BRITISH COLUMBIA COLLEGES

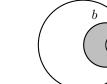
Junior High School Mathematics Contest, 2001

Final Round - Part A

Friday May 4, 2001

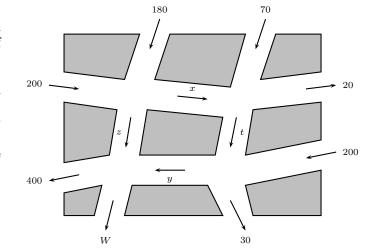
1.	The integer 9 is a perfect square that is both two greater than a prime number, 7, and two less than a
	prime number, 11. Another such perfect square is:

- 25 (a)
- 49 (b)
- 81
- 121 (d)
- 169 (e)
- Three circles, a, b, and c, are tangent to each other at point P, as shown. The center of b is on c and the center of a is on b. The ratio of the area of the shaded region to the total area of the unshaded regions enclosed by the circles is:



- (a) 3:13
- (b) 1:3
- 1:4(c)

- 2:9
- 1:25
- Here is a diagram of part of the downtown in a medium sized town in the interior of British Columbia. The arrows indicate oneway streets. The numbers or letters by the arrows represent the number of cars that travel along that portion of the street during a typical week day. Assuming that no car stops or parks and that no cars were there at the beginning of the day, the value of the variable W is:



- (a) 30
- 200
- (c) 250
- (d) 350
- 600
- The corners of a square of side x are cut off so that a regular octagon remains. The length of each side of the resulting octagon is:
- (b) $2x(2+\sqrt{2})$ (c) $\frac{x}{\sqrt{2}-1}$ (d) $x(\sqrt{2}-1)$ (e) $x(\sqrt{2}+1)$

- The value of $(0.0\overline{1})^{-1} + 1$ is: (The line over the digit 1 means that it is repeated indefinitely.)
- (b) $\frac{90}{91}$
- (d) 10
- (e) 91
- The people living on Sesame Street all decide to buy new house numbers from the same store, and they purchase the digits for their house numbers in the order of their addresses: 1, 2, 3, ... If the store has 100 of each digit, then the first address which cannot be displayed occurs at house number:
 - 100 (a)
- 101 (b)
- 162(c)
- 163 (d)
- 199 (e)

7. Given p dots on the top row and q dots on the bottom row, draw line segments connecting each top dot to each bottom dot. (In the diagram below, the dots referred to are the small open circles.) The dots must be arranged such that no three line segments intersect at a common point (except at the ends). The line segments connecting the dots intersect at several points. (In the diagram below, the points of intersection of the line segments are the small filled circles.) For example, when p=2 and q=3 there are three intersection points, as shown below.



When p = 3 and q = 4 the number of intersections is:

- (a) 7
- (b) 12
- (c) 18
- (d) 21
- (e) 27
- 8. At one time, the population of Petticoat Junction was a perfect square. Later, with an increase of 100, the population was 1 greater than a perfect square. Now, with an additional increase of 100, the population is again a perfect square. The original population was a multiple of:
 - (a) 3
- (b) 7
- (c) 9
- (d) 11
- (e) 17
- 9. The cashier at a local movie house took in a total of \$100 from 100 people. If the rates were \$3 per adult, \$2 per teenager and 25 cents per child, then the smallest number of adults possible was:
 - (a) 0
- (b) 2
- (c)
- (d) 13
- (e) 20

10. The island of Aresia has 27 states each of which belongs to one of two factions, the white faction and the grey faction, who are sworn enemies. The United Nations wishes to bring peace to Aresia by converting one state at a time to the opposite faction, i.e., converting one state from white to grey or from grey to white, so that eventually all states belong to the same faction. In doing this they must guarantee that no single state is completely surrounded by states of the opposite faction. Note that a coastal state can never be completely surrounded, and that it may be necessary to convert a state from one faction to the other at one stage and then convert it back to its original faction later. A map of the state of Aresia is shown. The five shaded states belong to the grey faction, and all of the unshaded states belong to the white faction. The minimum number of conversions necessary to completely pacify Aresia is:



(b) 7

(c) 9

(d) 10

(e) 15

