

# BRITISH COLUMBIA COLLEGES

Senior High School Mathematics Contest, 2003

Preliminary Round

Wednesday March 5, 2003

1. If the price of an article is increased by the fraction  $p$  of the original price, where  $0 \leq p \leq 1$ , then the corresponding decrease in sales must not exceed the fraction  $d$  of the original sales, again  $0 \leq d \leq 1$ , in order to yield the same income. The value of  $d$  is:

(a)  $\frac{1}{1+p}$       (b)  $\frac{1}{1-p}$       (c)  $\frac{p}{1+p}$       (d)  $\frac{p}{p-1}$       (e)  $\frac{1-p}{1+p}$

2. The point  $B$  is between the points  $A(2, 3)$  and  $C(5, -7)$  and collinear with  $A$  and  $C$ . If  $\overline{AB} : \overline{BC}$  is  $3 : 7$ , the sum of the coordinates of point  $B$  is:

(a)  $\frac{3}{2}$       (b)  $\frac{29}{10}$       (c)  $\frac{3}{10}$       (d)  $\frac{1}{10}$       (e) 2

3. You have a pan balance and three different weights: one weight of 1 kg, one weight of 3 kg, and one weight of 9 kg. Objects of different weights, for which the weight is an integer number of kilograms, are to be weighed. If an object to be weighed and the given weights can be placed on either pan of the balance, the number of such differently-weighted objects that can be weighed is:

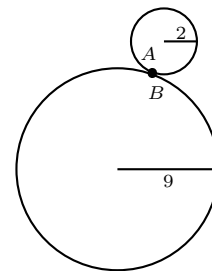
(a) 9      (b) 11      (c) 12      (d) 13      (e) 15

4. A circular grass plot 4 m in diameter is cut by a straight gravel path 1 m wide, one edge of which passes through the center of the plot. The number of square meters in the remaining grass area is:

(a)  $\frac{10\pi}{3} - \sqrt{3}$       (b)  $3\pi$       (c)  $4\pi - 4$       (d)  $\frac{10\pi}{3}$       (e)  $\frac{4\pi}{3} - \sqrt{3}$

5. A small circle of radius 2 cm is rotating without slipping around the edge of a larger circle of radius 9 cm. The small circle starts with point  $A$  on its circumference in contact with the larger circle at point  $B$ . The exact distance travelled by the centre of the small circle before the point  $A$  next comes in contact with the large circle at point  $B$  is:

(a)  $22\pi$       (b)  $36\pi$       (c)  $44\pi$   
(d)  $198\pi$       (e)  $A$  and  $B$  never come in contact again



6. A number  $N$  is the product of  $P$  distinct prime numbers. The number of positive integer divisors of  $N$  is:

(a)  $2^{(P-1)}$       (b)  $P!$       (c)  $2P$       (d)  $P^2$       (e)  $2^P$

7. At one point in a class vote for student rep on council, Anthony learned that exactly 45% of those voting had voted for him. After another five minutes of voting he had only 30% of the vote. The least number of people that could have voted during the five minute period is:

(a) 7      (b) 9      (c) 10      (d) 20      (e) 25

