



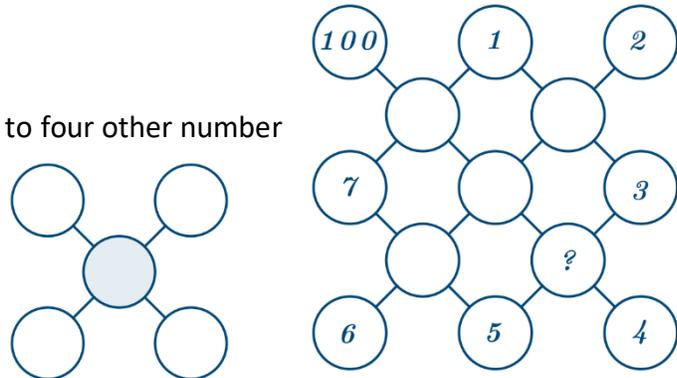
האולימפיאדה הארצית במתמטיקה לכיתות ט  
 שלב א, שנת תשפ"א

1. Consider the following diagram:

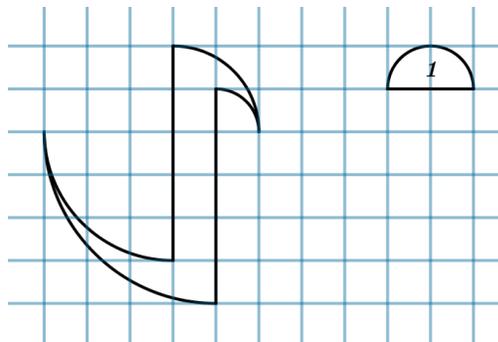
Any number in the diagram which is connected to four other number must be equal to their average:

Which number should be written inside the circle marked by “?”?

Note: an average of 4 numbers is their sum divided by 4.



2. In the following picture, the area of the half-circle equals 1. Find the area of the larger shape, if it is known that all the curved lines in the picture are quarters of circles.



3. How many minutes after 7:00 the angle between the hour hand of the clock and the minute hand of the clock will first be exactly one degree?

*Remark. The clock hands move continuously and at a constant speed.*

4. Ayala took all the numbers divisible by 3 between 1 and 99 (inclusive), and squared each of them. She summed the resulting numbers, and multiplied the resulting number by 2. Barvaz took all the numbers not divisible by 3 from 1 to 100 (inclusive), squared each of them, and summed the results. What is the difference between Barvaz's number and Ayala's number?

5. The equation  $x^2 + 2xy + y^2 - 200x - 200y + 1900 = 0$  is given. How many solutions  $(x, y)$  are there for the equations, where  $x$  and  $y$  are integer numbers between 1 and 100 (inclusive)?

6. Miriam has 8 cards with consecutive three-digit numbers. The units digit of the smallest number is 1, and the units digit of the largest number is 8. Miriam arranged the cards in a row, such that the first number is divisible by 2, the second by 3, the third by 4, and so on until the eighth number which is divisible by 9. What is the units digit of the number divisible by 7?