

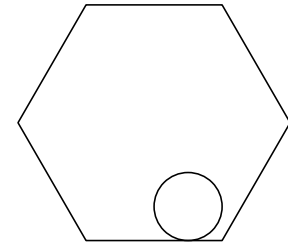
**BRITISH COLUMBIA SECONDARY SCHOOL
MATHEMATICS CONTEST, 2010**

Senior Preliminary

Wednesday, March 31

1. Yesterday Mary Lou worked a full shift of M hours and an additional N hours of overtime. She received 150% of her usual hourly rate for the overtime hours. Given that M and N are positive integers, the maximum total number of hours that Mary Lou worked yesterday to receive the equivalent of 12 hours at her usual pay was:
(A) 11 (B) 10 (C) 9 (D) 8 (E) 7
2. The value of $100 - 1 + 98 - 3 + 96 - 5 + \dots + 4 - 97 + 2 - 99$ is
(A) 0 (B) 50 (C) 100 (D) 147 (E) None of these
3. A glass box 7 cm by 12 cm by 18 cm, closed on all six sides, is partly filled with coloured water. When the box is placed on one of its 7 by 12 sides, the water level is 15 cm above the table. When the box is placed on one of its 7 by 18 sides, the water level above the table, in cm, is:
(A) 9 (B) 10 (C) 12.5 (D) 15 (E) 22.5
4. A city with an area of 100 square kilometres received 1 cm of rain on a certain day. If the average raindrop has a volume of 10 mm^3 , the number of raindrops that fell on the city that day was:
(A) 10^8 (B) 10^9 (C) 10^{12} (D) 10^{13} (E) 10^{14}
5. I give Sarah N dollars, where N is an integer, for getting a good mark in school. Then, since Tim got a better mark, I give him just enough two dollar coins so that he gets **more** money than Sarah. Finally, since Ursula got the best mark, I give her just enough five dollar bills so that she gets **more** money than Tim. The largest amount of money, in dollars, that Ursula could get is:
(A) $N + 2$ (B) $N + 5$ (C) $N + 6$ (D) $N + 7$ (E) $N + 10$
6. Suppose that your height this year is 10% more than it was last year, and last year your height was 20% more than it was the year before. The percentage by which your height has increased during the last two years is:
(A) 12 (B) 22 (C) 28 (D) 31 (E) 32
7. A lattice point is a point for which both the x and y coordinates are integers. The number of lattice points that lie on the curve defined by the equation $x^2 + 4y^2 = 100$ is:
(A) 6 (B) 8 (C) 10 (D) 12 (E) 16
8. The sum of all positive integers which are less than 2010 and are not divisible by 3 is:
(A) 1345695 (B) 1346700 (C) 1347705 (D) 1437150 (E) 1450000

9. A circle of radius 1 cm rolls around the inside of a regular hexagon with all sides of length 4 cm, so that the circle is always touching at least one of the hexagon walls. (See the diagram.) The distance measured in centimetres that the centre of the circle travels before the circle returns to where it began is:



- (A) $12\sqrt{3}$ (B) 18 (C) $42 - 12\sqrt{3}$
(D) 21 (E) $24 - 4\sqrt{3}$
10. On each question in this contest you receive five marks for each correct answer, one mark for no answer, and zero marks for an incorrect answer. Suppose that for six questions on the contest you can determine that two of the alternative answers are incorrect. For each of these questions you flip a fair coin to decide whether you leave it blank or randomly guess one of the remaining three answers. Your expected score for these six questions is:
- (A) 5 (B) 6 (C) 7 (D) 8 (E) 10
11. One of Jerry and Kelly tells lies on Mondays, Tuesdays and Wednesdays, and tells the truth on the other days of the week. The other lies on Thursdays, Fridays and Saturdays, and tells the truth on the other days of the week. At noon one day, the two had the following conversation:
- Jerry:* I lie on Saturdays.
Kelly: I will lie tomorrow.
Jerry: I lie on Sundays.
- The day of the week on which this conversation takes place is:
- (A) Monday (B) Wednesday (C) Thursday (D) Saturday (E) Sunday
12. Of the points $(0,0)$, $(2,0)$, $(3,1)$, $(1,2)$, $(3,3)$, $(4,3)$, and $(2,4)$, the largest number of them that can lie on the same circle is:
- (A) 3 (B) 4 (C) 5 (D) 6 (E) 7