

# BRITISH COLUMBIA COLLEGES

Junior High School Mathematics Contest, 2004

Preliminary Round

Wednesday March 10, 2004

- Of the 2004 students who wrote a mathematics contest, 239 wore Hip jeans and Fast runners, 252 wore Hip jeans but not Fast runners, and 1213 wore Fast runners but not Hip jeans. The number of students who wore neither is:  
(a) 298                      (b) 299                      (c) 300                      (d) 301                      (e) 302
- Two logs found in a wood pile are identical in every respect. Using a power saw, Kate takes 9 seconds to cut the first log into four smaller logs. Assuming the time it takes her to make each cut remains constant, the time (in seconds) it takes her to cut the second log into five smaller logs is:  
(a) 12                      (b) 11.5                      (c) 11.25                      (d) 11.75                      (e) none of these
- Using the standard  $xy$ -coordinate plane, the area, in square units, of a triangle whose vertices have the coordinates  $(0,0)$ ,  $(1,5)$ , and  $(7,3)$  is:  
(a) 15                      (b) 16                      (c) 17.5                      (d) 18                      (e) none of these
- A box contains red and blue pencils only. If the number of red pencils is two-thirds the number of blue pencils, then the proportion of pencils in the box that are red is:  
(a)  $\frac{1}{3}$                       (b)  $\frac{2}{3}$                       (c)  $\frac{1}{2}$                       (d)  $\frac{2}{5}$                       (e)  $\frac{3}{5}$
- Last year a skateboard cost \$100 and a helmet cost \$40. This year the cost of the skateboard increased by 12% and the cost of the helmet increased by 5%. The increase in the combined cost of the skateboard and the helmet is:  
(a) 17%                      (b) 10%                      (c) 9.5%                      (d) 8.5%                      (e) 7.5%
- Two vertical poles, one 10 metres high and the other 15 metres high, stand 12 metres apart. The distance, in metres, between the tops of the poles is:  
(a) 16                      (b) 15                      (c) 14                      (d) 13                      (e) 12
- The number of 4-digit numbers in which the digits sum to greater than 33 is:  
(a) 18                      (b) 13                      (c) 15                      (d) 11                      (e) none of these
- A large square, of perimeter 20 centimetres, has double the area of a smaller square. The perimeter, in centimetres, of the smaller square is:  
(a) 10                      (b)  $10\sqrt{2}$                       (c)  $20\sqrt{2}$                       (d) 40                      (e) none of these

9. Define the operation  $\star$  to mean  $A \star B = \frac{A + 2B}{3}$ . Then the value of  $[(4 \star 7) \star 8] - [4 \star (7 \star 8)]$  is:
- (a)  $-\frac{28}{9}$       (b)  $-\frac{2}{9}$       (c) 0      (d)  $\frac{8}{9}$       (e)  $\frac{29}{9}$
10. A box contains 20 yellow discs, 9 red discs, and 6 blue discs. If discs are selected at random, then the smallest number of discs that need to be selected to be assured of selecting at least two discs of each color is:
- (a) 7      (b) 17      (c) 23      (d) 28      (e) 31
11. If  $\frac{a}{d+b+c} = \frac{4}{3}$  and  $\frac{a}{b+c} = \frac{3}{5}$ , then the value of  $\frac{d}{a}$  is:
- (a)  $\frac{7}{6}$       (b)  $\frac{6}{7}$       (c)  $-\frac{12}{11}$       (d)  $-\frac{11}{12}$       (e)  $\frac{15}{11}$
12. Lana has a collection of nickels. When she collects them in groups of three, there is one left over; when she piles them in groups of five, there are two left over; and when she puts them in piles of seven, there are three left over. The sum of the digits of the smallest number of nickels that Lana can have is:
- (a) 9      (b) 7      (c) 10      (d) 12      (e) 3
13. The value of  $A + B$  that satisfies
- $$(6^{30} + 6^{-30})(6^{30} - 6^{-30}) = 3^A 8^B - 3^{-A} 8^{-B}$$
- is:
- (a) 30      (b) 40      (c) 60      (d) 80      (e) 120
14. Let  $x = 0.7181818\dots$ , where the digits '18' repeat. When  $x$  is expressed as a fraction in lowest terms, then its denominator exceeds its numerator by:
- (a) 18      (b) 31      (c) 93      (d) 141      (e) 279
15. A student has three different Mathematics books, two different English books, and four different Science books. The number of ways that the books can be arranged on a shelf, if all books of the same subject are kept together, is:
- (a) 288      (b) 864      (c) 1260      (d) 1544      (e) 1728