

12. The successive sides of a quadrilateral are 2, 6, 9, and  $x$ . If the diagonals of the quadrilateral are perpendicular, compute  $x$ .
13. If the 3-digit positive integer  $n = ABC = AB + BA + AC + CA + BC + CB$ , compute the largest possible value for  $n$ .
14. Consider the sequence 1, 2, 2, 3, 3, 3, 4, 4, 4, 4,  $\dots$ , where the integer  $n$  appears  $n$  times. Compute the 1992nd term of this sequence.
15. If  $L_n$  represents the number of lattice points on the graph of  $|x| + |y| = n$ , for positive integer  $n$ , compute the value of

$$L_1 - L_2 + L_3 - L_4 + L_5 - L_6 + \dots + L_{999} - L_{1000}.$$

16. The sides of an isosceles triangle are  $\cos x$ ,  $\cos x$ , and  $\cos 7x$ , and its vertex angle is  $2x$ . [All angle measurements are in degrees.] Compute *all three* possible values of  $x$ .
17. (Note: In this problem, the brackets represent the Greatest Integer Function.) Compute the number of intersection points of the graphs of

$$(x - [x])^2 + y^2 = x - [x] \quad \text{and} \\ y = \frac{1}{5}x.$$

18. In triangle  $ABC$ , points  $D$  and  $E$  are on  $\overline{AB}$  and  $\overline{AC}$ , and angle-bisector  $\overline{AT}$  intersects  $\overline{DE}$  at  $F$  [as shown in the diagram]. If  $AD = 1$ ,  $DB = 3$ ,  $AE = 2$ , and  $EC = 4$ , compute the ratio  $AF : AT$ .

