# 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 12, 1999*



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**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

| | |
|---|---|
| Scoring: | There is *no penalty* for an incorrect answer.<br>Each unanswered question is worth 2 credits, to a maximum of 20 credits. |

**Part A** (5 credits each)

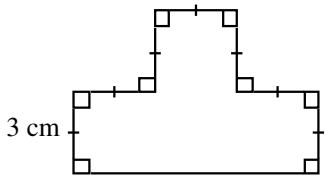
1. $10^3 + 10^2 + 10$ equals
   (**A**) 1110 (**B**) 101 010 (**C**) 111 (**D**) 100 010 010 (**E**) 11 010

2. $\frac{1}{2} + \frac{1}{3}$ is equal to
   (**A**) $\frac{2}{5}$ (**B**) $\frac{1}{6}$ (**C**) $\frac{1}{5}$ (**D**) $\frac{3}{2}$ (**E**) $\frac{5}{6}$

3. Which one of the following gives an odd integer?
   (**A**) $6^2$ (**B**) $23 - 17$ (**C**) $9 \times 24$ (**D**) $9 \times 41$ (**E**) $96 \div 8$

4. What is the remainder when 82 460 is divided by 8?
   (**A**) 0 (**B**) 5 (**C**) 4 (**D**) 7 (**E**) 2

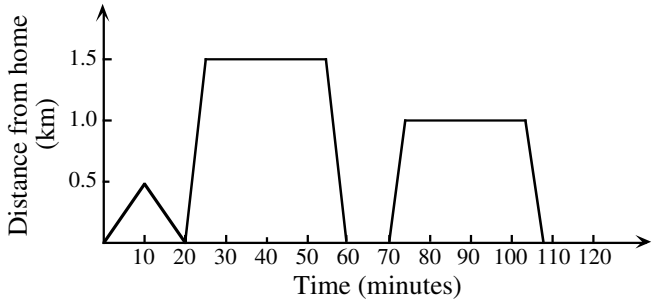
5. In the diagram, line segments meet at 90° as shown. If the short line segments are each 3 cm long, what is the area of the shape?
   (**A**) 30 (**B**) 36 (**C**) 40
   (**D**) 45 (**E**) 54



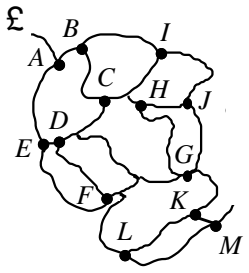

6. The average of $-5, -2, 0, 4$, and 8 is
   (**A**) 1 (**B**) 0 (**C**) $\frac{19}{5}$ (**D**) $\frac{5}{4}$ (**E**) $\frac{9}{4}$

7. If the sales tax rate were to increase from 7% to 7.5%, then the tax on a $1000 item would go up by
   (**A**) $75.00 (**B**) $5.00 (**C**) $0.5 (**D**) $0.05 (**E**) $7.50

8. Tom spent part of his morning visiting and playing with friends. The graph shows his travels. He went to his friends' houses and stopped to play if they were at home. The number of houses at which he stopped to play is
   (**A**) 1 (**B**) 2 (**C**) 3 (**D**) 4 (**E**) 5




9. André is hiking on the paths shown in the map. He is planning to visit sites *A* to *M* in alphabetical order. He can never retrace his steps and he must proceed directly from one site to the next. What is the largest number of labelled points he can visit before going out of alphabetical order?
   (**A**) 6 (**B**) 7 (**C**) 8
   (**D**) 10 (**E**) 13



10. The area of a rectangular shaped garden is $28\ m^2$. It has a length of 7 m. Its perimeter, in metres, is
(**A**) 22 (**B**) 11 (**C**) 24 (**D**) 36 (**E**) 48

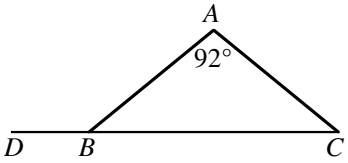
**Part B** (6 credits each)

11. Which of the following numbers is an odd integer, contains the digit 5, is divisible by 3, and lies between $12^2$ and $13^2$?
(**A**) 105 (**B**) 147 (**C**) 156 (**D**) 165 (**E**) 175

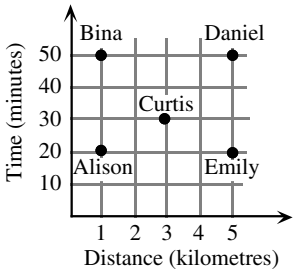
12. If $\frac{n+1999}{2} = -1$, then the value of $n$ is
(**A**) $-2001$ (**B**) $-2000$ (**C**) $-1999$ (**D**) $-1997$ (**E**) 1999

13. The expression $n!$ means the product of the positive integers from 1 to $n$. For example, $5! = 1\times2\times3\times4\times5$. The value of $6! - 4!$ is
(**A**) 2 (**B**) 18 (**C**) 30 (**D**) 716 (**E**) 696

14. $ABC$ is an isosceles triangle in which $\angle A = 92°$. $CB$ is extended to a point $D$. What is the size of $\angle ABD$?
(**A**) 88° (**B**) 44° (**C**) 92°
(**D**) 136° (**E**) 158°



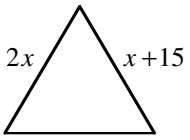

15. The graph shown at the right indicates the time taken by five people to travel various distances. On average, which person travelled the fastest?
(**A**) Alison (**B**) Bina (**C**) Curtis
(**D**) Daniel (**E**) Emily




16. In a set of five numbers, the average of two of the numbers is 12 and the average of the other three numbers is 7. The average of all five numbers is
(**A**) $8\frac{1}{3}$ (**B**) $8\frac{1}{2}$ (**C**) 9 (**D**) $8\frac{3}{4}$ (**E**) $9\frac{1}{2}$

17. In the subtraction question, $\begin{array}{r} 1957 \\ -\ a9 \\ \hline 18b8 \end{array}$, the sum of the digits $a$ and $b$ is
(**A**) 15 (**B**) 14 (**C**) 10 (**D**) 5 (**E**) 4

18. The equilateral triangle has sides of $2x$ and $x+15$ as shown. The perimeter of the triangle is
(**A**) 15 (**B**) 30 (**C**) 90
(**D**) 45 (**E**) 60




19. In a traffic study, a survey of 50 moving cars is done and it is found that 20% of these contain more than one person. Of the cars containing only one person, 60% of these are driven by women. Of the cars containing just one person, how many were driven by men?
(**A**) 10 (**B**) 16 (**C**) 20 (**D**) 30 (**E**) 40

20. A game is played on the board shown. In this game, a player can move three places in any direction (up, down, right or left) and then can move two places in a direction perpendicular to the first move. If a player starts at $S$, which position on the board ($P$, $Q$, $R$, $T$, or $W$) cannot be reached through any sequence of moves?

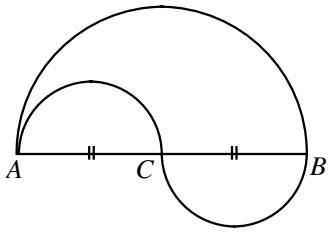
| | | | | |
|---|---|---|---|---|
| | | $P$ | | |
| | $Q$ | | $R$ | |
| | | $T$ | | |
| $S$ | | | | $W$ |

(**A**) $P$ (**B**) $Q$ (**C**) $R$
(**D**) $T$ (**E**) $W$

**Part C** (8 credits each)

21. The sum of seven consecutive positive integers is always
(**A**) odd (**B**) a multiple of 7 (**C**) even
(**D**) a multiple of 4 (**E**) a multiple of 3

22. In the diagram, $AC = CB = 10$ m, where $AC$ and $CB$ are each the diameter of the small equal semi-circles. The diameter of the larger semi-circle is $AB$. In travelling from $A$ to $B$, it is possible to take one of two paths. One path goes along the semi-circular arc from $A$ to $B$. A second path goes along the semi-circular arcs from $A$ to $C$ and then along the semi-circular arc from $C$ to $B$. The difference in the lengths of these two paths is




(**A**) $12\pi$ (**B**) $6\pi$ (**C**) $3\pi$
(**D**) $2\pi$ (**E**) 0

23. Kalyn writes down all of the integers from 1 to 1000 that have 4 as the sum of their digits. If $\frac{a}{b}$ (in lowest terms) is the fraction of these numbers that are prime, then $a+b$ is
(**A**) 5 (**B**) 4 (**C**) 15 (**D**) 26 (**E**) 19

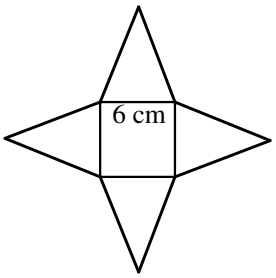
24. Raymonde's financial institution publishes a list of service charges as shown in the table. For her first twenty five transactions, she uses Autodebit three times as often as she writes cheques. She also writes as many cheques as she makes cash withdrawals. After her twenty- fifth transaction, she begins to make single transactions. What is the smallest number of transactions she needs to make so that her monthly service charges will exceed the $15.95 'all-in-one' fee?

| Service Fee per Item | |
|---|---|
| Cheque | $0.50 |
| Autodebit | $0.60 |
| Cash Withdrawal | $0.45 |

'All-in-one' fee is $15.95

(**A**) 29 (**B**) 30 (**C**) 27
(**D**) 28 (**E**) 31

25. Four identical isosceles triangles border a square of side 6 cm, as shown. When the four triangles are folded up they meet at a point to form a pyramid with a square base. If the height of this pyramid is 4 cm, the total area of the four triangles and the square is




(**A**) 84 cm$^2$ (**B**) 98 cm$^2$ (**C**) 96 cm$^2$
(**D**) 108 cm$^2$ (**E**) 90 cm$^2$