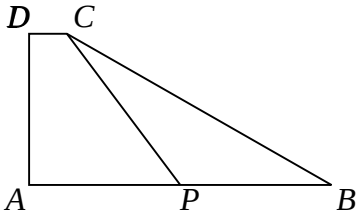
BRITISH COLUMBIA COLLEGES

Senior High School Mathematics Contest

Part A Final Round May 5, 2000

1. In the diagram, DC is parallel to AB, and DA is perpendicular to AB. If $DC = 1$, $DA = 4$, $AB = 10$, and the area of quadrilateral $APCD$ equals the area of triangle CPB, then PB equals:



(a) 3 (b) $3\frac{1}{2}$ (c) 4 (d) 5 (e) $5\frac{1}{2}$

2. Label the vertices of a regular pentagon with A, B, C, D, and E, so that edges of the pentagon are line segments AB, BC, CD, DE, and EA. One of the angles formed at the intersection of AC and BD has measure:

(a) 72° (b) 135° (c) 36° (d) 54° (e) 120°

3. Three children are all under the age of 15. If I tell you that the product of their ages is 90, you do not have enough information to determine their ages. If I also tell you the sum of their ages, you still do not have enough information to determine their ages. Which of the following is *not* a possible age for one of the children?

(a) 2 (b) 3 (c) 5 (d) 6 (e) 9

4. I know I can fill my bathtub in 10 minutes if I put the hot water tap on full, and that it takes 8 minutes if I put the cold water on full. I was in a hurry so I put both on full. Unfortunately I forgot to put in the plug. A full tub empties in 5 minutes. How long, in minutes, will it take for the tub to fill?

(a) 15 (b) 24 (c) 40 (d) 60 (e) it will never fill

5. The smallest positive integer k such that

$$(k+1) + (k+2) + \cdots + (k+19)$$

is a perfect square is:

(a) 4 (b) 9 (c) 19 (d) 28 (e) impossible to find

6. A six digit number begins with 1. If this digit is moved from the extreme left to the extreme right without changing the order of the other digits, the new number is three times the original. The sum of the digits in either number is:

(a) 6 (b) 9 (c) 18 (d) 27 (e) 51

7. A cube of edge 5 cm is cut into smaller cubes, not all the same size, in such a way that the smallest possible number of cubes is formed. If the edge of each of the smaller cubes is a whole number of centimetres, how many cubes with edge 2 cm are formed?

(a) 0 (b) 3 (c) 5 (d) 7 (e) 8

8. The nine councillors on the student council are not all on speaking terms. The table below shows the current relationship between each pair of councillors, where '1' means 'is on speaking terms', '0' means 'is not on speaking terms', and the letters stand for the councillors' names.

	A	B	C	D	E	F	G	H	I
A	–	0	0	1	0	0	1	0	0
B	0	–	1	1	1	1	1	1	1
C	0	1	–	0	0	0	1	1	0
D	1	1	0	–	1	0	1	0	1
E	0	1	0	1	–	0	1	0	0
F	0	1	0	0	0	–	0	0	1
G	1	1	1	1	1	0	–	0	0
H	0	1	1	0	0	0	0	–	0
I	0	1	0	1	0	1	0	0	–

Councillor A recently started a rumor. It was heard by each councillor once and only once. Each councillor heard it from and passed it to a councillor with whom he or she was on speaking terms. Counting councillor A as zero, councillor E was the eighth and last to hear it. Who was the fourth councillor to hear the rumor?

(a) B (b) C (c) F (d) H (e) I

9. A, B, and C are thermometers with different scales. When A reads 10° and 34°, B reads 15° and 31° respectively. When B reads 30° and 42°, C reads 5° and 77° respectively. If the temperature drops 18° using A's scale, how many degrees does it drop using C's scale?

(a) 12 (b) 24 (c) 48 (d) 54 (e) 72

10. The number of positive integers between 200 and 2000 that are multiples of 6 or 7 but not both is:

(a) 469 (b) 471 (c) 513 (d) 514 (e) 557