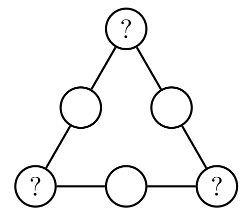
BRITISH COLUMBIA COLLEGES

Junior High School Mathematics Contest, 2003

Final Round, Part A

Friday May 2, 2003

1. The digits 1, 2, 3, 4, 5, and 6 are each placed in one circle in the diagram in such a way that the sum of the numbers along each side of the triangle is 11. The sum of the three corner entries (marked by ?) is:



(a) 11 (b) 12 (c) 13
(d) 14 (e) 15

2. Today's date, May 2, 2003, written in standard SI form, *yyyymmdd*, is 20030502. Viewed as a decimal number, this is divisible by 6. The number of dates in the year 2003 that are divisible by 6 when written in standard SI form is:

(a) 46 (b) 47 (c) 58 (d) 59 (e) 60

3. Let $a_1 = 7$ and $a_{n+1} = \sqrt{|a_n^2 - 16|}$. The value of a_{80} is:

(a) 1 (b) 7 (c) $\sqrt{33}$ (d) $\sqrt{17}$ (e) $\sqrt{15}$

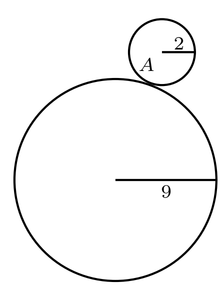
4. A circle is inscribed in an equilateral triangle. The ratio of the area of the circle to the area of the triangle is:

(a) $\frac{\pi}{12}$ (b) $\frac{\pi}{2\sqrt{3}}$ (c) $\frac{\pi}{3\sqrt{3}}$ (d) $\frac{\pi}{6}$ (e) $\frac{\pi}{2\sqrt{2}}$

5. If $3^{17} + 3^{17} + 3^{17} + 3^{17} + 3^{17} + 3^{17} + 3^{17} + 3^{17} + 3^{17} = 81^N$, then the value of N is:

(a) 6 (b) $\frac{17}{4}$ (c) $\frac{17}{2}$ (d) $\frac{19}{4}$ (e) $\frac{16}{9}$

6. A small circle of radius 2 cm is rotating without slipping around the edge of a larger circle of radius 9 cm. If the small circle starts with point A on its circumference in contact with the larger circle, the <u>**exact**</u> distance travelled by the centre of the small circle before the point A next comes in contact with the large circle is:



(a) 4π (b) $\frac{44\pi}{9}$ (c) $\frac{44\pi}{81}$
(d) 11π (e) $\frac{99\pi}{4}$

7. Two triangles share a common side. The sides of one triangle are in the ratio $8 : 9 : 15$ and the sides of the other triangle are in the ratio $7 : 10 : 12$. Assuming that all of the sides of both triangles are of integral length, the smallest possible length of the common side is:

(a) 18 (b) 24 (c) 30 (d) 36 (e) 56

8. Assuming that a, b, c, and d are distinct prime numbers greater than 10, the number of common multiples of $14a^7b^5c^4$ and $98a^3b^{15}d^7$ which are factors of the product of the two numbers is:

(a) 15 (b) 96 (c) 140 (d) 588 (e) 729

9. A scalene triangle is a triangle in which no two sides have equal length. The sides of a certain scalene triangle have integral lengths. If the perimeter of the triangle is 14, the shortest possible length of a side is:

(a) 1 (b) 2 (c) 3 (d) 4 (e) 5

10. Three concentric circles have radii a, b, and c, where $a < b < c$. If $a = 8$ and $b = 9$ and the middle circle bisects the area between the other two circles, then the value of c is:

(a) $7\sqrt{2}$ (b) $3\sqrt{17}$ (c) 10 (d) $6\sqrt{3}$ (e) $\frac{19}{2}$