Canadian Mathematics Competition

**An activity of The Centre for Education
in Mathematics and Computing,
University of Waterloo, Waterloo, Ontario**

Gauss Contest (Grade 8)

(Grade 7 Contest is on the reverse side)

Wednesday, May 16, 2001

Time: 1 hour

Calculators are permitted.

Instructions

1. Do not open the examination booklet until you are told to do so.

2. You may use rulers, compasses and paper for rough work.

3. Be certain that you understand the coding system for your answer sheet. If you are not sure, ask your teacher to explain it.

4. This is a multiple-choice test. Each question is followed by five possible answers marked **A**, **B**, **C**, **D**, and **E**. Only one of these is correct. When you have decided on your choice, enter the appropriate letter on your answer sheet for that question.

5. Scoring:
   Each correct answer is worth 5 in Part A, 6 in Part B, and 8 in Part C.
   There is *no penalty* for an incorrect answer.
   Each unanswered question is worth 2, to a maximum of 20.

6. Diagrams are *not* drawn to scale. They are intended as aids only.

7. When your supervisor tells you to start, you will have *sixty* minutes of working time.

Grade 8

Part A: Each correct answer is worth 5.

1. In 1998, the population of Canada was 30.3 million. Which number is the same as 30.3 million?
    (**A**) 30 300 000   (**B**) 303 000 000   (**C**) 30 300   (**D**) 303 000   (**E**) 30 300 000 000

2. What number should be placed in the box to make $\dfrac{6+\square}{20}=\dfrac{1}{2}$?

    (**A**) 10   (**B**) 4   (**C**) -5 (**D**) 34   (**E**) 14

3. The value of $3\times 4^2-(8\div 2)$ is
    (**A**) 44   (**B**) 12   (**C**) 20   (**D**) 8   (**E**) 140

4. When a number is divided by 7, the quotient is 12 and the remainder is 5. The number is
    (**A**) 47   (**B**) 79   (**C**) 67   (**D**) 119   (**E**) 89

5. If $2x-5=15$, the value of x is
    (**A**) 5   (**B**) -5 (**C**) 10   (**D**) 0   (**E**) -10

6. The area of the entire figure shown is
    (**A**) 16   (**B**) 32   (**C**) 20
    (**D**) 24   (**E**) 64
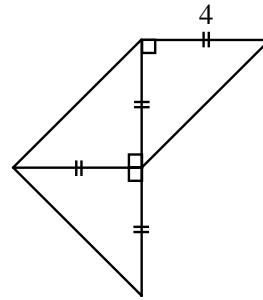
7. The bar graph shows the hair colours of the
    campers at Camp Gauss. The bar corresponding
    to redheads has been accidentally removed. If
    50% of the campers have brown hair, how many
    of the campers have red hair?
    (**A**) 5   (**B**) 10   (**C**) 25
    (**D**) 50   (**E**) 60
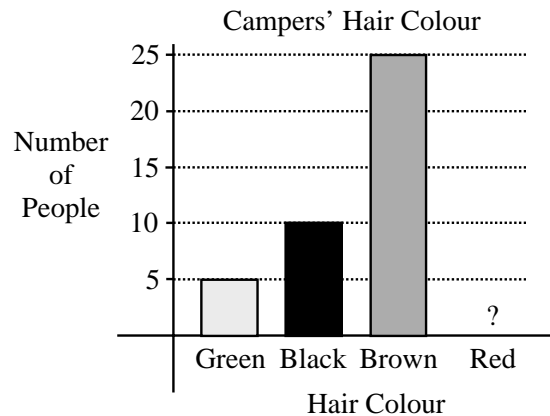
8. A fair die is constructed by labelling the faces of a wooden cube with the numbers 1, 1, 1, 2, 3, and 3.
    If this die is rolled once, the probability of rolling an odd number is
    (**A**) $\frac{5}{6}$ (**B**) $\frac{4}{6}$ (**C**) $\frac{3}{6}$ (**D**) $\frac{2}{6}$ (**E**) $\frac{1}{6}$

9. In the square shown, the numbers in each row, column, and diagonal multiply to give the same result. The sum of the two missing numbers is
   (A) 28 (B) 15 (C) 30
   (D) 38 (E) 72

 | 12 | 1 | 18 |
   |----|---|----|
   | 9 | 6 | 4 |
   | | | 3 |

10. Rowena is able to mow $\frac{2}{5}$ of a lawn in 18 minutes. If she began the job at 10:00 a.m., and mowed at this same constant rate, when did she finish mowing the entire lawn?
    (A) 10:08 a.m. (B) 11:30 a.m. (C) 10:40 a.m. (D) 10:25 a.m. (E) 10:45 a.m.

Part B: Each correct answer is worth 6.

11. In a class of 25 students, each student has at most one pet. Three-fifths of the students have cats, 20% have dogs, three have elephants, and the other students have no pets. How many students have no pets?
    (A) 5 (B) 4 (C) 3 (D) 2 (E) 1

12. A prime number is called a "Superprime" if doubling it, and then subtracting 1, results in another prime number. The number of Superprimes less than 15 is
    (A) 2 (B) 3 (C) 4 (D) 5 (E) 6

13. Laura earns $10/hour and works 8 hours per day for 10 days. She first spends 25% of her pay on food and clothing, and then pays $350 in rent. How much of her pay does she have left?
    (A) $275 (B) $200 (C) $350 (D) $250 (E) $300

14. A rectangular sign that has dimensions 9 m by 16 m has a square advertisement painted on it. The border around the square is required to be at least 1.5 m wide. The area of the largest square advertisement that can be painted on the sign is
    (A) $78\,\text{m}^2$ (B) $144\,\text{m}^2$ (C) $36\,\text{m}^2$ (D) $9\,\text{m}^2$ (E) $56.25\,\text{m}^2$

15. The surface area of a cube is $24\ \text{cm}^2$. The volume of this cube is
    (A) $4\,\text{cm}^3$ (B) $24\,\text{cm}^3$ (C) $8\,\text{cm}^3$ (D) $27\,\text{cm}^3$ (E) $64\,\text{cm}^3$

16. In the diagram, the value of x is
    (A) 30 (B) 40 (C) 60
    (D) 50 (E) 45
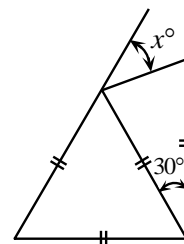
17. Daniel's age is one-ninth of his father's age. One year from now, Daniel's father's age will be seven times Daniel's age. The difference between their ages is
    (A) 24 (B) 25 (C) 26 (D) 27 (E) 28

18. Two squares are positioned, as shown. The smaller square has side length 1 and the larger square has side length 7. The length of AB is
    (A) 14 (B) $\sqrt{113}$ (C) 10
   (D) $\sqrt{85}$ (E) $\sqrt{72}$
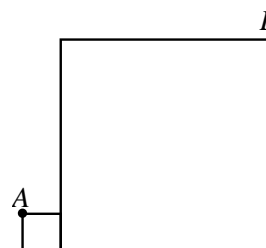
19. Anne, Beth and Chris have 10 candies to divide amongst themselves. Anne gets at least 3 candies, while Beth and Chris each get at least 2. If Chris gets at most 3, the number of candies that Beth could get is

    (A) 2   (B) 2 or 3   (C) 3 or 4   (D) 2, 3 or 5   (E) 2, 3, 4 or 5

20. What number should be placed in the box to make $10^4 \times 100^\square = 1000^6$?

    (A) 7   (B) 5   (C) 2   (D) $\frac{3}{2}$ (E) 10


Part C: Each correct answer is worth 8.

21. Lines PS, QT and RU intersect at a common point O, as shown. P is joined to Q, R to S, and T to U, to form triangles. The value of $\angle P + \angle Q + \angle R + \angle S + \angle T + \angle U$ is

    (A) 450°   (B) 270°   (C) 360°
    (D) 540°   (E) 720°
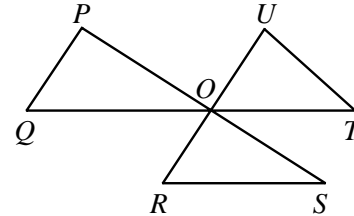
22. Sixty-four white $1 \times 1 \times 1$ cubes are used to form a $4 \times 4 \times 4$ cube, which is then painted red on each of its six faces. This large cube is then broken up into its 64 unit cubes. Each unit cube is given a score as follows:

Exact number of faces painted red	Score
3	3
2	2
1	1
0	−7

    The total score for the $4 \times 4 \times 4$ cube is

    (A) 40   (B) 41   (C) 42   (D) 43   (E) 44

23. The integers 2, 2, 5, 5, 8, and 9 are written on six cards, as shown. Any number of the six cards is chosen, and the sum of the integers on these cards is determined. Note that the integers 1 and 30 cannot be obtained as sums in this way. How many of the integers from 1 to 31 cannot be obtained as sums?

    (A) 4   (B) 22   (C) 8
    (D) 10   (E) 6
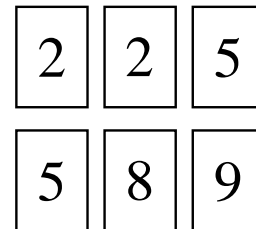
24. A triangle can be formed having side lengths 4, 5 and 8. It is impossible, however, to construct a triangle with side lengths 4, 5 and 9. Ron has eight sticks, each having an integer length. He observes that he cannot form a triangle using any three of these sticks as side lengths. The shortest possible length of the longest of the eight sticks is

    (A) 20   (B) 21   (C) 22   (D) 23   (E) 24

25. Tony and Maria are training for a race by running all the way up and down a 700 m long ski slope. They each run up the slope at different constant speeds. Coming down the slope, each runs at double his or her uphill speed. Maria reaches the top first, and immediately starts running back down, meeting Tony 70 m from the top. When Maria reaches the bottom, how far behind is Tony?

    (A) 140 m   (B) 250 m   (C) 280 m   (D) 300 m   (E) 320 m

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