# BRITISH COLUMBIA COLLEGES

Junior High School Mathematics Contest, 2003

Preliminary Round

Wednesday March 5, 2003

1. The reciprocal of $1 - \dfrac{1}{x}$ is -2. The value of x is:

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

2. The length of a rectangle is increased by 25% and the width is decreased by 25%. The percentage change in the area of the rectangle is:

   (a) 0   (b) 6.25%   (c) -6.25% (d) 12.5%   (e) -12.5%

3. If $x - y > x$ and $x + y > y$, then:

   (a) $x > 0$ and $y > 0$ (b) $x < 0$ and $y < 0$ (c) $y > x > 0$

   (d) $x < 0$ and $y > 0$ (e) $x > 0$ and $y < 0$

4. The number of integers between 1400 and 2400, inclusive, which are an integer multiple of both 15 and 16 is:

   (a) 4   (b) 5   (c) 10   (d) 15   (e) 16

5. Let $x = m + n$ where m and n are positive integers satisfying $2^6 + m^n = 2^7$. The sum of all of the possible values of x is:

   (a) 90   (b) 82   (c) 75   (d) 25   (e) 18

6. A three-by-three square grid is shown. Four of the squares in the grid are to be shaded in such a way that no two shaded squares have an edge in common. A possible shading is shown. The number of possible shadings of the grid is:

   (a) 3   (b) 4   (c) 5   (d) 6   (e) 7

7. A rectangle is made up of six squares as shown. If the length of the diagonal of one of the squares is 2, then the length of the diagonal of the rectangle is:

   (a) $2\sqrt{6}$ (b) $\sqrt{26}$ (c) 5

   (d) $4\sqrt{2}$ (e) $2\sqrt{13}$

8. When 3^{22} is divided by 5, the remainder is:

   (a) 4   (b) 3   (c) 2   (d) 1   (e) 0
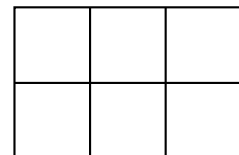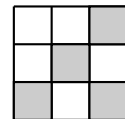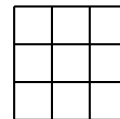
9. Given the figures below, in which Figure $n+1$ is obtained from Figure n by adding two squares, one vertically and the other horizontally,
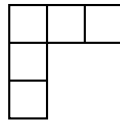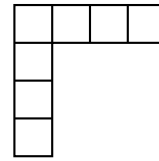
    Fig. 1   Fig. 2   Fig. 3

    the number of squares in the 2003rd figure is:

    (a) 5001   (b) 3006   (c) 2005   (d) 6009   (e) 4007

10. A scalene triangle is a triangle in which all three sides have different lengths. The number of scalene triangles with all sides of integer length whose perimeter is **at most** 13 is:

    (a) 5   (b) 6   (c) 10   (d) 14   (e) 16

11. The *digit sum* of a number is the sum of the digits of that number. For example, the digit sum of 2003 is $2+0+0+3=5$. The number of four-digit numbers **less than** 2003 that have a digit sum **less than** that for 2003 is:

    (a) 20   (b) 22   (c) 23   (d) 29   (e) 30

12. A pair of regular dice is rolled. If the dice are fair, the probability of rolling a total of 6 is:

    (a) $\dfrac{1}{12}$ (b) $\dfrac{1}{9}$ (c) $\dfrac{1}{6}$ (d) $\dfrac{5}{36}$ (e) $\dfrac{1}{4}$

13. The sum of the integer solutions to the equation $|x+3|+|x-5|=12$ is:

    (a) 12   (b) 14   (c) 0   (d) 2   (e) 8

14. A triangle has sides x, y, and z such that $x < y < z$. If the length of the shortest altitude is h, then the length of the longest altitude is:

    (a) $\dfrac{\sqrt{2}}{3}h$ (b) $\dfrac{yz}{h}$ (c) $\dfrac{xh}{z}$ (d) $\dfrac{hz}{x}$ (e) $\dfrac{hz}{y}$

15. The number of trailing zeros in the product

    $$47 \times 46 \times 45 \times 44 \times \cdots \times 3 \times 2 \times 1$$

    is:

    (a) 15   (b) 12   (c) 10   (d) 9   (e) 8