

# BRITISH COLUMBIA SECONDARY SCHOOL MATHEMATICS CONTEST, 2012

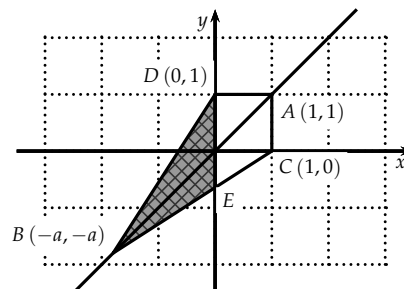
## Senior Preliminary

Wednesday, April 4

- Eva's school is on a semester system, with three terms per year. The grade point average (GPA) for a student is the sum of the percentage grades (maximum 100%) in each course divided by the total number of courses. The first term, she took five courses, and her GPA was 75%. The second term, she took four courses, and her GPA was 80%. In the third term, she took three courses. In one of these courses, her grade was 90%. If her overall GPA for the full year is 80%, the lowest possible grade she could have obtained in one of the other two courses she took in the third term is:  
 (A) 67                      (B) 70                      (C) 75                      (D) 77                      (E) 87
- The lockers in Euclid Middle School are numbered from 1 through 750. Every locker whose number is divisible by eight has a blue decal, every locker whose number is divisible by twelve has a yellow decal, and every locker whose number is divisible by fifteen has a green decal. The number of lockers having all three decals is:  
 (A) 6                      (B) 9                      (C) 12                      (D) 15                      (E) 36
- If four consecutive integers are multiplied and 1 is added to the result, the number obtained is always:  
 (A) greater than 1                      (B) even                      (C) prime  
 (D) a perfect cube                      (E) a perfect square
- A standard *deck* of playing cards consists of 52 *cards* partitioned into 4 *suits* ( $\heartsuit$ ,  $\clubsuit$ ,  $\diamondsuit$ , and  $\spadesuit$ ) of 13 cards each. In the game of bridge the 52 cards are randomly distributed into 4 *hands* of 13 cards each. For a given bridge hand, the *length* of a suit is the number of cards in the suit in that hand. The longest suit in a bridge hand must have at least  $n$  cards. The smallest possible value of  $n$  is:  
 (A) 1                      (B) 2                      (C) 3                      (D) 4                      (E) 5
- A pair of dice have their six faces numbered from 1 to 6. One of the dice is a standard die and the other is a trick die that comes up '6' one quarter of the time, '1' one quarter of the time, and each of the four remaining numbers comes up one-eighth for the time. The probability of rolling a sum of 7 using this pair of dice is:  
 (A)  $\frac{3}{16}$                       (B)  $\frac{7}{48}$                       (C)  $\frac{1}{6}$                       (D)  $\frac{11}{48}$                       (E)  $\frac{1}{4}$

- In the diagram points  $A$  and  $B$  are on the line  $y = x$ , points  $C$  and  $D$  are on the  $x$ - and  $y$ -axes, respectively, and  $E$  is the point where the line segment  $BC$  intersects the  $y$ -axis. The value of  $a$  for which the area of triangle  $BDE$  (shaded) equals the area of the quadrilateral  $ACED$  (unshaded) is:

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



7. Big Ben, the clock in Westminster Palace in London, England, takes five seconds to strike six o'clock, from the beginning of the first strike to the end of sixth strike, and each strike takes one quarter of a second. The number of seconds it will take to strike twelve o'clock is:

(A) 10                      (B) 10.4                      (C) 10.7                      (D) 11.2                      (E) 12

8. The four wheels of a car rotate independently. The front and rear wheels are both two metres apart, measured from one side of the car to the other. When the car drives in a certain circular path, its outside wheels are rotating twice as fast as the inside wheels. The length of the circumference of the path, measured in metres, followed by the outside wheels is:

(A)  $4\pi$                       (B)  $8\pi$                       (C)  $10\pi$                       (D)  $12\pi$                       (E)  $16\pi$

9. Consider the system of equations

$$4x + 4y = 10$$

$$2x + 2y = 5xy$$

The sum of the  $x$  values for all of the solutions to the system above is:

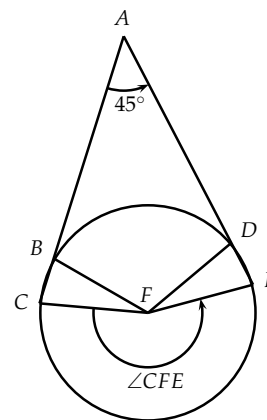
(A) 1                      (B)  $\frac{3}{2}$                       (C) 2                      (D)  $\frac{5}{2}$                       (E)  $\frac{7}{2}$

10. In an El Niño year, the probability of a spring drought in the Okanagan Valley is 60%. In a normal year, the probability is only 10%. In the twenty-first century, one-fifth of the years are expected to be El Niño years. The number of spring drought years that can be expected in the Okanagan Valley in the twenty-first century is:

(A) 12                      (B) 16                      (C) 20                      (D) 24                      (E) 30

11. In the diagram  $F$  is the centre of the circle and  $\overline{AC}$  and  $\overline{AE}$  are secants intersecting the circle at  $B$  and  $D$ , respectively. Given that  $\angle CAE = 45^\circ$ ,  $\angle BFC = 25^\circ$ , and  $|\overline{BC}| = |\overline{DE}|$ , it follows that  $\angle CFE$ , measured in degrees, equals:

(A) 115                      (B) 150                      (C) 185  
(D) 200                      (E) 210



12. A certain type of yeast increases in volume by 30% every 24 hours. Jake begins with  $1000 \text{ cm}^3$  of this yeast in a bowl at 9 AM one morning. At 9 AM on each subsequent day, he uses one quarter of the yeast that is currently in the bowl to make a loaf of bread. If he continues this process forever, the total amount of yeast that Jake uses, measured in  $\text{cm}^3$ , is:

(A) 13000                      (B) 10000                      (C) 40000                      (D) Infinite                      (E) None of these