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 15, 2002

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 10 unanswered questions.

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.

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Part A: Each correct answer is worth 5.

1. The value of $\frac{1}{2}+\frac{1}{4}$ is

   (A) 1   (B) $\frac{1}{8}$ (C) $\frac{1}{6}$ (D) $\frac{2}{6}$ (E) $\frac{3}{4}$

2. The expression $6\times1000+5\times100+6\times1$ is equivalent to
   (A) 656   (B) 6506   (C) 6056   (D) 60 506   (E) 6560

3. The value of $3^2-(4\times2)$ is
   (A) 4   (B) 17   (C) 1   (D) –2   (E) 0

4. An integer is divided by 7 and the remainder is 4. An example of such an integer is
   (A) 14   (B) 15   (C) 16   (D) 17   (E) 18

5. Which of the following expressions is equal to an odd integer?
   (A) $3(5)+1$ (B) $2(3+5)$ (C) $3(3+5)$ (D) $3+5+1$ (E) $\frac{3+5}{2}$

6. Qaddama is 6 years older than Jack. Jack is 3 years younger than Doug. If Qaddama is 19 years old, how old is Doug?
   (A) 17   (B) 16   (C) 10   (D) 18   (E) 15

7. The volume of a rectangular box is 144 cm^3. If its length is 12 cm and its width is 6 cm, what is its height?
   (A) 126 cm   (B) 72 cm   (C) 4 cm   (D) 8 cm   (E) 2 cm

8. In a jar, the ratio of the number of oatmeal cookies to the number of chocolate chip cookies is 5:2. If there are 20 oatmeal cookies, the number of chocolate chip cookies in the jar is
   (A) 28   (B) 50   (C) 8   (D) 12   (E) 18

9. The bar graph below shows the numbers of boys and girls in Mrs. Kuwabara's class. The percentage of students in the class who are girls is
   (A) 40%   (B) 15%   (C) 25%   (D) 10%   (E) 60%

Students in Mrs. Kuwabara's Class

Number of Students
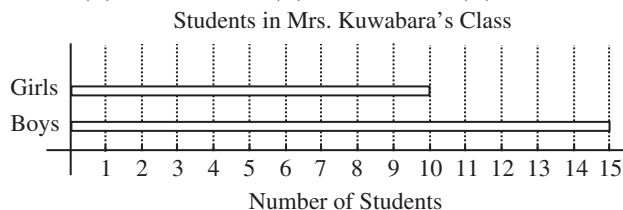
10. Which of the following statements is **not** true?
    (A) A quadrilateral has four sides.
    (B) The sum of the angles in a triangle is $180°$.
    (C) A rectangle has four $90°$ angles.
    (D) A triangle can have two $90°$ angles.
    (E) A rectangle is a quadrilateral.

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Part B: Each correct answer is worth 6.

11. A palindrome is a positive integer whose digits are the same when read forwards or backwards. For example, 2002 is a palindrome. What is the smallest number which can be added to 2002 to produce a larger palindrome?

    (A) 11   (B) 110   (C) 108   (D) 18   (E) 1001

12. Which of the following can be folded along the lines to form a cube?

    (A)   (B)   (C)   (D)   (E)

13. If $a+b=12$, $b+c=16$, and $c=7$, what is the value of a?

    (A) 1   (B) 5   (C) 9   (D) 7   (E) 3

14. In the diagram, $\angle ABD = \angle BDC$ and $\angle DAB = 80°$. Also, $AB = AD$ and $DB = DC$. The measure of $\angle BCD$ is

    (A) 65°   (B) 50°   (C) 80°

    (D) 60°   (E) 70°

15. A perfect number is an integer that is equal to the sum of all of its positive divisors, except itself. For example, 28 is a perfect number because $28 = 1+2+4+7+14$. Which of the following is a perfect number?

    (A) 10   (B) 13   (C) 6   (D) 8   (E) 9

16. Three pennies are flipped. What is the probability that they all land with heads up?

    (A) $\frac{1}{8}$ (B) $\frac{1}{6}$ (C) $\frac{1}{4}$ (D) $\frac{1}{3}$ (E) $\frac{1}{2}$

17. If P is a negative integer, which of the following is always positive?

    (A) P^2 (B) $\frac{1}{P}$ (C) $2P$ (D) $P-1$ (E) P^3

18. When expanded, the number of zeros in 1000^{10} is

    (A) 13   (B) 30   (C) 4   (D) 10   (E) 1000

19. The word "stop" starts in the position shown in the diagram to the right. It is then rotated 180° clockwise about the origin, O, and this result is then reflected in the x-axis. Which of the following represents the final image?
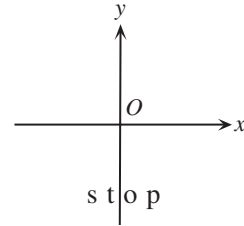
(A)

(B)

(C)

(D)

(E)

20. The units digit (that is, the last digit) of 7^{62} is
    (A) 7   (B) 1   (C) 3   (D) 9   (E) 5

Part C: Each correct answer is worth 8.

21. A rectangle has sides of integer length (when measured in cm) and an area of 36 cm^2. What is the maximum possible perimeter of the rectangle?
    (A) 72 cm   (B) 80 cm   (C) 26 cm   (D) 74 cm   (E) 48 cm

22. If each diagonal of a square has length 2, then the area of the square is
    (A) 1   (B) 2   (C) 3   (D) 4   (E) 5

23. A map is drawn to a scale of 1:10 000. On the map, the Gauss Forest occupies a rectangular region measuring 10 cm by 100 cm. What is the actual area of the Gauss Forest, in km^2?
    (A) 100   (B) 1 000 000   (C) 1000   (D) 1   (E) 10

24. Veronica has 6 marks on her report card.
    The mean of the 6 marks is 74.
    The mode of the 6 marks is 76.
    The median of the 6 marks is 76.
    The lowest mark is 50.
    The highest mark is 94.
    Only one mark appears twice and no mark appears more than twice.
    Assuming all of her marks are integers, the number of possibilities for her second lowest mark is
    (A) 17   (B) 16   (C) 25   (D) 18   (E) 24

25. Emily has created a jumping game using a straight row of floor tiles that she has numbered 1, 2, 3, 4, … . Starting on tile 2, she jumps along the row, landing on every second tile, and stops on the second last tile in the row. Starting from this tile, she turns and jumps back toward the start, this time landing on every third tile. She stops on tile 1. Finally, she turns again and jumps along the row, landing on every fifth tile. This time, she again stops on the second last tile. The number of tiles in the row could be
    (A) 39   (B) 40   (C) 47   (D) 49   (E) 53

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