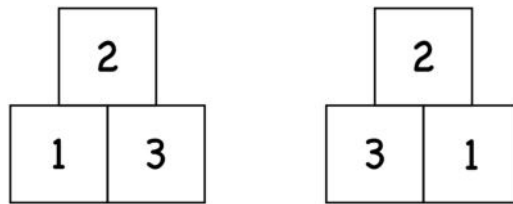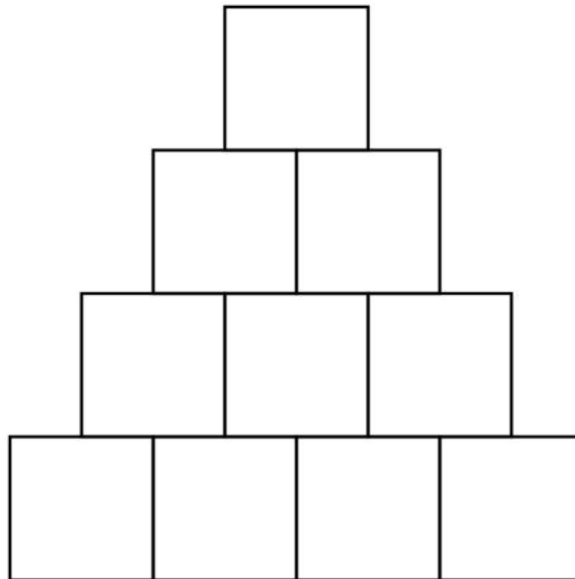# Puzzle of the Week
## *Difference Pyramids – 2*

These pyramids are called *Difference Pyramids*. The number on top is the difference of the two numbers below.



**THE CHALLENGE:** Place the numbers from 1 to 10 to make a Difference Pyramid.



## 1  2  3  4  5  6  7  8  9  10

**EXPLORATION:** Play with even larger pyramids.

# Puzzle of the Week
# *Difference Pyramids – 2 – Notes*

**THE CHALLENGE:** Because 10 cannot be the difference of two cards, it must go on the bottom row. Similarly, either 9 is in the bottom row or it is in the next-to-the-bottom row above the 1 and the 10. The 8 and 7 cards are also good cards to focus on to get rid of possibilities.

This means the bottom row looks like one of the following (ignoring mirror images):

X Y 9 10,  X 9 Y 10,  9 X Y 10,  X Y 10 9,  X 9 10 Y,  9 X 10 Y,  X Y 1 10,  X 1 10 Y,  X Y 10 1

That is a lot of possibilities to consider!

Fortunately, if you consider where 8 and 7 can go, the possibilities are reduced to the following list (assuming we haven't missed any). It is easy to finish each of these once you have the bottom row.

8 3 10 9,  9 3 10 8,  6 1 10 8,  8 1 10 6

Investigating pyramids of size 15, 21, or higher are for the truly dedicated.

From the literature, there is only one solution (up to reflections) for 15, and its bottom row is {6, 14, 15, 3, 13}. Even more surprisingly, there are no solutions for 21, 28, and 36, and it has been conjectured that there are no solutions above that!