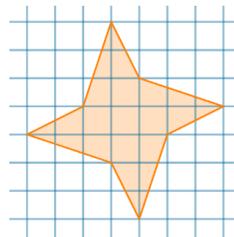




## האולימפיאדה הארצית במתמטיקה לביתות ה-10 שלב ב, שנת תשפ"א

1. What is the area of the following figure?

Remark: The area of a small grid square is 1.



2. Six people live in different floors of a 6-story building. Two of them are liars and the others are truth tellers. They said the following sentences:

Alon: "In the floor above me lives a liar."

Benny: "Two floors above me lives a liar."

Guy: "Three floors above me lives a liar."

Dor: "Three floors below me lives a liar."

Hila: "The liars live on floors 3 and 4."

Victor: "The liars live on floors 1 and 2."

On which floor does Victor live?

3. In the following picture there is a 4x4 table of numbers.

The sums of the numbers in the rows of the table are distinct. The sum of the numbers in each row is written besides it, except for the row with the smallest sum (the bottom row).

The sums of the numbers in the columns are distinct. The sum of the number in each column is written above it, except for the column with the largest sum (the rightmost column).

	11	13	16	Largest	
					13
					17
					15
					Smallest

What is the sum of the numbers in the bottom row?



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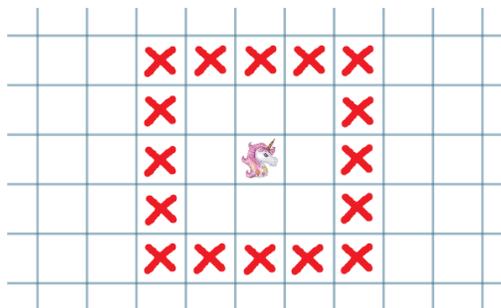
4. In the magical kingdom, there are only three possible grades in schools – 1, 2, and 3 (3 is the highest and 1 is the lowest). When a child gets a 2 on an exam, he works harder and gets a 3 on the next exam. When a child gets a 1, the teacher calls his parents and then he gets a 3 on the next two exams. Over the course of the school year, 10 exams were conducted, and for each student all their grades were recorded on their report card. How many possibilities are there for the grade list of a student?

5. If we present the sum

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \frac{1}{7} + \frac{1}{8} + \frac{1}{9} + \frac{1}{10}$$

as a reduced fraction, *what would be the denominator?*

6. Define a *unicorn* to be a chess piece that moves two squares in one direction (vertically or horizontally) and then 0, 1, or 2 squares in a perpendicular direction. In the following picture we marked all the squares threatened by the unicorn.



What is the largest number of unicorns that can be placed on a  $6 \times 6$  board without any two threatening each other?

**Good Luck!**