hide and seek in which rays are used to find targets hidden within a box. The rules of the game lay out a theory for how the universe of the game operates.

*Here is the theory:*

1. A box can contain any number of "targets".
2. Each target has a definite location within the box's grid (that is, it falls completely within one of the cells defined by the grid).
3. A "ray" may be sent into any of the edge positions of the box.
4. Once the ray enters the box, it either stays in the box (a "hit"), comes out exactly where it entered (a "reflection"), or comes out somewhere else (a "detour").
  - A ray's natural tendency is to travel in a straight line. (See Fig. 1)
  - If a ray travels directly to a target, it does not leave the box. (See Fig. 2)
  - A ray cannot travel past a target that lies directly next to its path. Instead, the ray detours 90 degrees from the nearest corner of the target's cell. (See Fig. 3)
  - If a ray enters the box in a cell adjacent to a cell with a target (and there is no target in the cell the ray enters), the ray is reflected. (Why? The ray cannot travel past the nearest corner of the cell containing the target, so it is forced to return to its starting point.) (See Fig. 4)
  - Two detours may also be compounded to reflect a ray to its starting point. (See Fig. 5)

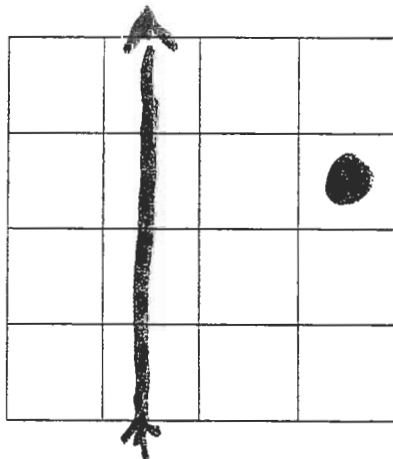


FIG. 1

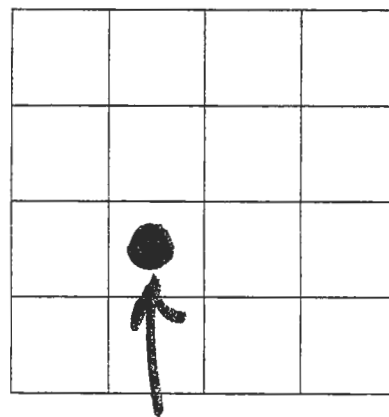


FIG. 2

FIG 3

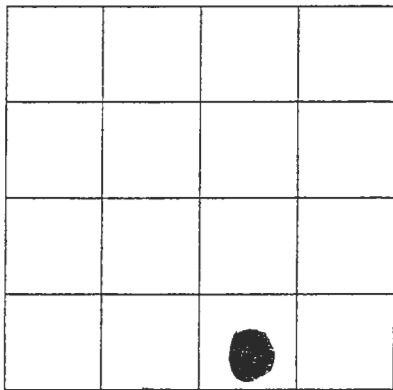
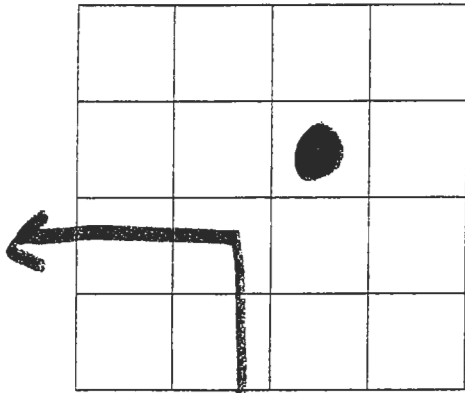
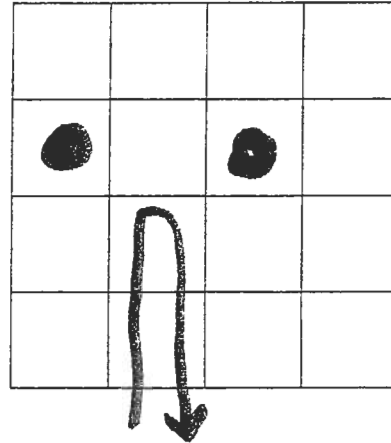


FIG 4

FIG 5

*Challenge:*

From the following sets of data on a 5 by 5 box, can you deduce the number and location of targets within the box? (If not, how far can you narrow the possibilities?)

Data  
Set  
1

1 exits 17; 2 exits 20; 3 doesn't exit; 4 exits 6;  
7 doesn't exit; 8 reflected; 9 exits 5; 10 doesn't exit;  
11 reflected; 12 doesn't exit; 13 reflected; 14 doesn't exit; 15 reflected;  
16 doesn't exit; 18 reflected; 19 doesn't exit.

Data  
Set  
2

1 exits 20; 2 doesn't exit; 3 reflected; 4 doesn't exit; 5 exits 6;  
7 doesn't exit; 8 reflected; 9 doesn't exit; 10 exits 11; 12 doesn't exit;  
13 reflected; 14 doesn't exit; 15 exits 16; 17 doesn't exit; 18 reflected; 19 doesn't exit.

Data  
Set  
3

1 doesn't exit; 14 reflected; 15 doesn't exit; 19 doesn't exit.

	20	19	18	17	16	
1						15
2						14
3						13
4						12
5						11

6 7 8 9 10  
20 19 18 17 16

1						15
2						14
3						13
4						12
5						11

6 7 8 9 10  
20 19 18 17 16

1						15
2						14
3						13
4						12
5						11

6 7 8 9 10

	20	19	18	17	16	
1						15
2						14
3						13
4						12
5						11

6 7 8 9 10  
20 19 18 17 16

1						15
2						14
3						13
4						12
5						11

6 7 8 9 10  
20 19 18 17 16

1						15
2						14
3						13
4						12
5						11

6 7 8 9 10