EDMONTON JUNIOR HIGH MATHEMATICS CONTEST
MAY 2, 2001

PART 1: MULTIPLE CHOICE

1. The last two digits of 49^{2001} are

   (a) 01 (b) 49 (c) 69 (d) 81

2. The sum $7^7 + 7^7 + 7^7 + 7^7 + 7^7 + 7^7 + 7^7$ is equal to

   (a) 8^7 (b) 7^8 (c) 49^7 (d) 7^{49}

3. For any numbers x and y, define $x \oplus y = x + y + xy - 1$ and $x \otimes y = a^2 + b^2 - ab$.
   The value of $3 \oplus (2 \otimes 4)$ is

   (a) 36 (b) 42 (c) 48 (d) 50

4. The price is first increased by r% and then reduced by r%. If the final price is divided by the original price, the quotient is

   (a) 1 (b) $1-\frac{r}{10000}$ (c) $1+\frac{r^2}{10000}$ (d) $1-\frac{r^2}{10000}$

5. There is enough cabbage to last the goat x days and the rabbit y days. The number of days the cabbage will last both the goat and the rabbit is

   (a) $\frac{1}{x+y}$ (b) $\frac{1}{x}+\frac{1}{y}$ (c) $\frac{xy}{x+y}$ (d) $\frac{1}{xy}$

6. When Ace was as old as Bea is now, Bea was 10 years old. When Bea is as old as Ace is now, Ace will be 25 years old. Ace is older than Bea by

   (a) 5 years (b) 10 years (c) 15 years (d) none of these

7. The length of each side of a triangle is a positive integer and the sum of these three integers is odd. If the difference between two of them is 5, the smallest possible value of the third is

   (a) 4 (b) 6 (c) 7 (d) 8

8. The sum of the angles of a polygon is less than 2001°. The largest possible number of sides of this polygon is

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

9. In triangle ABC, $AB = AC$. E is the point on AC such BE is perpendicular to AC. F is the midpoint of AB. If $BE = EF$, then the measure of $\angle C$ is

(a) 65° (b) 70° (c) 75° (d) 80°

10. If the number x satisfies $\frac{2}{x} - |x| = 1$, what is the value of $\frac{2}{x} + |x|$.

Hint: $|2| = 2, and |-2| = 2$.

(a) −3 (b) −1 (c) 1 (d) 3

PART 2: NUMERIC RESPONSE

1. The value of $\dfrac{-2\div(-2)^{-2}+(-2)^{3}}{\left(-\dfrac{1}{2}\right)^{-1}+\dfrac{1}{2}}$ in fractional form.

2. In a Student Union election, 1500 votes are cast. Of the first 1000, Ace receives 350, Bea 370 and Cec 280. Of the remaining 500 votes, at least how many must Ace receive in order for him to have more votes than either Bea or Cec?

3. The ratio of Peter's and Steven's running speed is 5:3. They start from the same point on a circular track at the same time. After some time, they meet again at the starting point, and Peter has run 4 more laps than Steven. How many laps has Steven run?

4. What is the smallest positive integer n such that $n + 13$ is a multiple of 5 and $n - 13$ is a positive multiple of 6?

5. The positive integers w, x, y and z are such that $\frac{w}{x}=\frac{x}{y}=\frac{y}{z}=\frac{5}{8}$. What is the smallest possible value of $w + x + y + z$?

6. D is a point on the side BC of triangle ABC. If $AC = 5$, $AD = 6$, $BD = 10$ and $CD = 5$. What is the area of triangle ABC?

7. What is the unit digit of $1^3 - 2^3 + 3^3 - 4^3 + \ldots + 1999^3 - 2000^3 + 2001^3$?

8. How many four-digit multiples of 11 are there in which each of the digits 1, 2, 3 and 4 appears?

9. Three thousand three hundred and seventy-five 1 cm cubes are used to form a larger cube. The outer surfaces of the newly assembled cube are painted. After drying the paint, the cubes are knocked apart. Find the total surface area of the unpainted surfaces on the 3375 cubes.

10. $ABCD$ is a rectangle of area 24. E, F and G are points on AB, BC and CD respectively, such that $BE = 3AE$, $CF = 2BF$ and $DG = CG$. What is the area of triangle EFG?