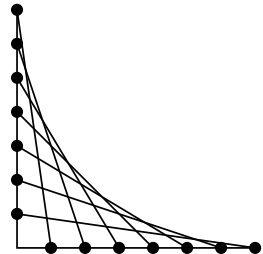# BRITISH COLUMBIA COLLEGES

Junior High School Mathematics Contest
Part A – Final Round May 5, 2000

1. The last (ones) digit of a perfect square cannot be:

   (a) 1   (b) 4   (c) 5   (d) 6   (e) 8

2. Suppose a string art design is constructed by connecting nails on a vertical axis and on a horizontal axis by line segments as follows: The nail furthest from the origin on the vertical axis is connected to the nail nearest the origin on the horizontal axis. Then proceed toward the origin on the vertical axis and away on the horizontal axis as shown in the diagram. If this were done on a project with 10 nails on each axis, the number of points of intersection of line segments would be:

   (a) 45   (b) 46   (c) 47   (d) 48   (e) none of these

3. Assume there is an unlimited supply of pennies, nickles, dimes, and quarters. An amount (in cents) which cannot be made using exactly 6 of these coins is:

   (a) 91   (b) 87   (c) 78   (d) 51   (e) 49

4. Given $x^2 + y^2 = 28$ and $xy = 14$, the value of $x^2 - y^2$ equals:

   (a) -14   (b) 0   (c) 14   (d) 28   (e) 42

5. Given that $0 < x < y < 20$, the number of integer solutions (x, y) to the equation $2x + 3y = 50$ is:

   (a) 16   (b) 9   (c) 8   (d) 5   (e) 3

6. The numbers $1, 3, 6, 10, 15, \ldots$ are known as triangular numbers. Each triangular number can be expressed as $\dfrac{n(n+1)}{2}$ where n is a natural number. The largest triangular number less than 500 is:

   (a) 494   (b) 495   (c) 496   (d) 497   (e) 498

7. An 80 m rope is suspended at its two ends from the tops of two 50 m flagpoles. If the lowest point to which the midpoint of the rope can be pulled is 36 m from the ground, then the distance, in metres, between the flagpoles is:

   (a) $6\sqrt{39}$ (b) $36\sqrt{13}$ (c) $12\sqrt{39}$ (d) $18\sqrt{13}$ (e) $12\sqrt{26}$

8. At a certain party, the first time the door bell rang 1 guest arrived. On each succeeding ring two more guests arrived than on the previous ring. After 20 rings the number of guests at the party was:

   (a) 39   (b) 58   (c) 210   (d) 361   (e) 400

9. An operation $*$ is defined such that

$$A * B = A^B - B^A$$

The value of $2 * (-1)$ is:

(a) -3 (b) -1 (c) $-\frac{1}{2}$ (d) 0 (e) $\frac{3}{2}$

10. Three circles with a common centre P are drawn as shown with $PQ = QR = RS$. The ratio of the area of the region between the inner and middle circles (shaded with squares) to the area of the region between the middle and outer circles (shaded with dots) is:

(a) $\frac{1}{3}$ (b) $\frac{4}{9}$ (c) $\frac{1}{2}$ (d) $\frac{3}{5}$ (e) $\frac{2}{3}$