BRITISH COLUMBIA SECONDARY SCHOOL MATHEMATICS CONTEST, 2009

Senior Final, Part A

Friday May 8

Dedicated to the memory of Jim Totten, the inspiration for and co-founder of the BCSSMC

1. The symbols Δ, Φ, Ψ, and $\odot$ represent integers. The sum of the values in each row and three of the columns is given. The value of Δ is:

Δ	Φ	Φ	Φ	11
Δ	$\odot$	$\odot$	Φ	13
$\odot$	$\odot$	Δ	Δ	16
Φ	Ψ	Ψ	Ψ	14
15	12	14		

(A) 1 (B) 2 (C) 3

(D) 4 (E) 5

2. Antonino can run around a track in 5 minutes while Bill runs around the same track in 9 minutes. If Antonino and Bill start together, running in the same direction, the number of minutes it will take Antonino to gain one lap on Bill is:

(A) 10 (B) $10\frac{1}{4}$ (C) $10\frac{3}{4}$ (D) $11\frac{1}{4}$ (E) $11\frac{1}{2}$

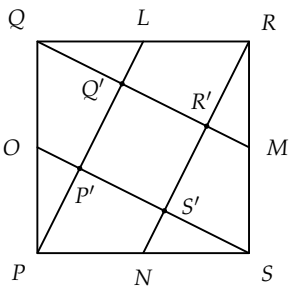
3. Five straight lines are drawn on the plane. The maximum possible number of intersection points of the five lines is:

(A) 5 (B) 6 (C) 10 (D) 15 (E) 20

4. The number 2009 can be expressed as the sum of n ($n \geq 2$) consecutive odd integers in several ways. The smallest possible value of n is:

(A) 5 (B) 7 (C) 21 (D) 41 (E) 49

5. In the square $PQRS$ shown in the figure, the points L, M, N, and O are the midpoints of the sides. A smaller square $P'Q'R'S'$ is formed inside the larger square. The ratio of the area of square $P'Q'R'S'$ to the area of square $PQRS$ is:



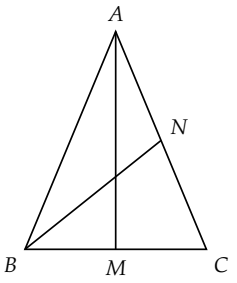
(A) 1 : 5 (B) 1 : 4 (C) 1 : 4

(D) 1 : 2 (E) 2 : 5

6. The equation $x^2 + Bx + 2 = 0$ has only one root. The product of the possible values of B is:

(A) 8 (B) -8 (C) $2\sqrt{2}$ (D) $-2\sqrt{2}$ (E) -4

7. In ΔABC we have $\overline{AB} = \overline{AC}$, $\overline{AN} = \overline{NC}$, and $\overline{BM} = \overline{MC}$ with $\overline{MC} = 5$ and $\overline{AM} = 12$. The shortest distance from point N to line segment BC is:



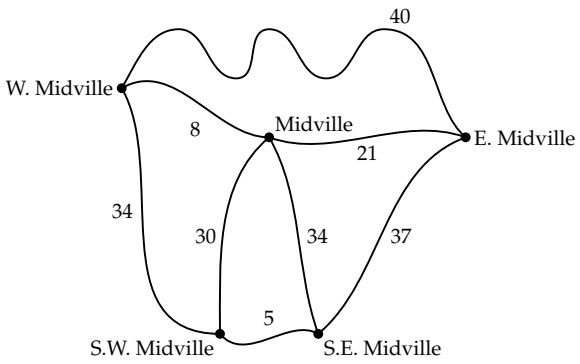
(A) 6 (B) $\frac{13}{2}$ (C) $\frac{169}{24}$

(D) 8 (E) 10

8. X and Y are positive integers. The sum of the digits of X is 53, and the sum of the digits of Y is 47. If the addition of X and Y involves exactly 5 carries, the sum of the digits of $X + Y$ is:

   (A) 45 (B) 55 (C) 95 (D) 100 (E) Impossible to determine.

9. The Middle Okanagan Regional District has just resurfaced a local road system, and now the yellow strip down the middle of the roads must be repainted. The District Manager would like to have the truck used for this purpose to travel the shortest distance possible. A road map of the local road system is shown, with distances given in kilometres. The truck is garaged in Midville and must return there when the job is done. The number of kilometres the truck must travel in order to cover each road in the system at least once, and return to its starting point in Midville, could be:



   (A) 209 (B) 214 (C) 230 (D) 243 (E) 254

10. A point P is chosen in the first quadrant so that the lines from P to the point $(1, 0)$ and from P to the point $(-1, 0)$ are perpendicular. The shortest distance from any such point P to the point $(1, 1)$ is:

    (A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\sqrt{2} - 1$ (D) $\frac{1}{5}\sqrt{5}$ (E) $2 - \sqrt{2}$