

BRITISH COLUMBIA COLLEGES

Senior High School Mathematics Contest, 2005

Preliminary Round

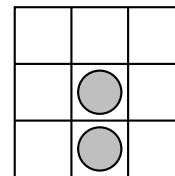
Wednesday March 2, 2005

- The two shorter sides of a right triangle are 5 and 12. The shortest distance to the third side from the intersection of the two shorter sides is:
(A) $\frac{12}{5}$ (B) $\frac{10}{3}$ (C) $\frac{60}{13}$ (D) $\frac{13}{3}$ (E) $\frac{17}{6}$
- A wire is cut into two parts in the ratio 3 : 2. Each part is bent to form a square. The ratio of the area of the larger square to the area of the smaller square is:
(A) 3 : 2 (B) 9 : 4 (C) 5 : 3 (D) 5 : 2 (E) 12 : 5
- The number of four digit numbers with no digit repeated is:
(A) 3024 (B) 4536 (C) 5040 (D) 6581 (E) 9000
- Each of the letters A , B , D , and M represents a decimal digit. Two have the value 9, one has the value 8, and the other has the value 1. The largest possible sum of the 3-digit numbers BAD , DAM , and MAD is
(A) 2159 (B) 2655 (C) 2656 (D) 2657 (E) 2958
- You visit the land of knights and knaves, where there are two types of people: knights, who always tell the truth; and knaves, who always lie. Two people A and B approach you and A says, "We are both knaves." Then it must be true that
(A) A is a knave and B is a knight (B) both A and B are knights
(C) A is a knight and B is a knave (D) both A and B are knaves
(E) There is not enough information
- The minimum number of students that must be in a room to insure that at least 10 are boys or at least 8 are girls is:
(A) 10 (B) 11 (C) 17 (D) 18 (E) 19
- A rectangle has dimensions 20 cm \times 50 cm. If the longer side is increased by 20% and the shorter side is decreased by 20%, then the change in the perimeter is:
(A) an $8\frac{4}{7}\%$ increase (B) a 4% increase (C) a 0% increase (D) a 4% decrease (E) an $8\frac{4}{7}\%$ decrease
- Given that $30! = 30 \times 29 \times 28 \times \cdots \times 2 \times 1$ and 6^n is a factor of $30!$, then the largest possible value of n is:
(A) 7 (B) 9 (C) 14 (D) 17 (E) 18
- An irrational number between $3\sqrt{2}$ and 6 is
(A) 5 (B) $4\sqrt{3}$ (C) $\sqrt{37}$ (D) $4.\overline{27}$ (E) $2\sqrt{6}$

10. The number 2005 can be written in the form $a^2 - b^2$, where a and b are positive integers less than 1000, in exactly one way. The value of $a^2 + b^2$ is

(A) 160825 (B) 160801 (C) 80418 (D) 80413 (E) 80406

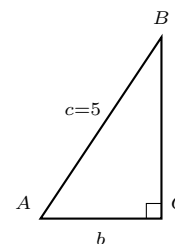
11. The game of Solitaire JumpIt is played on a 3×3 grid with two identical game discs. If the two discs are adjacent horizontally, vertically, or diagonally, one disc can jump the other by moving onto the open space opposite the other disc. The disc that is jumped is removed. (See the diagram). Two identical game discs are placed on the board at random. The probability that no jump is possible is:



(A) $\frac{5}{36}$ (B) $\frac{4}{9}$ (C) $\frac{5}{9}$ (D) $\frac{2}{3}$ (E) $\frac{5}{6}$

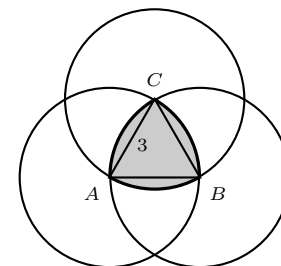
12. In the diagram $\triangle ABC$ is a right triangle with the right angle at C , $a + b = \sqrt{45}$, and $c = 5$. The area of triangle ABC is:

(A) $3\sqrt{5}$ (B) 6 (C) $4\sqrt{5}$
(D) 5 (E) $\frac{7\sqrt{5}}{2}$

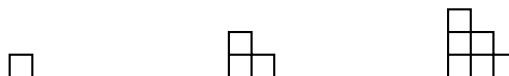


13. Let ABC be an equilateral triangle with sides of length 3. Let \widehat{AC} be the shorter circular arc with centre B joining A and C , \widehat{BC} be the shorter circular arc with centre A joining B and C , and \widehat{AB} be the shorter circular arc with centre C joining A and B . See the diagram. The shaded area contained by the three arcs is:

(A) $\frac{9}{4}(2\pi - 3\sqrt{3})$ (B) $\frac{9}{4}(2\pi - \sqrt{3})$ (C) $\frac{9}{2}\pi$
(D) $\frac{9}{2}(\pi + \sqrt{3})$ (E) $\frac{9}{2}(\pi - \sqrt{3})$



14. One step has 4 walls, two steps have 10 walls, and three step have 18 walls, as shown below.



If you have a set of steps with 340 walls, following the same pattern as above, the number of walls that must be added to construct the next set of steps in the sequence is:

(A) 36 (B) 38 (C) 48 (D) 68 (E) 72

15. If the area of a square inscribed in a circle is 15 cm^2 , then the area of the square inscribed in a semicircle of the same circle, in square centimetres, is:

(A) 7.5 (B) $\sqrt{50}$ (C) 6 (D) 5 (E) 3.75