# Gauss Contest

## (Grade 7)

### (The Grade 8 Contest is on the reverse side)

**Wednesday, May 11, 2011**

UNIVERSITY OF
**WATERLOO**

**WATERLOO**
**MATHEMATICS**

THE
**Great-West Life**
ASSURANCE COMPANY

**London Life**

**Canada Life**

STRONGER COMMUNITIES TOGETHER™

Canadian
Institute of
Actuaries

Institut
canadien
des actuaires

**Deloitte.**

**Maplesoft**
Mathematics • Modeling • Simulation

---

**Time:** 1 hour ©2010 Centre for Education in Mathematics and Computing

**Calculators are permitted.**

**Instructions**

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

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

3. Be sure 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 made your choice, enter the appropriate letter for that question on your answer sheet.

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 instructs you to start, you will have *sixty* minutes of working time.

---

*Please see our Web site: http://www.cemc.uwaterloo.ca. The Gauss Report will list the names of some top-scoring students. You will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.*

# Grade 7

---

## Part A: Each correct answer is worth 5.

1. The value of $5 + 4 - 3 + 2 - 1$ is
   (A) 0          (B) $-5$          (C) 3          (D) $-3$          (E) 7

2. The value of $\sqrt{9 + 16}$ is
   (A) 5.2          (B) 7          (C) 5.7          (D) 25          (E) 5

3. Students were surveyed about their favourite season. The results are shown in the bar graph. What percentage of the 10 students surveyed chose Spring?
   (A) 50          (B) 10          (C) 25
   (D) 250          (E) 5



Favourite Season
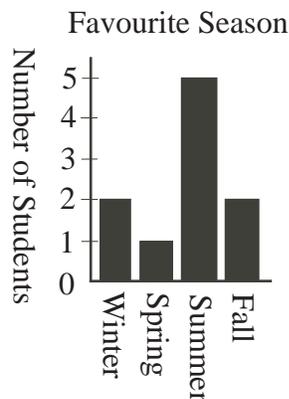
4. Ground beef sells for $5.00 per kg. How much does 12 kg of ground beef cost?
   (A) $5.00          (B) $12.00          (C) $60.00          (D) $17.00          (E) $2.40

5. The smallest number in the list $\{1.0101, 1.0011, 1.0110, 1.1001, 1.1100\}$ is
   (A) 1.0101          (B) 1.0011          (C) 1.0110          (D) 1.1001          (E) 1.1100

6. You are writing a multiple choice test and on one question you guess and pick an answer at random. If there are five possible choices (A,B,C,D,E), what is the probability that you guessed correctly?
   (A) $\frac{1}{5}$          (B) $\frac{5}{5}$          (C) $\frac{4}{5}$          (D) $\frac{2}{5}$          (E) $\frac{3}{5}$

7. $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$ equals
   (A) $3\frac{1}{3}$          (B) $7 + \frac{1}{3}$          (C) $\frac{3}{7}$          (D) $7 + 3$          (E) $7 \times \frac{1}{3}$

8. Keegan paddled the first 12 km of his 36 km kayak trip before lunch. What fraction of his overall trip remains to be completed after lunch?
   (A) $\frac{1}{2}$          (B) $\frac{5}{6}$          (C) $\frac{3}{4}$          (D) $\frac{2}{3}$          (E) $\frac{3}{5}$

9. If the point $(3, 4)$ is reflected in the $x$-axis, what are the coordinates of its image?
   (A) $(-4, 3)$          (B) $(-3, 4)$          (C) $(4, 3)$
   (D) $(3, -4)$          (E) $(-3, -4)$

10. I bought a new plant for my garden. Anika said it was a red rose, Bill said it was a purple daisy, and Cathy said it was a red dahlia. Each person was correct in stating either the colour or the type of plant. What was the plant that I bought?

   **(A)** purple dahlia      **(B)** purple rose      **(C)** red dahlia
   **(D)** yellow rose        **(E)** red daisy

---

**Part B: Each correct answer is worth 6.**

11. In the diagram, the value of $x$ is

   **(A)** 15      **(B)** 20      **(C)** 22

   **(D)** 18      **(E)** 36

   

12. A square has a perimeter of 28 cm. The area of the square, in cm$^2$, is

   **(A)** 196      **(B)** 784      **(C)** 64      **(D)** 49      **(E)** 56

13. Five children had dinner. Chris ate more than Max. Brandon ate less than Kayla. Kayla ate less than Max but more than Tanya. Which child ate the second most?

   **(A)** Brandon      **(B)** Chris      **(C)** Kayla      **(D)** Max      **(E)** Tanya

14. A *palindrome* is a positive integer that is the same when read forwards or backwards. For example, 545 and 1331 are both palindromes. The difference between the smallest three-digit palindrome and the largest three-digit palindrome is

   **(A)** 909      **(B)** 898      **(C)** 888      **(D)** 979      **(E)** 878

15. A ski lift carries a skier at a rate of 12 km per hour. How many kilometres does the ski lift carry the skier in 10 minutes?

   **(A)** 120      **(B)** 1.2      **(C)** 2      **(D)** 2.4      **(E)** 1.67

16. A 51 cm rod is built from 5 cm rods and 2 cm rods. All of the 5 cm rods must come first, and are followed by the 2 cm rods. For example, the rod could be made from seven 5 cm rods followed by eight 2 cm rods. How many ways are there to build the 51 cm rod?

   **(A)** 5      **(B)** 6      **(C)** 7      **(D)** 8      **(E)** 9

17. In Braydon's cafeteria, the meats available are beef and chicken. The fruits available are apple, pear and banana. Braydon is randomly given a lunch with one meat and one fruit. What is the probability that the lunch will include a banana?

   **(A)** $\frac{1}{3}$      **(B)** $\frac{2}{3}$      **(C)** $\frac{1}{2}$      **(D)** $\frac{1}{5}$      **(E)** $\frac{3}{5}$

18. Three pumpkins are weighed two at a time in all possible ways. The weights of the pairs of pumpkins are 12 kg, 13 kg and 15 kg. How much does the lightest pumpkin weigh?

   **(A)** 4 kg      **(B)** 5 kg      **(C)** 6 kg      **(D)** 7 kg      **(E)** 8 kg

19. The sum of four numbers is $T$. Suppose that each of the four numbers is now increased by 1. These four new numbers are added together and then the sum is tripled. What is the value of this final result?

    **(A)** $3T + 3$     **(B)** $3T + 4$     **(C)** $3T + 12$     **(D)** $T + 12$     **(E)** $12T$

20. A triangular prism is placed on a rectangular prism, as shown. The volume of the combined structure, in cm$^3$, is

    **(A)** 76        **(B)** 78        **(C)** 72

    **(D)** 84        **(E)** 66

    

---
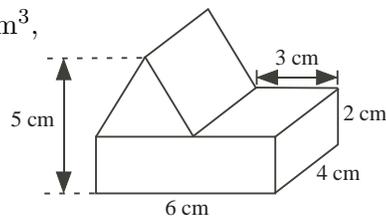
**Part C: Each correct answer is worth 8.**

21. Steve begins at 7 and counts forward by 3, obtaining the list $7, 10, 13$, and so on. Dave begins at 2011 and counts backwards by 5, obtaining the list $2011, 2006, 2001$, and so on. Which of the following numbers appear in each of their lists?

    **(A)** 1009     **(B)** 1006     **(C)** 1003     **(D)** 1001     **(E)** 1011

22. A pool has a volume of 4000 L. Sheila starts filling the empty pool with water at a rate of 20 L/min. The pool springs a leak after 20 minutes and water leaks out at 2 L/min. Beginning from the time when Sheila starts filling the empty pool, how long does it take until the pool is completely full?

    **(A)** 3 hours           **(B)** 3 hours 40 minutes          **(C)** 4 hours
    **(D)** 4 hours 20 minutes      **(E)** 3 hours 20 minutes

23. In the addition of the three-digit numbers shown, the letters $A$, $B$, $C$, $D$, and $E$ each represent a single digit.

$$
\begin{array}{ccccc}
 & A & B & E \\
 & A & C & E \\
+ & A & D & E \\
\hline
2 & 0 & 1 & 1 \\
\end{array}
$$

    The value of $A + B + C + D + E$ is

    **(A)** 34     **(B)** 21     **(C)** 32     **(D)** 27     **(E)** 24

24. From the figure shown, three of the nine squares are to be selected. Each of the three selected squares must share a side with at least one of the other two selected squares. In how many ways can this be done?

    **(A)** 19     **(B)** 22     **(C)** 15

    **(D)** 16     **(E)** 20
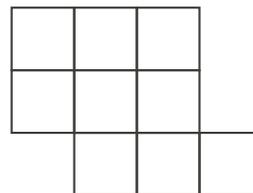
    

25. Ten circles are all the same size. Each pair of these circles overlap but no circle is exactly on top of another circle. What is the greatest possible total number of intersection points of these ten circles?

    **(A)** 40     **(B)** 70     **(C)** 80     **(D)** 90     **(E)** 110

**Canadian Mathematics Competition**

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

# Gauss Contest (Grade 7)

## *(The Grade 8 Contest is on the reverse side)*

### *Wednesday, May 12, 2010*

UNIVERSITY OF **Waterloo**

THE **Great-West Life** ASSURANCE COMPANY

**London Life**

**Canada Life**

STRONGER COMMUNITIES TOGETHER™

**Deloitte.**

**Maplesoft** command the brilliance™

**Time:** 1 hour ©2009 Centre for Education in Mathematics and Computing
**Calculators are permitted.**

**Instructions**

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

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

3. Be sure 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 made your choice, enter the appropriate letter for that question on your answer sheet.

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 instructs you to start, you will have *sixty* minutes of working time.

*Please see our Web site: http://www.cemc.uwaterloo.ca. The Gauss Report will list the names of some top-scoring students. You will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.*

# Grade 7

## Part A: Each correct answer is worth 5.

1.  The grade 7 students at Gauss Public School were asked, "What is your favourite pet?" The number of students who chose fish is

    **(A)** 10          **(B)** 20          **(C)** 30

    **(D)** 40          **(E)** 50
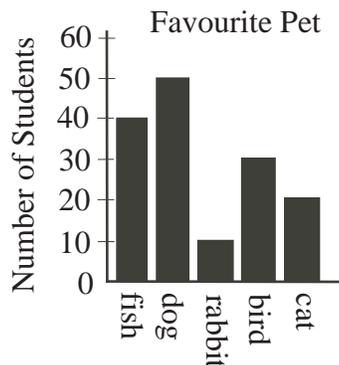


2.  Tanya scored 20 out of 25 on her math quiz. What percent did she score?

    **(A)** 75          **(B)** 95          **(C)** 80          **(D)** 20          **(E)** 45

3.  The value of $4 \times 5 + 5 \times 4$ is

    **(A)** 160          **(B)** 400          **(C)** 100          **(D)** 18          **(E)** 40

4.  In the diagram, the point with coordinates $(-2, -3)$ is located at

    **(A)** $A$          **(B)** $B$          **(C)** $C$

    **(D)** $D$          **(E)** $E$
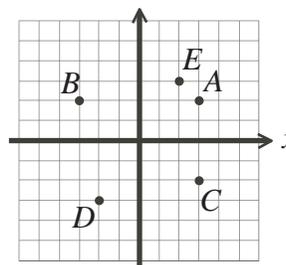


5.  Chaz gets on the elevator on the eleventh floor. The elevator goes down two floors, then stops. Then the elevator goes down four more floors and Chaz gets off the elevator. On what floor does Chaz get off the elevator?

    **(A)** 7th floor     **(B)** 9th floor     **(C)** 4th floor     **(D)** 5th floor     **(E)** 6th floor

6.  If $10.0003 \times \square = 10000.3$, the number that should replace the $\square$ is

    **(A)** 100          **(B)** 1000          **(C)** 10000          **(D)** 0.001          **(E)** 0.0001

7.  In the diagram, the value of $x$ is

    **(A)** 40          **(B)** 35          **(C)** 150

    **(D)** 30          **(E)** 25
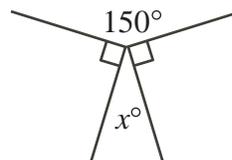


8.  How many 1 cm × 1 cm × 1 cm blocks are needed to build the solid rectangular prism shown?

    **(A)** 10          **(B)** 12          **(C)** 33

    **(D)** 66          **(E)** 36
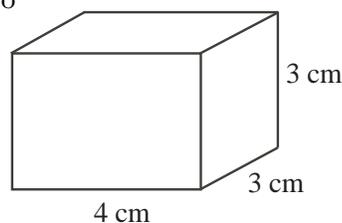
9. The time on a digital clock reads 3:33. What is the shortest length of time, in minutes, until all of the digits are again equal to each other?

    **(A)** 71      **(B)** 60      **(C)** 142      **(D)** 222      **(E)** 111

10. Each number below the top row is the product of the number to the right and the number to the left in the row immediately above it. What is the value of $x$?

    **(A)** 8      **(B)** 4      **(C)** 7

    **(D)** 5      **(E)** 6
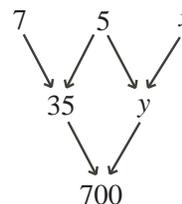
    

**Part B: Each correct answer is worth 6.**

11. The area of the figure, in square units, is

    **(A)** 36      **(B)** 64      **(C)** 46

    **(D)** 58      **(E)** 32
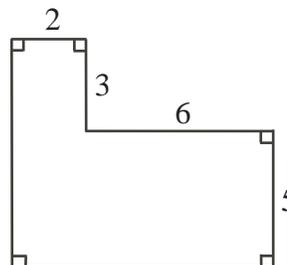
    

12. Recycling 1 tonne of paper will save 24 trees. If 4 schools each recycle $\frac{3}{4}$ of a tonne of paper, then the total number of trees this will save is

    **(A)** 24      **(B)** 72      **(C)** 18      **(D)** 126      **(E)** 80

13. If the mean (average) of five consecutive integers is 21, the smallest of the five integers is

    **(A)** 17      **(B)** 21      **(C)** 1      **(D)** 18      **(E)** 19

14. A bag contains green mints and red mints only. If 75% of the mints are green, what is the ratio of the number of green mints to the number of red mints?

    **(A)** $3:4$      **(B)** $3:1$      **(C)** $4:3$      **(D)** $1:3$      **(E)** $3:7$

15. Square $M$ has an area of 100 cm². The area of square $N$ is four times the area of square $M$. The perimeter of square $N$ is

    **(A)** 160 cm      **(B)** 400 cm      **(C)** 80 cm      **(D)** 40 cm      **(E)** 200 cm

16. In a magic square, all rows, columns, and diagonals have the same sum. The magic square shown uses each of the integers from $-6$ to $+2$. What is the value of $Y$?

    **(A)** $-1$      **(B)** 0      **(C)** $-6$

    **(D)** $+2$      **(E)** $-2$

    | +1 | | $Y$ |
    |---|---|---|
    | $-4$ | | |
    | $-3$ | | $-5$ |

17. How many three-digit integers are exactly 17 more than a two-digit integer?

    **(A)** 17      **(B)** 16      **(C)** 10      **(D)** 18      **(E)** 5

18. Distinct points are placed on a circle. Each pair of points is joined with a line segment. An example with 4 points and 6 line segments is shown. If 6 distinct points are placed on a circle, how many line segments would there be?
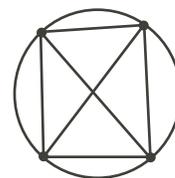
    **(A)** 13        **(B)** 16        **(C)** 30

    **(D)** 15        **(E)** 14

19. If each of the four numbers 3, 4, 6, and 7 replaces a □, what is the largest possible sum of the fractions shown?

    $$\frac{\square}{\square} + \frac{\square}{\square}$$

    **(A)** $\frac{19}{12}$        **(B)** $\frac{13}{7}$        **(C)** $\frac{5}{2}$

    **(D)** $\frac{15}{4}$        **(E)** $\frac{23}{6}$

20. Andy, Jen, Sally, Mike, and Tom are sitting in a row of five seats. Andy is not beside Jen. Sally is beside Mike. Who *cannot* be sitting in the middle seat?
    **(A)** Andy        **(B)** Jen        **(C)** Sally        **(D)** Mike        **(E)** Tom

---

**Part C: Each correct answer is worth 8.**

21. A bicycle travels at a constant speed of 15 km/h. A bus starts 195 km behind the bicycle and catches up to the bicycle in 3 hours. What is the average speed of the bus in km/h?
    **(A)** 65        **(B)** 80        **(C)** 70        **(D)** 60        **(E)** 50

22. In the *Coin Game*, you toss three coins at the same time. You win only if the 3 coins are all showing heads, or if the 3 coins are all showing tails. If you play the game once only, what is the probability of winning?
    **(A)** $\frac{1}{6}$        **(B)** $\frac{1}{4}$        **(C)** $\frac{2}{27}$        **(D)** $\frac{2}{3}$        **(E)** $\frac{1}{3}$

23. Molly assigns every letter of the alphabet a *different* whole number value. She finds the value of a word by *multiplying* the values of its letters together. For example, if D has a value of 10, and I has a value of 8, then the word DID has a value of $10 \times 8 \times 10 = 800$. The table shows the value of some words. What is the value of the word MATH?

    | Word | Value |
    |------|-------|
    | TOTE | 18 |
    | TEAM | 168 |
    | MOM | 49 |
    | HOME | 70 |
    | MATH | ? |

    **(A)** 19        **(B)** 840        **(C)** 420

    **(D)** 190        **(E)** 84

24. How many different pairs $(m, n)$ can be formed using numbers from the list of integers $\{1, 2, 3, \ldots, 20\}$ such that $m < n$ and $m + n$ is even?
    **(A)** 55        **(B)** 90        **(C)** 140        **(D)** 110        **(E)** 50

25. Tanner wants to fill his swimming pool using two hoses, each of which sprays water at a constant rate. Hose $A$ fills the pool in $a$ hours when used by itself, where $a$ is a positive integer. Hose $B$ fills the pool in $b$ hours when used by itself, where $b$ is a positive integer. When used together, Hose $A$ and Hose $B$ fill the pool in 6 hours. How many different possible values are there for $a$?
    **(A)** 5        **(B)** 6        **(C)** 9        **(D)** 10        **(E)** 12

**Canadian
Mathematics
Competition**

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

# Gauss Contest (Grade 7)

## (The Grade 8 Contest is on the reverse side)

### Wednesday, May 13, 2009

C.M.C. Sponsors

C.M.C. Supporter

THE
**Great-West Life**
ASSURANCE COMPANY

Canadian
Institute of
Actuaries

Institut
canadien
des actuaires

UNIVERSITY OF
**Waterloo**

**London Life**

SYBASE®
*iAnywhere*®

**Canada Life**™

STRONGER COMMUNITIES TOGETHER™

**Deloitte
& Touche**
Chartered
Accountants

**Maplesoft**™
command the brilliance™

---

**Time:** 1 hour  ©2009 Centre for Education in Mathematics and Computing

**Calculators are permitted.**

**Instructions**

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

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

3. Be sure 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 made your choice, enter the appropriate letter for that question on your answer sheet.

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 instructs you to start, you will have *sixty* minutes of working time.

---

*Please see our Web site: http://www.cemc.uwaterloo.ca. The Gauss Report will list the names of some top-scoring students. You will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.*

# Grade 7

**Part A: Each correct answer is worth 5.**

1. $4.1 + 1.05 + 2.005$ equals

   **(A)** 7.155 **(B)** 7.2 **(C)** 8.1 **(D)** 7.605 **(E)** 8.63

2. In the diagram, the equilateral triangle has a base of 8 m.
   The perimeter of the equilateral triangle is

   **(A)** 4 m **(B)** 16 m **(C)** 24 m

   **(D)** 32 m **(E)** 64 m

   8 m
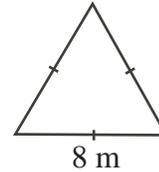
3. How many numbers in the list 11, 12, 13, 14, 15, 16, 17 are prime numbers?

   **(A)** 0 **(B)** 1 **(C)** 2 **(D)** 3 **(E)** 4

4. The smallest number in the list $\{0.40, 0.25, 0.37, 0.05, 0.81\}$ is

   **(A)** 0.40 **(B)** 0.25 **(C)** 0.37 **(D)** 0.05 **(E)** 0.81

5. In the diagram, the coordinates of point $P$ could be

   **(A)** $(1, 3)$ **(B)** $(1, -3)$ **(C)** $(-3, 1)$

   **(D)** $(3, -1)$ **(E)** $(-1, 3)$
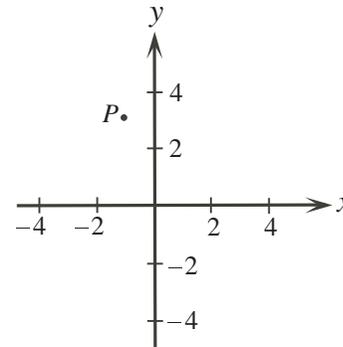
6. The temperature in Vancouver is $22°$C. The temperature in Calgary is $19°$C colder than the temperature in Vancouver. The temperature in Quebec City is $11°$C colder than the temperature in Calgary. What is the temperature in Quebec City?

   **(A)** $14°$C **(B)** $3°$C **(C)** $-8°$C **(D)** $8°$C **(E)** $-13°$C

7. On a map of Nunavut, a length of 1 centimetre measured on the map represents a real distance of 60 kilometres. What length on the map represents a real distance of 540 kilometres?

   **(A)** 9 cm **(B)** 90 cm **(C)** 0.09 cm **(D)** 0.11 cm **(E)** 5.4 cm

8. In $\triangle PQR$, the sum of $\angle P$ and $\angle Q$ is $60°$. The measure of $\angle R$ is

   **(A)** $60°$ **(B)** $300°$ **(C)** $120°$ **(D)** $30°$ **(E)** $40°$

9. In a class of 30 students, exactly 7 have been to Mexico and exactly 11 have been to England. Of these students, 4 have been to both Mexico and England. How many students in this class have not been to Mexico or England?

   **(A)** 23 **(B)** 16 **(C)** 20 **(D)** 12 **(E)** 18
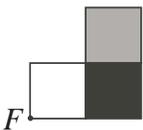
10. If the figure  is rotated 180° about point $F$, the result could be

(A) 
(B) 
(C)  $F$
(D)  $F$
(E) $F$ 

---
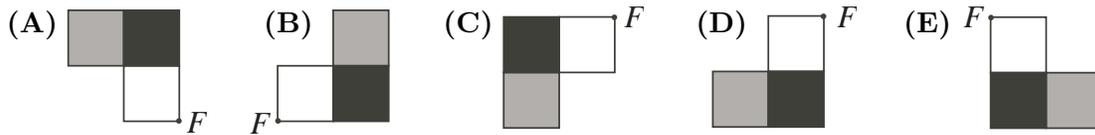
**Part B: Each correct answer is worth 6.**

11. Scott challenges Chris to a 100 m race. Scott runs 4 m for every 5 m that Chris runs. How far will Scott have run when Chris crosses the finish line?

    (A) 75 m     (B) 96 m     (C) 20 m     (D) 76 m     (E) 80 m

12. $\triangle PQR$ has an area of 27 cm$^2$ and a base measuring 6 cm. What is the height, $h$, of $\triangle PQR$?

    (A) 9 cm     (B) 18 cm     (C) 4.5 cm

    (D) 2.25 cm     (E) 7 cm
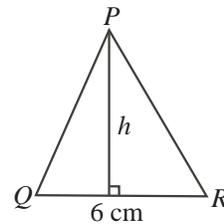
13. The product $60 \times 60 \times 24 \times 7$ equals

    (A) the number of minutes in seven weeks
    (B) the number of hours in sixty days
    (C) the number of seconds in seven hours
    (D) the number of seconds in one week
    (E) the number of minutes in twenty-four weeks

14. Which of the points positioned on the number line best represents the value of $S \div T$?

    (A) $P$     (B) $Q$     (C) $R$

    (D) $T$     (E) $U$
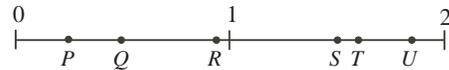
15. The product of three *different* positive integers is 144. What is the maximum possible sum of these three integers?

    (A) 20     (B) 75     (C) 146     (D) 52     (E) 29

16. A square has an area of 25. A rectangle has the same width as the square. The length of the rectangle is double its width. What is the area of the rectangle?

    (A) 25     (B) 12.5     (C) 100     (D) 50     (E) 30

17. Vanessa set a school record for most points in a single basketball game when her team scored 48 points. The six other players on her team averaged 3.5 points each. How many points did Vanessa score to set her school record?

    (A) 21     (B) 25     (C) 32     (D) 17     (E) 27

18. If $x$, $y$ and $z$ are positive integers with $xy = 18$, $xz = 3$ and $yz = 6$, what is the value of $x + y + z$?

    (A) 6     (B) 10     (C) 25     (D) 11     (E) 8

19. A jar contains quarters (worth $0.25 each), nickels (worth $0.05 each) and pennies (worth $0.01 each). The value of the quarters is $10.00. The value of the nickels is $10.00. The value of the pennies is $10.00. If Judith randomly chooses one coin from the jar, what is the probability that it is a quarter?

    (A) $\frac{25}{31}$      (B) $\frac{1}{31}$      (C) $\frac{1}{3}$      (D) $\frac{5}{248}$      (E) $\frac{1}{30}$

20. Each of $\triangle PQR$ and $\triangle STU$ has an area of 1. In $\triangle PQR$, $U$, $W$ and $V$ are the midpoints of the sides, as shown. In $\triangle STU$, $R$, $V$ and $W$ are the midpoints of the sides. What is the area of parallelogram $UVRW$?

    (A) 1      (B) $\frac{1}{2}$      (C) $\frac{1}{3}$

    (D) $\frac{1}{4}$      (E) $\frac{2}{3}$



---
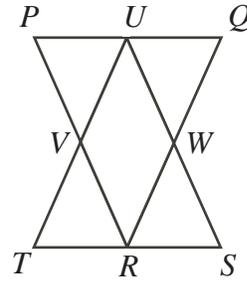
**Part C: Each correct answer is worth 8.**

21. Lara ate $\frac{1}{4}$ of a pie and Ryan ate $\frac{3}{10}$ of the same pie. The next day Cassie ate $\frac{2}{3}$ of the pie that was left. What fraction of the original pie was not eaten?

    (A) $\frac{9}{10}$      (B) $\frac{3}{10}$      (C) $\frac{7}{60}$      (D) $\frac{3}{20}$      (E) $\frac{1}{20}$

22. In the diagram, a $4 \times 4$ grid is to be filled so that each of the digits 1, 2, 3, and 4 appears in each row and each column. The $4 \times 4$ grid is divided into four smaller $2 \times 2$ squares. Each of these $2 \times 2$ squares is also to contain each of the digits 1, 2, 3 and 4. What digit replaces $P$?

    (A) 1      (B) 2      (C) 3

    (D) 4      (E) The digit cannot be determined
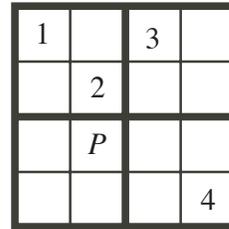


23. Each time Kim pours water from a jug into a glass, exactly 10% of the water remaining in the jug is used. What is the minimum number of times that she must pour water into a glass so that less than half the water remains in the jug?

    (A) 5      (B) 6      (C) 7      (D) 8      (E) 9

24. In square $ABCD$, $P$ is the midpoint of $DC$ and $Q$ is the midpoint of $AD$. If the area of the quadrilateral $QBCP$ is 15, what is the area of square $ABCD$?

    (A) 27.5      (B) 25      (C) 30

    (D) 20      (E) 24
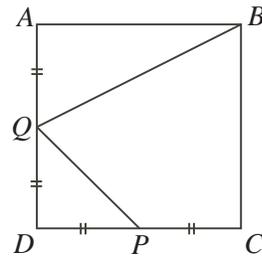


25. Kira can draw a connected path from $M$ to $N$ by drawing arrows along only the diagonals of the nine squares shown. One such possible path is shown. A path cannot pass through the interior of the same square twice. In total, how many different paths can she draw from $M$ to $N$?

    (A) 5      (B) 6      (C) 7

    (D) 8      (E) 9
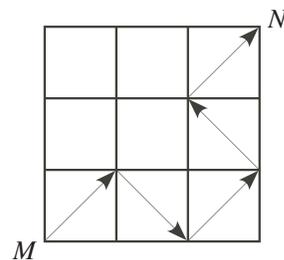
**Canadian Mathematics Competition**

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

# Gauss Contest (Grade 7)

## (The Grade 8 Contest is on the reverse side)

**Wednesday, May 14, 2008**

**Time:** 1 hour          ©2008 Waterloo Mathematics Foundation

**Calculators are permitted.**

**Instructions**

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

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

3. Be sure 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 made your choice, enter the appropriate letter for that question on your answer sheet.

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 instructs you to start, you will have *sixty* minutes of working time.

*Please see our Web site: http://www.cemc.uwaterloo.ca. The Gauss Report will list the names of some top-scoring students. You will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.*

# Grade 7

**Part A: Each correct answer is worth 5.**

1. The value of $6 \times 2 - 3$ is

   **(A)** 9      **(B)** $-6$      **(C)** 12      **(D)** 15      **(E)** 10

2. The value of $1 + 0.01 + 0.0001$ is

   **(A)** 1.0011      **(B)** 1.0110      **(C)** 1.1001      **(D)** 1.1010      **(E)** 1.0101

3. $\frac{1}{2} + \frac{1}{4} + \frac{1}{8}$ is equal to

   **(A)** 1      **(B)** $\frac{1}{64}$      **(C)** $\frac{3}{14}$      **(D)** $\frac{7}{8}$      **(E)** $\frac{3}{8}$

4. A regular polygon has perimeter 108 cm and each side has length 12 cm. How many sides does this polygon have?

   **(A)** 6      **(B)** 7      **(C)** 8      **(D)** 9      **(E)** 10

5. The smallest number in the set { 3.2, 2.3, 3, 2.23, 3.22 } is

   **(A)** 3.2      **(B)** 2.3      **(C)** 3      **(D)** 2.23      **(E)** 3.22

6. If $PQ$ is a straight line, then the value of $x$ is

   **(A)** 36      **(B)** 72      **(C)** 18

   **(D)** 20      **(E)** 45
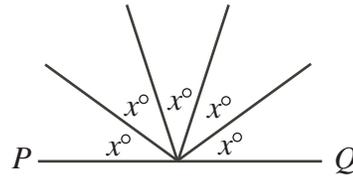
7. Which of the following is a prime number?

   **(A)** 20      **(B)** 21      **(C)** 23      **(D)** 25      **(E)** 27

8. Kayla went for a walk every day last week. Each day, she walked half as far as she did the day before. If she walked 8 kilometres on Monday last week, how many kilometres did she walk on Friday last week?

   **(A)** 0.25      **(B)** 4      **(C)** 1      **(D)** 2      **(E)** 0.5

9. The circle graph shows the favourite ice cream flavours of those surveyed. What fraction of people surveyed selected either chocolate or strawberry as their favourite flavour of ice cream?

   **(A)** $\frac{3}{5}$      **(B)** $\frac{1}{3}$      **(C)** $\frac{2}{3}$

   **(D)** $\frac{3}{4}$      **(E)** $\frac{5}{8}$
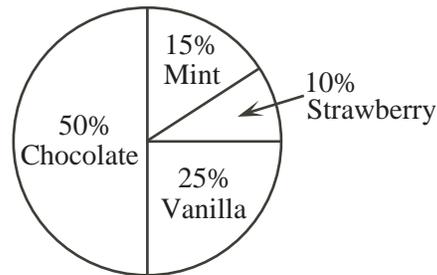
10. Max sold glasses of lemonade for 25 cents each. He sold 41 glasses on Saturday and 53 glasses on Sunday. What were his total sales for these two days?

    **(A)** $23.50      **(B)** $10.25      **(C)** $13.25      **(D)** $21.50      **(E)** $24.25

**Part B: Each correct answer is worth 6.**

11. Chris bought two hockey sticks at the same price. He also bought a helmet for $25. If Chris spent $68 in total, how much did one hockey stick cost?

    **(A)** $9.00      **(B)** $18.00      **(C)** $21.50      **(D)** $43.00      **(E)** $41.50

12. In the chart, each number below the top row is the positive difference of the two numbers to the right and left in the row immediately above it. What is the value of $x$?

    **(A)** 1      **(B)** 2      **(C)** 3

    **(D)** 4      **(E)** 0

    $$
    \begin{array}{ccccc}
    8 & 9 & 17 & 6 & 4 \\
    1 & 8 & - & 2 & \\
    7 & - & - & & \\
    - & x & - & & \\
    \end{array}
    $$

13. In the diagram, $\triangle PQR$ is isosceles. The value of $x$ is

    **(A)** 40      **(B)** 70      **(C)** 60

    **(D)** 30      **(E)** 110
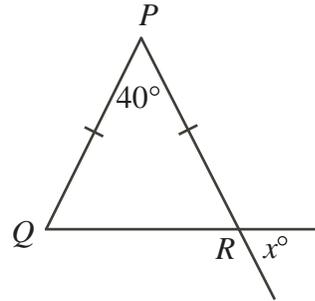
14. Wesley is 15 and his sister Breenah is 7. The sum of their ages is 22. In how many years will the sum of their ages be double what it is now?

    **(A)** 7      **(B)** 8      **(C)** 15      **(D)** 14      **(E)** 11

15. Using two transformations, the letter R is changed as shown:  R → Я → Я.
    Using the same two transformations, the letter L is changed as shown:  L → Ꞁ → Γ.
    Using the same two transformations, the letter G is changed to

    **(A)** G      **(B)** Ә      **(C)** Ꭾ      **(D)** Ꮯ      **(E)** ႒

16. In the diagram, each small square in the grid is the same size. What percent of the grid is shaded?

    **(A)** 84      **(B)** 80      **(C)** 90

    **(D)** 75      **(E)** 66
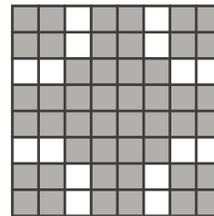
17. The length of a rectangle is 6 more than twice its width. If the perimeter of the rectangle is 120, what is its width?

    **(A)** 8      **(B)** 18      **(C)** 27      **(D)** 38      **(E)** 22

18. Rishi got the following marks on four math tests: 71, 77, 80, and 87. He will write one more math test. Each test is worth the same amount and all marks are between 0 and 100. Which of the following is a possible average for his five math tests?

    **(A)** 88      **(B)** 62      **(C)** 82      **(D)** 84      **(E)** 86

19. A $4 \times 4$ square grid can be entirely covered by three non-overlapping pieces made from $1 \times 1$ squares. If the first two pieces are [shape] and [shape], the third piece is

    **(A)** [shape]     **(B)** [shape]   **(C)** [shape]    **(D)** [shape]    **(E)** [shape]
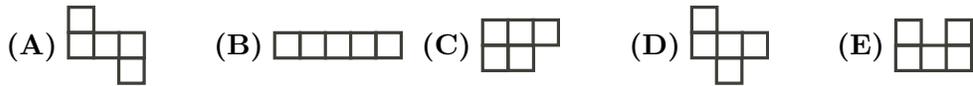
20. The product of three *different* positive integers is 72. What is the smallest possible sum of these integers?

    **(A)** 13      **(B)** 14      **(C)** 15      **(D)** 17      **(E)** 12

---

**Part C: Each correct answer is worth 8.**

21. Andrea has finished the third day of a six day canoe trip. If she has completed $\frac{3}{7}$ of the trip's total distance of 168 km, how many km per day must she average for the remainder of her trip?

    **(A)** 29      **(B)** 24      **(C)** 27      **(D)** 32      **(E)** 26

22. In the diagram, $PQRS$ is a trapezoid with an area of 12. $RS$ is twice the length of $PQ$. The area of $\triangle PQS$ is

    **(A)** 3      **(B)** 4      **(C)** 5

    **(D)** 6      **(E)** 8
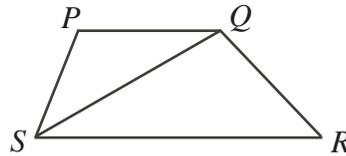
23. There are 24 ways in which Beverly, Dianne, Ethan, and Jamaal can arrange themselves to sit in a row of four seats. In how many ways can Beverly, Dianne, Ethan, and Jamaal arrange themselves in a row of four seats so that Ethan *does not* sit beside Dianne?

    **(A)** 18      **(B)** 12      **(C)** 21      **(D)** 6      **(E)** 15

24. A star is made by overlapping two identical equilateral triangles, as shown. The entire star has an area of 36. What is the area of the shaded region?

    **(A)** 24      **(B)** 18      **(C)** 27

    **(D)** 33      **(E)** 30
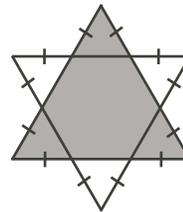
25. The sum of all the digits of the integers from 98 to 101 is

    $$9 + 8 + 9 + 9 + 1 + 0 + 0 + 1 + 0 + 1 = 38$$

    The sum of all of the digits of the integers from 1 to 2008 is

    **(A)** 30 054      **(B)** 27 018      **(C)** 28 036      **(D)** 30 036      **(E)** 28 054

**Canadian**
**Mathematics**
**Competition**

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

# Gauss Contest (Grade 7)

## (The Grade 8 Contest is on the reverse side)

### Wednesday, May 16, 2007

**Time:** 1 hour
© 2006 Waterloo Mathematics Foundation

**Calculators are permitted.**

**Instructions**

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

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

3. Be sure 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 made your choice, enter the appropriate letter for that question on your answer sheet.

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 instructs you to start, you will have *sixty* minutes of working time.

## Grade 7

**Part A: Each correct answer is worth 5.**

1.   The value of $(4 - 3) \times 2$ is
     **(A)** $-2$            **(B)** 2            **(C)** 1            **(D)** 3            **(E)** 5

2.   Which number represents ten thousand?
     **(A)** 10            **(B)** 10 000 000   **(C)** 10 000            **(D)** 100            **(E)** 1 000

3.   What integer should be placed in the ☐ to make the statement ☐ $- 5 = 2$ true?
     **(A)** 7            **(B)** 4            **(C)** 3            **(D)** 1            **(E)** 8

4.   If Mukesh got 80% on a test which has a total of 50 marks, how many marks did he get?
     **(A)** 40            **(B)** 62.5            **(C)** 10            **(D)** 45            **(E)** 35

5.   The sum $\frac{7}{10} + \frac{3}{100} + \frac{9}{1000}$ is equal to
     **(A)** 0.937            **(B)** 0.9037            **(C)** 0.7309            **(D)** 0.739            **(E)** 0.0739

6.   Mark has $\frac{3}{4}$ of a dollar and Carolyn has $\frac{3}{10}$ of a dollar. Together they have
     **(A)** \$0.90            **(B)** \$0.95            **(C)** \$1.00            **(D)** \$1.10            **(E)** \$1.05

7.   Six students have an apple eating contest. The graph shows the number of apples eaten by each student. Lorenzo ate the most apples and Jo ate the fewest. How many more apples did Lorenzo eat than Jo?
     **(A)** 2            **(B)** 5            **(C)** 4
     **(D)** 3            **(E)** 6
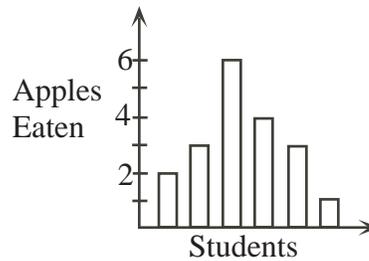


8.   In the diagram, what is the value of $x$?
     **(A)** 110            **(B)** 50            **(C)** 10
     **(D)**  60            **(E)** 70
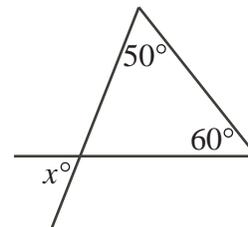


9.   The word BANK is painted exactly as shown on the outside of a clear glass window. Looking out through the window from the inside of the building, the word appears as
     **(A)** ВАИЖ            **(B)** KNAᙣ            **(C)** ᙣАИЖ            **(D)** ЖИАᙣ            **(E)** KNAB

10.  A large box of chocolates and a small box of chocolates together cost \$15. If the large box costs \$3 more than the small box, what is the price of the small box of chocolates?
     **(A)** \$3            **(B)** \$4            **(C)** \$5            **(D)** \$6            **(E)** \$9

**Part B: Each correct answer is worth 6.**

11. In the Fibonacci sequence 1, 1, 2, 3, 5, ..., each number beginning with the 2 is the sum of the two numbers before it. For example, the next number in the sequence is $3 + 5 = 8$. Which of the following numbers is in the sequence?

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

12. The Grade 7 class at Gauss Public School has sold 120 tickets for a lottery. One winning ticket will be drawn. If the probability of one of Mary's tickets being drawn is $\frac{1}{15}$, how many tickets did she buy?

    **(A)** 5      **(B)** 6      **(C)** 7      **(D)** 8      **(E)** 9

13. What is the largest amount of postage in cents that *cannot* be made using only 3 cent and 5 cent stamps?

    **(A)** 7      **(B)** 13      **(C)** 4      **(D)** 8      **(E)** 9

14. Harry, Ron and Neville are having a race on their broomsticks. If there are no ties, in how many different possible orders can they finish?

    **(A)** 7      **(B)** 6      **(C)** 5      **(D)** 4      **(E)** 3

15. How many positive whole numbers, including 1, divide exactly into both 40 and 72?

    **(A)** 9      **(B)** 12      **(C)** 4      **(D)** 2      **(E)** 5

16. In the diagram, each scale shows the total mass (weight) of the shapes on that scale. What is the mass (weight) of a △ ?

    

    **(A)** 3      **(B)** 5      **(C)** 12

    **(D)** 6      **(E)** 5.5
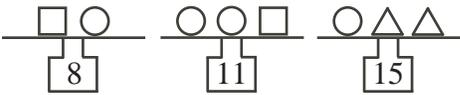
17. To rent a kayak and a paddle, there is a fixed fee to use the paddle, plus a charge of $5 per hour to use the kayak. For a three hour rental, the total cost is $30. What is the total cost for a six hour rental?

    **(A)** $50      **(B)** $15      **(C)** $45      **(D)** $60      **(E)** $90

18. Fred's birthday was on a Monday and was exactly 37 days after Pat's birthday. Julie's birthday was 67 days before Pat's birthday. On what day of the week was Julie's birthday?

    **(A)** Saturday    **(B)** Sunday    **(C)** Monday    **(D)** Tuesday    **(E)** Wednesday

19. The whole numbers from 1 to 1000 are written. How many of these numbers have at least two 7's appearing side-by-side?

    **(A)** 10      **(B)** 11      **(C)** 21      **(D)** 30      **(E)** 19

20. In the diagram, the square has a perimeter of 48 and the triangle has a height of 48. If the square and the triangle have the same area, what is the value of $x$?

    **(A)** 1.5      **(B)** 12      **(C)** 6

    **(D)** 3      **(E)** 24

    

**Part C: Each correct answer is worth 8.**

21.  In the diagram, how many paths can be taken to spell "KARL"?

(A) 4          (B) 16          (C) 6

(D) 8          (E) 14



22.  The average of four different positive whole numbers is 4. If the difference between the largest and smallest of these numbers is as large as possible, what is the average of the other two numbers?

(A) $1\frac{1}{2}$          (B) $2\frac{1}{2}$          (C) 4          (D) 5          (E) 2

23.  A square is divided, as shown. What fraction of the area of the square is shaded?

(A) $\frac{1}{4}$          (B) $\frac{1}{8}$          (C) $\frac{3}{16}$

(D) $\frac{1}{6}$          (E) $\frac{3}{32}$



24.  In the multiplication shown, $P$, $Q$ and $R$ are all different digits so that

$$\begin{array}{r} PPQ \\ \times \quad Q \\ \hline RQ5Q \end{array}$$

What is the value of $P + Q + R$?

(A) 20          (B) 13          (C) 15          (D) 16          (E) 17

25.  The CMC reception desk has a tray in which to stack letters as they arrive. Starting at 12:00, the following process repeats every five minutes:

  • Step 1 – Three letters arrive at the reception desk and are stacked on top of the letters already in the stack. The first of the three is placed on the stack first, the second letter next, and the third letter on top.

  • Step 2 – The top two letters in the stack are removed.

This process repeats until 36 letters have arrived (and the top two letters have been immediately removed). Once all 36 letters have arrived (and the top two letters have been immediately removed), no more letters arrive and the top two letters in the stack continue to be removed every five minutes until all 36 letters have been removed. At what time was the 13th letter to arrive removed?

(A) 1:15          (B) 1:20          (C) 1:10          (D) 1:05          (E) 1:25

**Canadian Mathematics Competition**

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

# Gauss Contest (Grade 7)

## (The Grade 8 Contest is on the reverse side)

**Wednesday, May 10, 2006**

C.M.C. Sponsors:

University of **Waterloo**

**Deloitte & Touche**
Chartered Accountants

**Great-West Life**
ASSURANCE COMPANY

*stronger communities together*
GREAT-WEST LIFE | LONDON LIFE

Great West Life
and London Life

**SYBASE**
Sybase
*i*Anywhere
SOLUTIONS   A SYBASE COMPANY

*i*Anywhere Solutions

C.M.C. Supporter:

Canadian Institute
of Actuaries

---

**Calculators are permitted.**

**Instructions**

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

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

3. Be sure 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 made your choice, enter the appropriate letter for that question on your answer sheet.

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 instructs you to start, you will have *sixty* minutes of working time.

---

*Please see our website http://www.cemc.uwaterloo.ca for copies of past Contests and for information on publications which are excellent resources for enrichment, problem solving and contest preparation.*

# Grade 7

**Part A: Each correct answer is worth 5.**

1.  The value of $(8 \times 4) + 3$ is

    **(A)** 96          **(B)** 15          **(C)** 56          **(D)** 35          **(E)** 28

2.  In the diagram, $ABC$ is a straight line. The value of $x$ is

    **(A)** 100          **(B)** 140          **(C)** 50

    **(D)** 120          **(E)** 320
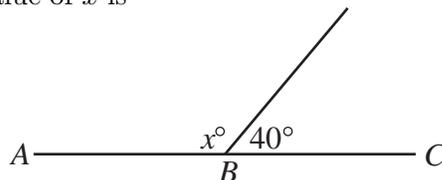
    

3.  Mikhail has \$10 000 in \$50 bills. How many \$50 bills does he have?

    **(A)** 1000          **(B)** 200          **(C)** 1250          **(D)** 500          **(E)** 2000

4.  What is the perimeter of the figure shown?

    **(A)** 16          **(B)** 10          **(C)** 8

    **(D)** 14          **(E)** 18
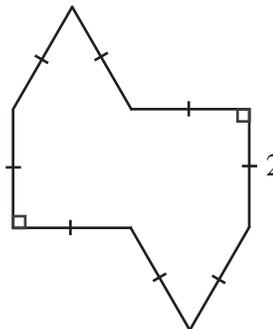
    

5.  The value of $\frac{2}{5} + \frac{1}{3}$ is

    **(A)** $\frac{3}{8}$          **(B)** $\frac{2}{15}$          **(C)** $\frac{11}{15}$          **(D)** $\frac{13}{15}$          **(E)** $\frac{3}{15}$

6.  The value of $6 \times 100\,000 + 8 \times 1000 + 6 \times 100 + 7 \times 1$ is

    **(A)** 6867          **(B)** 608\,067          **(C)** 608\,607          **(D)** 6\,008\,607          **(E)** 600\,000\,867

7.  If $3 + 5x = 28$, the value of $x$ is

    **(A)** 20          **(B)** 3.5          **(C)** 5          **(D)** 6.2          **(E)** 125

8.  The value of $9^2 - \sqrt{9}$ is

    **(A)** 0          **(B)** 6          **(C)** 15          **(D)** 72          **(E)** 78

9.  There are 2 red, 5 yellow and 4 blue balls in a bag. If a ball is chosen at random from
    the bag, without looking, the probability of choosing a yellow ball is

    **(A)** $\frac{2}{11}$          **(B)** $\frac{5}{11}$          **(C)** $\frac{4}{11}$          **(D)** $\frac{6}{11}$          **(E)** $\frac{7}{11}$

10. A small block is placed along a 10 cm ruler. Which of
    the following is closest to the length of the block?

    **(A)** 0.24 cm          **(B)** 4.4 cm          **(C)** 2.4 cm

    **(D)** 3 cm          **(E)** 24 cm
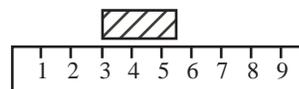
    

**Part B: Each correct answer is worth 6.**

11. The cost, before taxes, of the latest CD released by The Magic Squares is $14.99. If the sales tax is 15%, how much does it cost to buy this CD, including tax?

    **(A)** $17.24     **(B)** $15.14     **(C)** $2.25     **(D)** $16.49     **(E)** $16.50

12. A rectangular pool is 6 m wide, 12 m long and 4 m deep. If the pool is half full of water, what is the volume of water in the pool?

    **(A)** 100 m$^3$     **(B)** 288 m$^3$     **(C)** 36 m$^3$     **(D)** 22 m$^3$     **(E)** 144 m$^3$

13. What number must be added to 8 to give the result $-5$?

    **(A)** 3     **(B)** $-3$     **(C)** 13     **(D)** $-13$     **(E)** $-10$

14. In the diagram, $O$ is the centre of the circle, $AOB$ is a diameter, and the circle graph illustrates the favourite season of 600 students. How many of the students surveyed chose Fall as their favourite season?

    **(A)** 100     **(B)** 50     **(C)** 360

    **(D)** 150     **(E)** 75
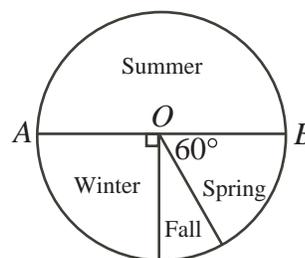
15. Harry charges $4 to babysit for the first hour. For each additional hour, he charges 50% more than he did for the previous hour. How much money in total would Harry earn for 4 hours of babysitting?

    **(A)** $16.00     **(B)** $19.00     **(C)** $32.50     **(D)** $13.50     **(E)** $28.00

16. A fraction is equivalent to $\frac{5}{8}$. Its denominator and numerator add up to 91. What is the difference between the denominator and numerator of this fraction?

    **(A)** 21     **(B)** 3     **(C)** 33     **(D)** 13     **(E)** 19

17. Bogdan needs to measure the area of a rectangular carpet. However, he does not have a ruler, so he uses a shoe instead. He finds that the shoe fits exactly 15 times along one edge of the carpet and 10 times along another. He later measures the shoe and finds that it is 28 cm long. What is the area of the carpet?

    **(A)** 150 cm$^2$                 **(B)** 4200 cm$^2$                 **(C)** 22 500 cm$^2$
    **(D)** 630 000 cm$^2$             **(E)** 117 600 cm$^2$

18. Keiko and Leah run on a track that is 150 m around. It takes Keiko 120 seconds to run 3 times around the track, and it takes Leah 160 seconds to run 5 times around the track. Who is the faster runner and at approximately what speed does she run?

    **(A)** Keiko, 3.75 m/s           **(B)** Keiko, 2.4 m/s             **(C)** Leah, 3.3 m/s
    **(D)** Leah, 4.69 m/s            **(E)** Leah, 3.75 m/s

19. Which of the following is closest to one million ($10^6$) seconds?

    **(A)** 1 day     **(B)** 10 days     **(C)** 100 days     **(D)** 1 year     **(E)** 10 years

20. The letter P is written in a 2 × 2 grid of squares as shown:

A combination of rotations about the centre of the grid and reflections in the two lines through the centre achieves the result:

When the same combination of rotations and reflections is applied to , the result is

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

---

**Part C: Each correct answer is worth 8.**

21. Gail is a server at a restaurant. On Saturday, Gail gets up at 6:30 a.m., starts work at $x$ a.m. and finishes at $x$ p.m. How long does Gail work on Saturday?

    (A) $24 - 2x$ hours    (B) $12 - x$ hours    (C) $2x$ hours
    (D) 0 hours    (E) 12 hours

22. In the diagram, a shape is formed using unit squares, with $B$ the midpoint of $AC$ and $D$ the midpoint of $CE$. The line which passes through $P$ and cuts the area of the shape into two pieces of equal area also passes through the point

    (A) $A$    (B) $B$    (C) $C$
    (D) $D$    (E) $E$
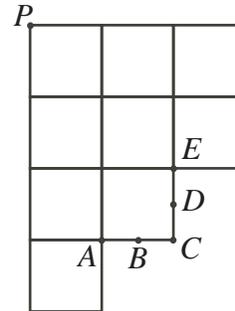
23. In the addition of two 2-digit numbers, each blank space, including those in the answer, is to be filled with one of the digits 0, 1, 2, 3, 4, 5, 6, each used exactly once. The units digit of the sum is

    (A) 2    (B) 3    (C) 4
    (D) 5    (E) 6
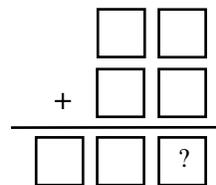
24. A triangle can be formed having side lengths 4, 5 and 8. It is impossible, however, to construct a triangle with side lengths 4, 5 and 10. Using the side lengths 2, 3, 5, 7 and 11, how many different triangles *with exactly two equal sides* can be formed?

    (A) 8    (B) 5    (C) 20    (D) 10    (E) 14

25. Five students wrote a quiz with a maximum score of 50. The scores of four of the students were 42, 43, 46, and 49. The score of the fifth student was $N$. The average (mean) of the five students' scores was the same as the median of the five students' scores. The number of values of $N$ which are possible is

    (A) 3    (B) 4    (C) 1    (D) 0    (E) 2

# Gauss Contest *(Grade 7)*

**(Grade 8 Contest is on the reverse side)**

**Wednesday, May 11, 2005**

C.M.C. Sponsors:

University of Waterloo

**Deloitte & Touche**
**Chartered Accountants**

C.M.C. Supporters:

Canadian Institute of Actuaries

**Great-West Life**
ASSURANCE COMPANY

*stronger communities together*
GREAT-WEST LIFE | LONDON LIFE

Great West Life and London Life

SYBASE
Sybase
*i*Anywhere
*i*Anywhere Solutions

Scoring: There is *no penalty* for an incorrect answer.

Each unanswered question is worth 2, to a maximum of 10 unanswered questions.

**Part A: Each correct answer is worth 5.**

1. The value of $\dfrac{3 \times 4}{6}$ is

   **(A)** 1      **(B)** 2      **(C)** 3      **(D)** 4      **(E)** 6

2. $0.8 - 0.07$ equals

   **(A)** 0.1      **(B)** 0.71      **(C)** 0.793      **(D)** 0.01      **(E)** 0.73

3. Contestants on "Gauss Reality TV" are rated by an applause metre. In the diagram, the arrow for one of the contestants is pointing to a rating that is closest to

   **(A)** 9.4      **(B)** 9.3      **(C)** 9.7

   **(D)** 9.9      **(E)** 9.5
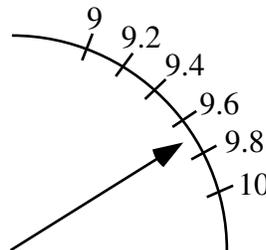
4. Twelve million added to twelve thousand equals

   **(A)** 12 012 000      **(B)** 12 120 000      **(C)** 120 120 000

   **(D)** 12 000 012 000      **(E)** 12 012 000 000

5. The largest number in the set $\{0.109, 0.2, 0.111, 0.114, 0.19\}$ is

   **(A)** 0.109      **(B)** 0.2      **(C)** 0.11      **(D)** 0.114      **(E)** 0.19

6. At a class party, each student randomly selects a wrapped prize from a bag. The prizes include books and calculators. There are 27 prizes in the bag. Meghan is the first to choose a prize. If the probability of Meghan choosing a book for her prize is $\frac{2}{3}$, how many books are in the bag?

   **(A)** 15      **(B)** 9      **(C)** 21      **(D)** 7      **(E)** 18

7. Karen has just been chosen the new "Math Idol". A total of 1 480 000 votes were cast and Karen received 83% of them. How many people voted for her?

   **(A)** 830 000      **(B)** 1 228 400      **(C)** 1 100 000      **(D)** 251 600      **(E)** 1 783 132

8. In the diagram, the size of $\angle ACB$ is

   **(A)** $57°$      **(B)** $37°$      **(C)** $47°$

   **(D)** $60°$      **(E)** $17°$
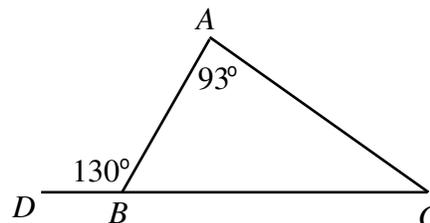
9. A movie theatre has eleven rows of seats. The rows are numbered from 1 to 11. Odd-numbered rows have 15 seats and even-numbered rows have 16 seats. How many seats are there in the theatre?

   **(A)** 176      **(B)** 186      **(C)** 165      **(D)** 170      **(E)** 171

10. In relation to Smiths Falls, Ontario, the local time in St. John's, Newfoundland, is 90 minutes ahead, and the local time in Whitehorse, Yukon, is 3 hours behind. When the local time in St. John's is 5:36 p.m., the local time in Whitehorse is

(A) 1:06 p.m.   (B) 2:36 p.m.   (C) 4:06 p.m.   (D) 12:06 p.m.   (E) 10:06 p.m.

---

**Part B: Each correct answer is worth 6.**

11. The temperature range on a given day is the difference between the daily high and the daily low temperatures. On the graph shown, which day has the greatest temperature range?
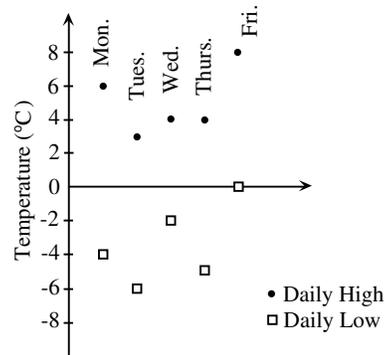
    (A) Monday     (B) Tuesday     (C) Wednesday

    (D) Thursday     (E) Friday



12. A bamboo plant grows at a rate of 105 cm per day. On May 1st at noon it was 2 m tall. Approximately how tall, in metres, was it on May 8th at noon?

    (A) 10.40        (B) 8.30        (C) 3.05        (D) 7.35        (E) 9.35

13. In the diagram, the length of $DC$ is twice the length of $BD$. The area of the triangle $ABC$ is
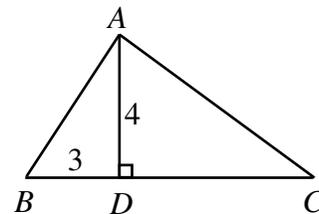
    (A) 24        (B) 72        (C) 12

    (D) 18        (E) 36



14. The numbers on opposite sides of a die total 7. What is the sum of the numbers on the unseen faces of the two dice shown?
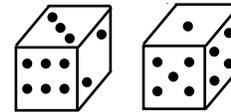
    (A) 14        (B) 20        (C) 21

    (D) 24        (E) 30



15. In the diagram, the area of rectangle $PQRS$ is 24. If $TQ = TR$, the area of quadrilateral $PTRS$ is
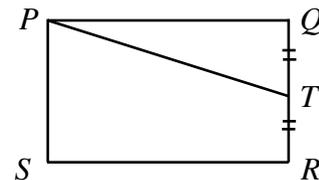
    (A) 18        (B) 20        (C) 16

    (D) 6        (E) 15



16. Nicholas is counting the sheep in a flock as they cross a road. The sheep begin to cross the road at 2:00 p.m. and cross at a constant rate of three sheep per minute. After counting 42 sheep, Nicholas falls asleep. He wakes up an hour and a half later, at which point exactly half of the total flock has crossed the road since 2:00 p.m. How many sheep are there in the entire flock?

    (A) 630        (B) 621        (C) 582        (D) 624        (E) 618

17. The symbol $\boxed{\begin{array}{cc} 3 & 4 \\ 5 & 6 \end{array}}$ is evaluated as $3 \times 6 + 4 \times 5 = 38$. If $\boxed{\begin{array}{cc} 2 & 6 \\ 1 & \end{array}}$ is evaluated as 16, then the number that should be placed in the empty space is

    (A) 1        (B) 2        (C) 3        (D) 4        (E) 5

18. A game is said to be fair if your chance of winning is equal to your chance of losing. How many of the following games, involving tossing a regular six-sided die, are fair?
    - You win if you roll a 2
    - You win if you roll an even number
    - You win if you roll a number less than 4
    - You win if you roll a number divisible by 3
    (A) 0    (B) 1    (C) 2    (D) 3    (E) 4

19. Chris and Pat are playing catch. Standing 1 m apart, Pat first throws the ball to Chris and then Chris throws the ball back to Pat. Next, standing 2 m apart, Pat throws to Chris and Chris throws back to Pat. After each pair of throws, Chris moves 1 m farther away from Pat. They stop playing when one of them misses the ball. If the game ends when the 29th throw is missed, how far apart are they standing and who misses catching the ball?
    (A) 15 m, Chris  (B) 15 m, Pat    (C) 14m, Chris  (D) 14 m, Pat    (E) 16 m, Pat

20. While driving at 80 km/h, Sally's car passes a hydro pole every four seconds. Which of the following is closest to the distance between two neighbouring hydro poles?
    (A) 50 m    (B) 60 m    (C) 70 m    (D) 80 m    (E) 90 m

---

**Part C: Each correct answer is worth 8.**

21. Emily was at a garage sale where the price of every item was reduced by 10% of its current price every 15 minutes. At 9:00 a.m., the price of a carpet was $10.00. At 9:15 a.m., the price was reduced to $9.00. As soon as the price of the carpet fell below $8.00, Emily bought it. At what time did Emily buy the carpet?
    (A) 9:45 a.m.    (B) 9:15 a.m.    (C) 9:30 a.m.    (D) 10:15 a.m.  (E) 10:00 a.m.

22. In a bin at the Gauss Grocery, the ratio of the number of apples to the number of oranges is $1 : 4$, and the ratio of the number of oranges to the number of lemons is $5 : 2$. What is the ratio of the number of apples to the number of lemons?
    (A) $1 : 2$    (B) $4 : 5$    (C) $5 : 8$    (D) $20 : 8$    (E) $2 : 1$

23. Using an equal-armed balance, if □□□□ balances ○○ and ○○○ balances △△, which of the following would not balance △○□?
    (A) △○□    (B) □□□△    (C) □□○○    (D) △△□    (E) ○□□□□

24. On a circular track, Alphonse is at point $A$ and Beryl is diametrically opposite at point $B$. Alphonse runs counterclockwise and Beryl runs clockwise. They run at constant, but different, speeds. After running for a while they notice that when they pass each other it is always at the same three places on the track. What is the ratio of their speeds?
    (A) $3 : 2$    (B) $3 : 1$    (C) $4 : 1$
    (D) $2 : 1$    (E) $5 : 2$
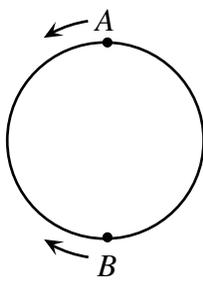
25. How many different combinations of pennies, nickels, dimes and quarters use 48 coins to total $1.00?
    (A) 3    (B) 4    (C) 5    (D) 6    (E) 8

## Canadian Mathematics Competition

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

# *Gauss Contest* (Grade 7)

**(Grade 8 Contest is on the reverse side)**

**Wednesday, May 12, 2004**

C.M.C. Sponsors:

University of
**Waterloo**

**Deloitte & Touche**
**Chartered Accountants**

C.M.C. Supporters:

Canadian Institute
of Actuaries

**Great-West Life**
ASSURANCE COMPANY

*stronger communities together*
**GREAT-WEST LIFE | LONDON LIFE**

Great West Life
and London Life

**S**YBASE
Sybase
Inc. (Waterloo)

***i*Anywhere**
SOLUTIONS          A SYBASE COMPANY
*i*Anywhere Solutions

---

**Time:** 1 hour

© 2004 Waterloo Mathematics Foundation

**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.

# Grade 7

**Part A:  Each correct answer is worth 5.**

1.  The value of $\dfrac{10+20+30+40}{10}$ is

    **(A)** 90          **(B)** 91          **(C)** 10          **(D)** 64          **(E)** 9

2.  The value of $\dfrac{1}{2}-\dfrac{1}{8}$ is

    **(A)** $\dfrac{3}{8}$          **(B)** $-\dfrac{1}{6}$          **(C)** $\dfrac{5}{8}$          **(D)** $\dfrac{1}{16}$          **(E)** $\dfrac{1}{4}$

3.  Seven thousand twenty-two can be written as
    **(A)** 70 022          **(B)** 722          **(C)** 7202          **(D)** 7022          **(E)** 7220

4.  In the diagram, the value of $x$ is
    **(A)**  77          **(B)** 113          **(C)** 67
    **(D)** 103          **(E)**  90
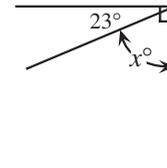
5.  Five years ago today, Sally was 7 years old.  In two more years, Sally will be
    **(A)** 12          **(B)** 14          **(C)** 9          **(D)** 13          **(E)** 10

6.  At the Gauss Store, you earn 5 "reward points" for each $25 you spend.  When Stuart spends $200 at the Gauss Store, the number of reward points that he earns is
    **(A)** 5          **(B)** 8          **(C)** 40          **(D)** 125          **(E)** 1000

7.  Which of the following fractions has the largest value?
    **(A)** $\dfrac{8}{9}$          **(B)** $\dfrac{7}{8}$          **(C)** $\dfrac{66}{77}$          **(D)** $\dfrac{55}{66}$          **(E)** $\dfrac{4}{5}$

8.  A box contains 1 grey ball, 2 white balls and 3 black balls.  Without looking, John reaches in and chooses one ball at random.  What is the probability that the ball *is not* grey?
    **(A)** 1          **(B)** $\dfrac{2}{6}$          **(C)** $\dfrac{3}{6}$          **(D)** $\dfrac{4}{6}$          **(E)** $\dfrac{5}{6}$

9.  In the diagram, all rows, columns and diagonals have the same sum.
    What is the value of $x$?
    **(A)** 12          **(B)** 13          **(C)** 16
    **(D)** 17          **(E)** 18

10. The perimeter of the figure, in cm, is
    **(A)** 30          **(B)** 28          **(C)** 25
    **(D)** 24          **(E)** 22
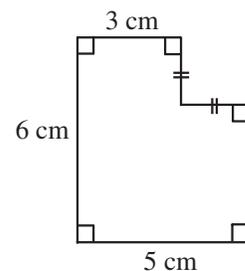
# Grade 7

**Part B: Each correct answer is worth 6.**

11. What is the median quiz score of the 25 scores shown on the bar graph?
    (**A**) 8      (**B**) 9      (**C**) 10
    (**D**) 11      (**E**) 12

FREQUENCY OF QUIZ SCORES
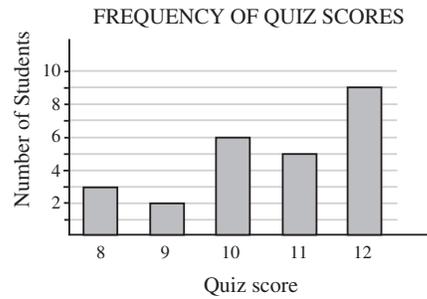


12. The elevation of Lake Ontario is 75.00 m and the elevation of Lake Erie is 174.28 m. A ship travels between the two lakes, passing through the locks of the Welland Canal. If the ship takes 8 hours to travel between the lakes, the average (mean) change in elevation per hour is
    (**A**) 12.41 m      (**B**) 21.79 m      (**C**) 5.25 m      (**D**) 4.14 m      (**E**) 7.80 m

13. Two positive integers have a sum of 11. The greatest possible product of these two positive integers is
    (**A**) 11      (**B**) 18      (**C**) 28      (**D**) 35      (**E**) 30

14. How many even whole numbers lie between $3^2$ and $3^3$?
    (**A**) 9      (**B**) 4      (**C**) 6      (**D**) 10      (**E**) 17

15. If $P = 1000$ and $Q = 0.01$, which of the following calculations gives the largest result?

    (**A**) $P + Q$      (**B**) $P \times Q$      (**C**) $\dfrac{P}{Q}$      (**D**) $\dfrac{Q}{P}$      (**E**) $P - Q$

16. What is the maximum number of rectangular wooden blocks with dimensions $20 \text{ cm} \times 30 \text{ cm} \times 40 \text{ cm}$ that could fit into a rectangular box with inner dimensions $40 \text{ cm} \times 60 \text{ cm} \times 80 \text{ cm}$?
    (**A**) 2      (**B**) 4      (**C**) 10
    (**D**) 8      (**E**) 6
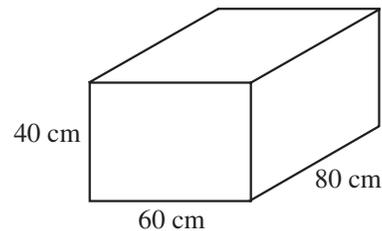


17. Kalyn is trying out a new recipe that calls for 5 cups of flour and 1 cup shortening. She only has $\frac{2}{3}$ cup of shortening, and uses all of it. How much flour should she use to keep the ingredients in the same ratio as called for in the recipe?

    (**A**) $2\frac{1}{3}$      (**B**) $3\frac{1}{3}$      (**C**) $1\frac{2}{3}$      (**D**) $1\frac{1}{3}$      (**E**) 2

18. A rectangular wooden prism is made up of three pieces, each consisting of four cubes of wood glued together. Which of the pieces below has the same shape as the black piece?



(**A**)      (**B**)      (**C**)      (**D**)      (**E**)
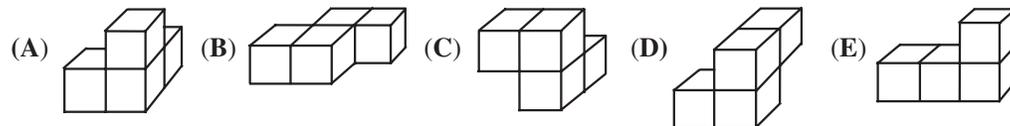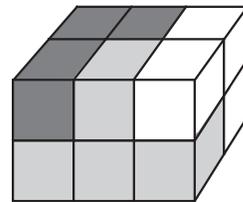
# Grade 7

19. A two-digit number is divisible by 8, 12 and 18. The number is between
    (**A**) 10 and 19      (**B**) 20 and 39      (**C**) 40 and 59      (**D**) 60 and 79      (**E**) 80 and 99

20. The area of square $ABCD$ is 64 and $AX = BW = CZ = DY = 2$.
    What is the area of square $WXYZ$?
    (**A**) 58      (**B**) 52      (**C**) 48
    (**D**) 40      (**E**) 36

---
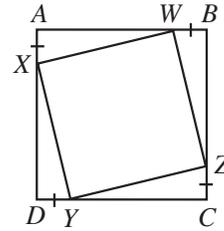
**Part C: Each correct answer is worth 8.**

21. In the diagram, the rectangular floor plan of the first floor
    of a house is shown. The living room and the laundry room
    are both square. The areas of three of the rooms are shown
    on the diagram. The area of the kitchen, in $m^2$, is

    | Living Room 16 m² | Dining Room 24 m² |
    |---|---|
    | Laundry 4 m² | Kitchen |

    (**A**) 12      (**B**) 16      (**C**) 18
    (**D**) 24      (**E**) 36
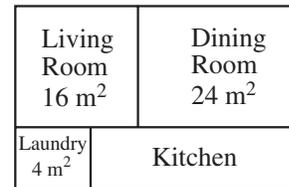
22. The entire contents of a jug can exactly fill 9 small glasses and 4 large glasses of juice. The entire
    contents of the jug could instead fill 6 small glasses and 6 large glasses. If the entire contents of
    the jug is used to fill only large glasses, the maximum number of large glasses that can be filled is
    (**A**) 8      (**B**) 9      (**C**) 10      (**D**) 11      (**E**) 12

23. It takes Sharon one hour to drive the 59 km from her home to her office. Her drive includes 20
    minutes on a highway and 40 minutes on city roads. If her average speed when she is on city roads
    is 45 km/h, the average speed, in km/h, at which she drives on the highway is
    (**A**) 42      (**B**) 59      (**C**) 87      (**D**) 90      (**E**) 100

24. In the Gauss 2004 Olympics, there are six competitors and eight events. The top three competitors
    in each event receive gold, silver and bronze medals respectively. (There are no ties at the Gauss
    Olympics, and no competitor can win more than one medal on the same event.) Each competitor
    scores 5 points for each gold medal, 3 points for each silver medal, and 1 point for each bronze
    medal. If one of the competitors had a total of 27 points, what is the maximum number of silver
    medals she could have won?
    (**A**) 6      (**B**) 2      (**C**) 3      (**D**) 4      (**E**) 5

25. A grid with 10 rows and some number of columns is made
    up of unit squares, as shown. A domino (☐☐) can be
    placed horizontally or vertically to exactly cover two unit
    squares. There are 2004 positions in which the domino
    could be placed. The number of columns in the grid is
    (**A**) 105      (**B**) 106      (**C**) 107
    (**D**) 108      (**E**) 109

� ✖ ✖ ✖

## Canadian Mathematics Competition

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

# *Gauss Contest* (Grade 7)

**(Grade 8 Contest is on the reverse side)**

**Wednesday, May 14, 2003**

**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.

# Grade 7

**Part A:  Each correct answer is worth 5.**

1.    $3.26 \times 1.5$ equals
      (**A**) 0.489          (**B**) 4.89          (**C**) 48.9          (**D**) 489          (**E**) 4890

2.    The value of $(9-2)-(4-1)$ is
      (**A**) 2          (**B**) 3          (**C**) 4          (**D**) 6          (**E**) 10

3.    The value of $30 + 80\,000 + 700 + 60$ is
      (**A**) 87 090          (**B**) 807 090          (**C**) 800 790          (**D**) 80 790          (**E**) 87 630

4.    $\dfrac{1+2+3}{4+5+6}$ equals

      (**A**) $\frac{1}{9}$          (**B**) $\frac{1}{3}$          (**C**) $\frac{2}{5}$          (**D**) $\frac{4}{11}$          (**E**) $\frac{1}{10}$

5.    In a survey, 90 people were asked "What is your favourite pet?"  Their responses were recorded and then graphed.  In the graph, the bar representing "favourite pet is dog" has been omitted.  How many people selected a dog as their favourite pet?
      (**A**) 20          (**B**) 55          (**C**) 40
      (**D**) 45          (**E**) 35
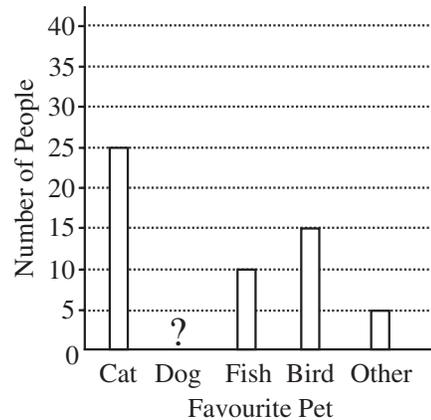
6.    Travis spikes his hair using gel.  If he uses 4 mL of gel every day, how many days will it take him to empty a 128 mL tube of gel?
      (**A**) 32          (**B**) 33          (**C**) 40          (**D**) 30          (**E**) 28

7.    An expression that can be placed in the box to make the equation $\dfrac{3 \times 6 \times 9}{3} = \dfrac{\square}{2}$ true is

      (**A**) $2 \times 4 \times 6$          (**B**) $3 \times 4 \times 6$          (**C**) $2 \times 6 \times 9$          (**D**) $2 \times 4 \times 8$          (**E**) $2 \times 12 \times 18$

8.    The words "PUNK CD FOR SALE" are painted on a clear window.  How many of the letters in the sign look the same from both sides of the window?
      (**A**) 3          (**B**) 4          (**C**) 5          (**D**) 6          (**E**) 7

9.    Spencer was walking home from school when he realized he had forgotten his homework.  He walked back to the school, picked up his homework and then walked home.  The graph shows his distance from home at different times.  In total, how far did he walk?
      (**A**) 2800 m          (**B**) 1000 m          (**C**) 800 m
      (**D**) 1200 m          (**E**) 1400 m
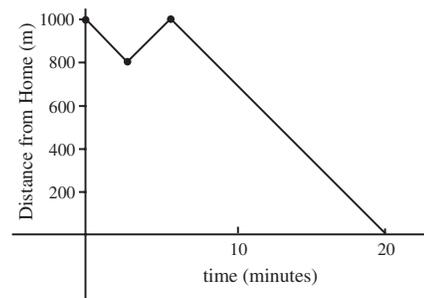
# Grade 7

10. In the diagram, three lines meet at the points $A$, $B$ and $C$. If
    $\angle ABC = 50°$ and $\angle ACB = 30°$, the value of $x$ is
    (A) 80    (B) 30    (C) 100
    (D) 60    (E) 50

---
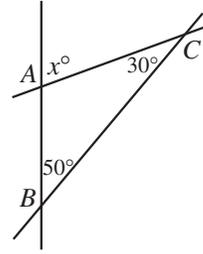
**Part B: Each correct answer is worth 6.**

11. If $\frac{1}{2}$ of $\frac{2}{3}$ of the twelve small squares in the given figure are removed, how many squares remain?

    (A) 2    (B) 3    (C) 4    (D) 8    (E) 9

12. The perimeter of a rectangular field is 3 times its length. If the perimeter is 240 m, the width of the field is
    (A) 80 m    (B) 40 m    (C) 20 m    (D) 30 m    (E) 120 m

13. Chris and Pat go on a 30 km run. They both usually run at 10 km/h. If Chris runs at $\frac{1}{2}$ his usual running speed, and Pat runs at $1\frac{1}{2}$ times her usual speed, how many more hours does it take Chris to complete the run than it takes Pat to complete the run?
    (A) 1    (B) 1.5    (C) 2    (D) 4    (E) 6

14. A box contains 14 disks, each coloured red, blue or green. There are twice as many red disks as green disks, and half as many blue as green. How many disks are green?
    (A) 2    (B) 4    (C) 6    (D) 8    (E) 10

15. A bottle of children's vitamins contains tablets in three different shapes. Among the vitamins, there are 60 squares, 60 triangles and 60 stars. Each shape comes in an equal number of three different flavours – strawberry, grape and orange. A tablet is randomly chosen from a newly opened bottle. What is the probability that this tablet is a grape star?
    (A) $\frac{1}{9}$    (B) $\frac{1}{60}$    (C) $\frac{1}{20}$    (D) $\frac{1}{3}$    (E) $\frac{1}{180}$

16. Triangle $ABC$ has its vertices at $A(2,0)$, $B(6,0)$ and $C(6,3)$. The area of the triangle, in square units, is
    (A) 3    (B) 4    (C) 6    (D) 7    (E) 12

17. Genna rents a car for a business trip. The rental company charges a fee of $45 plus 12 cents per kilometre driven. If Genna's bill before taxes is $74.16, how many kilometres did she travel in the car?
    (A) 993    (B) 375    (C) 243    (D) 288    (E) 618

18. Two squares, each with side length 5 cm, overlap as shown. The shape of their overlap is a square, which has an area of $4 \text{ cm}^2$. What is the perimeter, in centimetres, of the shaded figure?
    (A) 24    (B) 32    (C) 40
    (D) 42    (E) 50
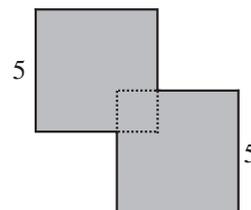
# Grade 7

19. Abraham's mathematics exam had 30 algebra questions and 50 geometry questions, each worth 1 mark. He got 70% of the algebra questions correct, and his overall exam mark was 80%. How many geometry questions did he answer correctly?

    (A) 43          (B) 45          (C) 39          (D) 41          (E) 35

20. Six points $A$, $B$, $C$, $D$, $E$, and $F$ are placed on a square grid, as shown. How many triangles that are *not* right-angled can be drawn by using 3 of these 6 points as vertices?

    (A) 2          (B) 1          (C) 6

    (D) 0          (E) 4
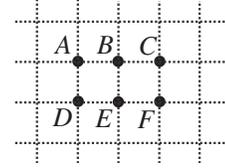
    

**Part C:  Each correct answer is worth 8.**

21. In a large hospital with several operating rooms, ten people are each waiting for a 45 minute operation. The first operation starts at 8:00 a.m., the second at 8:15 a.m., and each of the other operations starts at 15 minute intervals thereafter. When does the last operation end?

    (A) 10:15 a.m.          (B) 10:30 a.m.          (C) 10:45 a.m.          (D) 11:00 a.m.          (E) 11:15 a.m.

22. Luke has played 20 games and has a 95% winning percentage. Without losing any more games, how many more games in a row must he win to reach exactly a 96% winning percentage?

    (A) 1          (B) 3          (C) 4          (D) 5          (E) 10

23. A different letter is painted on each face of a cube. This cube is shown below in 3 different positions:

    

    What letter belongs on the shaded face of this cube in the following diagram?

    (A) $T$          (B) $P$          (C) $X$

    (D) $E$          (E) $V$
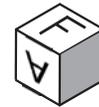
    

24. In the pattern of numbers shown, every row begins with a 1 and ends with a 2. Each of the numbers, not on the end of a row, is the sum of the two numbers located immediately above and to the right, and immediately above and to the left. For example, in the fourth row the 9 is the sum of the 4 and the 5 in the third row. If this pattern continues, the sum of all of the numbers in the thirteenth row is
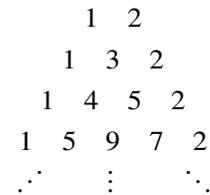
    (A) 12 270          (B) 12 276          (C) 12 282

    (D) 12 288          (E) 12 294

    ```
        1   2
      1   3   2
    1   4   5   2
  1   5   9   7   2
    ```

25. The digits 1, 2, 3, 4, 5, and 6 are each placed in one of the boxes so that the resulting product is correct. If each of the six digits is used exactly once, the digit represented by "?" is

    (A) 2          (B) 3          (C) 4

    (D) 5          (E) 6

    

✸ ✸ ✸ ✸ ✸

# Canadian Mathematics Competition

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

# *Gauss Contest* (Grade 7)

## (Grade 8 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.

# Grade 7

**Part A:  Each correct answer is worth 5.**

1.  When the numbers 8, 3, 5, 0, 1 are arranged from smallest to largest, the middle number is
    **(A)** 5  **(B)** 8  **(C)** 3  **(D)** 0  **(E)** 1

2.  The value of $0.9 + 0.99$ is
    **(A)** 0.999  **(B)** 1.89  **(C)** 1.08  **(D)** 1.98  **(E)** 0.89

3.  $\dfrac{2+1}{7+6}$ equals
    **(A)** $\dfrac{3}{13}$  **(B)** $\dfrac{21}{76}$  **(C)** $\dfrac{1}{21}$  **(D)** $\dfrac{2}{13}$  **(E)** $\dfrac{1}{14}$

4.  20% of 20 is equal to
    **(A)** 400  **(B)** 100  **(C)** 5  **(D)** 2  **(E)** 4

5.  Tyesha earns $5 per hour babysitting, and babysits for 7 hours in a particular week.  If she starts the week with $20 in her bank account, deposits all she earns into her account, and does not withdraw any money, the amount she has in her account at the end of the week is
    **(A)** $35  **(B)** $20  **(C)** $45  **(D)** $55  **(E)** $65

6.  Five rats competed in a 25 metre race.  The graph shows the time that each rat took to complete the race.  Which rat won the race?
    **(A)** Allan  **(B)** Betsy  **(C)** Caelin
    **(D)** Devon  **(E)** Ella
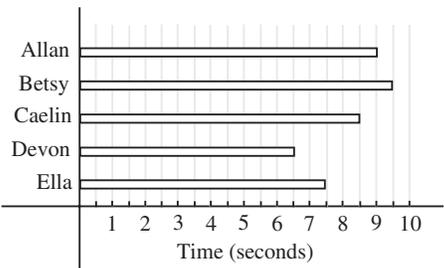
    

7.  The mean (average) of the numbers 12, 14, 16, and 18, is
    **(A)** 30  **(B)** 60  **(C)** 17  **(D)** 13  **(E)** 15

8.  If $P = 1$ and $Q = 2$, which of the following expressions is **not** equal to an integer?

    **(A)** $P + Q$  **(B)** $P \times Q$  **(C)** $\dfrac{P}{Q}$  **(D)** $\dfrac{Q}{P}$  **(E)** $P^Q$

9.  Four friends equally shared $\dfrac{3}{4}$ of a pizza, which was left over after a party.  What fraction of a whole pizza did each friend get?
    **(A)** $\dfrac{3}{8}$  **(B)** $\dfrac{3}{16}$  **(C)** $\dfrac{1}{12}$  **(D)** $\dfrac{1}{16}$  **(E)** $\dfrac{1}{8}$

10. Two squares, each with an area of $25\text{ cm}^2$, are placed side by side to form a rectangle.  What is the perimeter of this rectangle?
    **(A)** 30 cm  **(B)** 25 cm  **(C)** 50 cm  **(D)** 20 cm  **(E)** 15 cm

**Part B: Each correct answer is worth 6.**

11. After running 25% of a race, Giselle had run 50 metres. How long was the race, in metres?
    (**A**) 100　　　　(**B**) 1250　　　　(**C**) 200　　　　(**D**) 12.5　　　　(**E**) 400

12. 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

13. 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

14. The first six letters of the alphabet are assigned values A = 1, B = 2, C = 3, D = 4, E = 5, and F = 6. The value of a word equals the sum of the values of its letters. For example, the value of BEEF is $2 + 5 + 5 + 6 = 18$. Which of the following words has the greatest value?
    (**A**) BEEF　　　　(**B**) FADE　　　　(**C**) FEED　　　　(**D**) FACE　　　　(**E**) DEAF

15. In the diagram, $AC = 4$, $BC = 3$, and $BD = 10$. The area of the shaded triangle is
    (**A**) 14　　　　(**B**) 20　　　　(**C**) 28
    (**D**) 25　　　　(**E**) 12
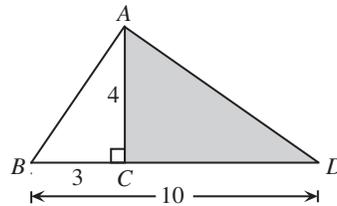
16. In the following equations, the letters $a$, $b$ and $c$ represent different numbers.
    $$1^3 = 1$$
    $$a^3 = 1 + 7$$
    $$3^3 = 1 + 7 + b$$
    $$4^3 = 1 + 7 + c$$
    The numerical value of $a + b + c$ is
    (**A**) 58　　　　(**B**) 110　　　　(**C**) 75　　　　(**D**) 77　　　　(**E**) 79

17. In the diagram, the value of $z$ is
    (**A**) 150　　　　(**B**) 180　　　　(**C**) 60
    (**D**) 90　　　　(**E**) 120
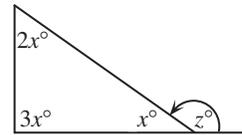
18. A perfect number is an integer that is equal to the sum of all of its positive divisors, except itself. For example, 28 is a perfect number because $28 = 1 + 2 + 4 + 7 + 14$. Which of the following is a perfect number?
    (**A**) 10　　　　(**B**) 13　　　　(**C**) 6　　　　(**D**) 8　　　　(**E**) 9

19. Subesha wrote down Davina's phone number in her math binder. Later that day, while correcting her homework, Subesha accidentally erased the last two digits of the phone number, leaving 893-44_ _. Subesha tries to call Davina by dialing phone numbers starting with 893-44. What is the least number of phone calls that she has to make to be guaranteed to reach Davina's house?
    (**A**) 100　　　　(**B**) 90　　　　(**C**) 10　　　　(**D**) 1000　　　　(**E**) 20

20. 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?
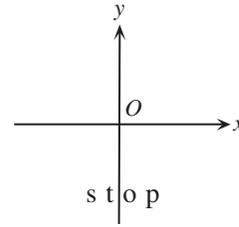


(A)   (B)   (C)   (D)   (E) 

**Part C: Each correct answer is worth 8.**

21. Five people are in a room for a meeting. When the meeting ends, each person shakes hands with each of the other people in the room exactly once. The total number of handshakes that occurs is

(A) 5      (B) 10      (C) 12      (D) 15      (E) 25

22. The figure shown can be folded along the lines to form a rectangular prism. The surface area of the rectangular prism, in $cm^2$, is

(A) 312      (B) 300      (C) 280

(D) 84      (E) 600
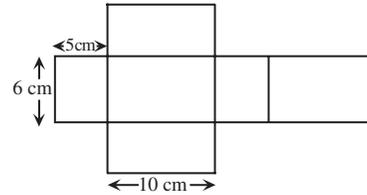


23. Mark has a bag that contains 3 black marbles, 6 gold marbles, 2 purple marbles, and 6 red marbles. Mark adds a number of white marbles to the bag and tells Susan that if she now draws a marble at random from the bag, the probability of it being black or gold is $\frac{3}{7}$. The number of white marbles that Mark adds to the bag is

(A) 5      (B) 2      (C) 6      (D) 4      (E) 3

24. $PQRS$ is a square with side length 8. $X$ is the midpoint of side $PQ$, and $Y$ and $Z$ are the midpoints of $XS$ and $XR$, respectively, as shown. The area of trapezoid $YZRS$ is

(A) 24      (B) 16      (C) 20

(D) 28      (E) 32
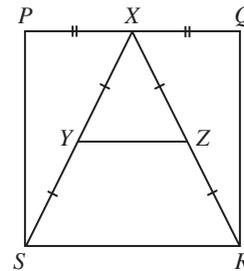


25. Each of the integers 226 and 318 have digits whose product is 24. How many three-digit positive integers have digits whose product is 24?

(A) 4      (B) 18      (C) 24      (D) 12      (E) 21

✶✶✶✶✶

## Canadian Mathematics Competition

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

# *Gauss Contest* (Grade 7)

## (Grade 8 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 7

**Part A:  Each correct answer is worth 5.**

1.  The largest number in the set $\{0.01, 0.2, 0.03, 0.02, 0.1\}$ is
    (**A**) 0.01      (**B**) 0.2      (**C**) 0.03      (**D**) 0.02      (**E**) 0.1

2.  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

3.  The value of $0.001 + 1.01 + 0.11$ is
    (**A**) 1.111      (**B**) 1.101      (**C**) 1.013      (**D**) 0.113      (**E**) 1.121

4.  When the number 16 is doubled and the answer is then halved, the result is
    (**A**) $2^1$      (**B**) $2^2$      (**C**) $2^3$      (**D**) $2^4$      (**E**) $2^8$

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

6.  In the diagram, *ABCD* is a rhombus.  The size of $\angle BCD$ is
    (**A**) 60°      (**B**) 90°      (**C**) 120°
    (**D**) 45°      (**E**) 160°
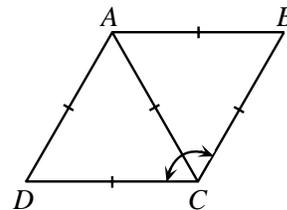
7.  A number line has 40 consecutive integers marked on it.  If the smallest of these integers is –11, what is the largest?
    (**A**) 29      (**B**) 30      (**C**) 28      (**D**) 51      (**E**) 50

8.  The area of the entire figure shown is
    (**A**) 16      (**B**) 32      (**C**) 20
    (**D**) 24      (**E**) 64
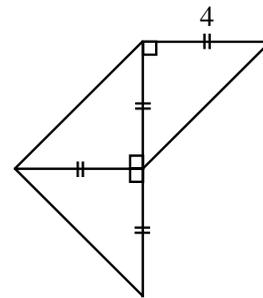
9.  The bar graph shows the hair colours of the campers at Camp Gauss.  The bar corresponding to redheads has been accidentally removed.  If 50% of the campers have brown hair, how many of the campers have red hair?
    (**A**) 5      (**B**) 10      (**C**) 25
    (**D**) 50      (**E**) 60
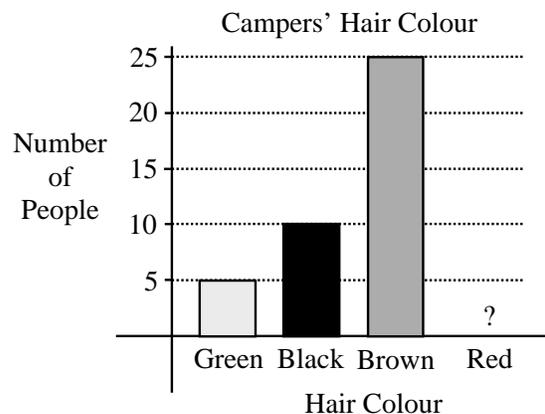
10. Henri scored a total of 20 points in his basketball team's first three games. He scored $\frac{1}{2}$ of these points in the first game and $\frac{1}{10}$ of these points in the second game. How many points did he score in the third game?
    (**A**) 2      (**B**) 10      (**C**) 11      (**D**) 12      (**E**) 8

**Part B: Each correct answer is worth 6.**

11. 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**) $\frac{1}{6}$

12. The ratio of the number of big dogs to the number of small dogs at a pet show is 3:17. There are 80 dogs, in total, at this pet show. How many big dogs are there?
    (**A**) 12      (**B**) 68      (**C**) 20      (**D**) 24      (**E**) 6

13. The product of two whole numbers is 24. The smallest possible sum of these two numbers is
    (**A**) 9      (**B**) 10      (**C**) 11      (**D**) 14      (**E**) 25

14. 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  |

15. 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

16. $BC$ is a diameter of the circle with centre $O$ and radius 5, as shown. If $A$ lies on the circle and $AO$ is perpendicular to $BC$, the area of triangle $ABC$ is
    (**A**) 6.25      (**B**) 12.5      (**C**) 25
    (**D**) 37.5      (**E**) 50
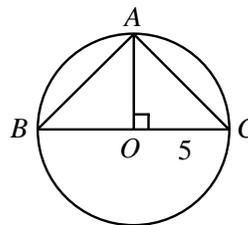
17. A rectangular sign that has dimensions 9 m by 16 m has a square advertisement painted on it. The border around the square is required to be at least 1.5 m wide. The area of the largest square advertisement that can be painted on the sign is

    (**A**) $78\,\text{m}^2$      (**B**) $144\,\text{m}^2$      (**C**) $36\,\text{m}^2$      (**D**) $9\,\text{m}^2$      (**E**) $56.25\,\text{m}^2$

18. Felix converted $924.00 to francs before his trip to France. At that time, each franc was worth thirty cents. If he returned from his trip with 21 francs, how many francs did he spend?
    (**A**) 3080      (**B**) 3101      (**C**) 256.2      (**D**) 3059      (**E**) 298.2

19. Rectangular tiles, which measure 6 by 4, are arranged without overlapping, to create a square. The minimum number of these tiles needed to make a square is
    (**A**) 8      (**B**) 24      (**C**) 4      (**D**) 12      (**E**) 6

20. 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

# Grade 7

**Part C**: **Each correct answer is worth 8.**

21. Naoki wrote nine tests, each out of 100.  His average on these nine tests is 68%.  If his lowest mark is omitted, what is his highest possible resulting average?
    (**A**) 76.5%    (**B**) 70%    (**C**) 60.4%    (**D**) 77%    (**E**) 76%

22. A regular hexagon is inscribed in an equilateral triangle, as shown.  If the hexagon has an area of 12, the area of this triangle is
    (**A**) 20    (**B**) 16    (**C**) 15
    (**D**) 18    (**E**) 24
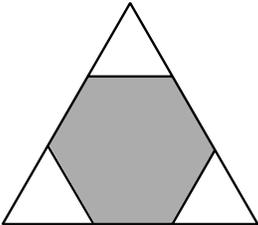
23. Catrina runs 100 m in 10 seconds.  Sedra runs 400 m in 44 seconds.  Maintaining these constant speeds, they participate in a 1 km race.  How far ahead, to the nearest metre, is the winner as she crosses the finish line?
    (**A**) 100 m    (**B**) 110 m    (**C**) 95 m    (**D**) 90 m    (**E**) 91 m

24. Enzo has fish in two aquariums.  In one aquarium, the ratio of the number of guppies to the number of goldfish is 2:3.  In the other, this ratio is 3:5.  If Enzo has 20 guppies in total, the least number of goldfish that he could have is
    (**A**) 29    (**B**) 30    (**C**) 31    (**D**) 32    (**E**) 33

25. 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

❀❀❀❀❀❀❀❀❀

## Canadian Mathematics Competition

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

# *Gauss Contest* (Grade 7)

### (Grade 8 Contest is on the reverse side)

### Wednesday, May 17, 2000

C.M.C. Sponsors:

University of
**Waterloo**

**Deloitte &
Touche**
**Chartered Accountants**

C.M.C. Supporters:

IBM
Canada Ltd.

Canadian Institute
of Actuaries

SYBASE
Sybase
Inc. (Waterloo)

C.M.C. Contributors:

The Great-West
Life Assurance
Company

Northern Telecom
(Nortel)

Manulife
Financial

Equitable Life
of Canada

---

**Time:** 1 hour

© 2000 Waterloo Mathematics Foundation

**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 7

**Part A** (5 credits each)

1.　The value of $987 + 113 - 1000$ is
(**A**) 90　　　　(**B**) 10　　　　(**C**) 110　　　　(**D**) 2000　　　　(**E**) 100

2.　As a decimal, $\frac{9}{10} + \frac{8}{100}$ is
(**A**) 1.098　　　(**B**) 0.98　　　(**C**) 0.098　　　(**D**) 0.0908　　　(**E**) 9.8

3.　What integer is closest in value to $7 \times \frac{3}{4}$?
(**A**) 21　　　　(**B**) 9　　　　(**C**) 6　　　　(**D**) 5　　　　(**E**) 1

4.　The value of the expression $5^2 - 4^2 + 3^2$ is
(**A**) 20　　　　(**B**) 18　　　　(**C**) 21　　　　(**D**) 10　　　　(**E**) 16

5.　When a number is divided by 7, it gives a quotient of 4 with a remainder of 6. What is the number?
(**A**) 17　　　　(**B**) 168　　　　(**C**) 34　　　　(**D**) 31　　　　(**E**) 46

6.　In the addition shown, a digit, either the same or different, can be placed in each of the two boxes. What is the sum of the two missing digits?
(**A**) 9　　　　(**B**) 11　　　　(**C**) 13
(**D**) 3　　　　(**E**) 7

$$\begin{array}{r} 8\ 6\ 3 \\ \square\ 9\ 1 \\ 7\ \square\ 8 \\ \hline 2\ 1\ 8\ 2 \end{array}$$

7.　The graph shows the complete scoring summary for the last game played by the eight players on Gaussian Guardians intramural basketball team. The total number of points scored by the Gaussian Guardians was
(**A**) 54　　　　(**B**) 8　　　　(**C**) 12
(**D**) 58　　　　(**E**) 46



Gaussian Guardians Scoring Summary
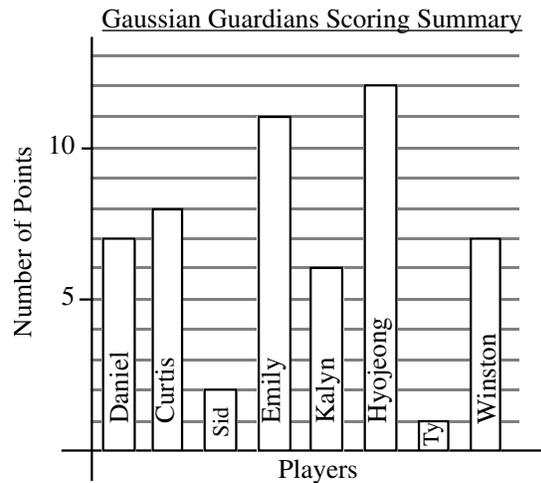
8.　If $\frac{1}{2}$ of the number represented by $x$ is 32, what is $2x$?
(**A**) 128　　　　(**B**) 64　　　　(**C**) 32　　　　(**D**) 256　　　　(**E**) 16

9.　In the given diagram, all 12 of the small rectangles are the same size. Your task is to completely shade some of the rectangles until $\frac{2}{3}$ of $\frac{3}{4}$ of the diagram is shaded. The number of rectangles you need to shade is
(**A**) 9　　　　(**B**) 3　　　　(**C**) 4
(**D**) 6　　　　(**E**) 8
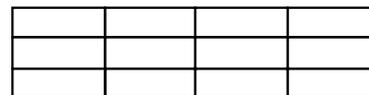
10. The sum of three consecutive integers is 90. What is the largest of the three integers?
    (**A**) 28      (**B**) 29      (**C**) 31      (**D**) 32      (**E**) 21

**Part B** (6 credits each)

11. A rectangular building block has a square base *ABCD* as shown. Its height is 8 units. If the block has a volume of 288 cubic units, what is the side length of the base?
    (**A**) 6      (**B**) 8      (**C**) 36
    (**D**) 10      (**E**) 12
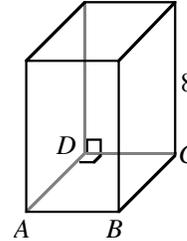
12. A recipe requires 25 mL of butter to be used along with 125 mL of sugar. If 1000 mL of sugar is used, how much butter would be required?
    (**A**) 100 mL      (**B**) 500 mL      (**C**) 200 mL      (**D**) 3 litres      (**E**) 400 mL

13. Karl had his salary reduced by 10%. He was later promoted and his salary was increased by 10%. If his original salary was $20 000, what is his present salary?
    (**A**) $16 200      (**B**) $19 800      (**C**) $20 000      (**D**) $20 500      (**E**) $24 000

14. The area of a rectangle is 12 square metres. The lengths of the sides, in metres, are whole numbers. The greatest possible perimeter (in metres) is
    (**A**) 14      (**B**) 16      (**C**) 12      (**D**) 24      (**E**) 26

15. In the diagram, all rows, columns and diagonals have the sum 12. What is the sum of the four corner numbers?
    (**A**) 14      (**B**) 15      (**C**) 16
    (**D**) 17      (**E**) 12

16. Paul, Quincy, Rochelle, Surinder, and Tony are sitting around a table. Quincy sits in the chair between Paul and Surinder. Tony is not beside Surinder. Who is sitting on either side of Tony?
    (**A**) Paul and Rochelle      (**B**) Quincy and Rochelle      (**C**) Paul and Quincy
    (**D**) Surinder and Quincy      (**E**) Not possible to tell

17. *ABCD* is a square that is made up of two identical rectangles and two squares of area 4 cm$^2$ and 16 cm$^2$. What is the area, in cm$^2$, of the square *ABCD*?
    (**A**) 64      (**B**) 49      (**C**) 25      (**D**) 36      (**E**) 20

18. The month of April, 2000, had five Sundays. Three of them fall on even numbered days. The eighth day of this month is a
    (**A**) Saturday      (**B**) Sunday      (**C**) Monday      (**D**) Tuesday      (**E**) Friday

19. The diagram shows two isosceles right-triangles with sides as marked. What is the area of the shaded region?
    (**A**) 4.5 cm$^2$      (**B**) 8 cm$^2$      (**C**) 12.5 cm$^2$
    (**D**) 16 cm$^2$      (**E**) 17 cm$^2$
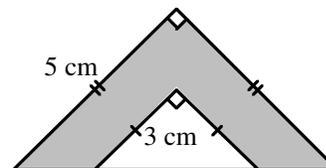
20. A dishonest butcher priced his meat so that meat advertised at $3.79 per kg was actually sold for $4.00 per kg. He sold 1 800 kg of meat before being caught and fined $500. By how much was he ahead or behind where he would have been had he not cheated?
    (**A**) $478 loss      (**B**) $122 loss      (**C**) Breaks even      (**D**) $122 gain      (**E**) $478 gain

# Grade 7

**Part C** (8 credits each)

21. In a basketball shooting competition, each competitor shoots ten balls which are numbered from 1 to 10. The number of points earned for each successful shot is equal to the number on the ball. If a competitor misses exactly two shots, which one of the following scores is not possible?
(**A**) 52      (**B**) 44      (**C**) 41      (**D**) 38      (**E**) 35

22. Sam is walking in a straight line towards a lamp post which is 8 m high. When he is 12 m away from the lamp post, his shadow is 4 m in length. When he is 8 m from the lamp post, what is the length of his shadow?

(**A**) $1\frac{1}{2}$ m      (**B**) 2 m      (**C**) $2\frac{1}{2}$ m      (**D**) $2\frac{2}{3}$ m      (**E**) 3 m

23. The total area of a set of different squares, arranged from smallest to largest, is 35 km$^2$. The smallest square has a side length of 500 m. The next larger square has a side length of 1000 m. In the same way, each successive square has its side length increased by 500 m. What is the total number of squares?
(**A**) 5      (**B**) 6      (**C**) 7      (**D**) 8      (**E**) 9

24. Twelve points are marked on a rectangular grid, as shown. How many squares can be formed by joining four of these points?
(**A**) 6      (**B**) 7      (**C**) 9
(**D**) 11      (**E**) 13

25. A square floor is tiled, as partially shown, with a large number of regular hexagonal tiles. The tiles are coloured blue or white. Each blue tile is surrounded by 6 white tiles and each white tile is surrounded by 3 white and 3 blue tiles. Ignoring part tiles, the ratio of the number of blue tiles to the number of white tiles is closest to
(**A**) 1:6      (**B**) 2:3      (**C**) 3:10
(**D**) 1:4      (**E**) 1:2
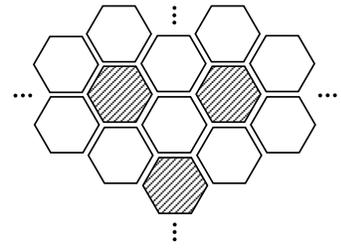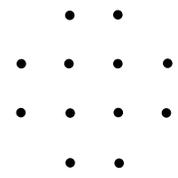
## Canadian Mathematics Competition

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

# Gauss Contest (Grade 7)

## (Grade 8 Contest is on the reverse side)

### Wednesday, May 12, 1999

C.M.C. Sponsors:

University of
**Waterloo**

**NATIONAL
BANK
OF CANADA**

**Deloitte &
Touche**

**Chartered Accountants**

C.M.C. Supporters:

IBM
Canada Ltd.

Canadian Institute
of Actuaries

**SYBASE**
Sybase
Inc. (Waterloo)

C.M.C. Contributors:

The Great-West
Life Assurance
Company

Northern Telecom
(Nortel)

Manulife
Financial

Equitable Life
of Canada

---

**Time:** 1 hour

© 1999 Waterloo Mathematics Foundation

**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 7

**Part A** (5 credits each)

1.  $1999 - 999 + 99$ equals
    (**A**) 901          (**B**) 1099          (**C**) 1000          (**D**) 199          (**E**) 99

2.  The integer 287 is exactly divisible by
    (**A**) 3          (**B**) 4          (**C**) 5          (**D**) 7          (**E**) 6

3.  Susan wants to place 35.5 kg of sugar in small bags. If each bag holds 0.5 kg, how many bags are needed?
    (**A**) 36          (**B**) 18          (**C**) 53          (**D**) 70          (**E**) 71

4.  $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8}$ is equal to

    (**A**) $\frac{15}{8}$          (**B**) $1\frac{3}{14}$          (**C**) $\frac{11}{8}$          (**D**) $1\frac{3}{4}$          (**E**) $\frac{7}{8}$

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

6.  In $\triangle ABC$, $\angle B = 72°$. What is the sum, in degrees, of the other two angles?
    (**A**) 144          (**B**) 72          (**C**) 108
    (**D**) 110          (**E**) 288
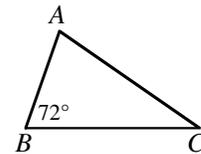
7.  If the numbers $\frac{4}{5}$, 81% and 0.801 are arranged from smallest to largest, the correct order is

    (**A**) $\frac{4}{5}$, 81%, 0.801          (**B**) 81%, 0.801, $\frac{4}{5}$          (**C**) 0.801, $\frac{4}{5}$, 81%

    (**D**) 81%, $\frac{4}{5}$, 0.801          (**E**) $\frac{4}{5}$, 0.801, 81%

8.  The average of 10, 4, 8, 7, and 6 is
    (**A**) 33          (**B**)13          (**C**) 35          (**D**) 10          (**E**) 7

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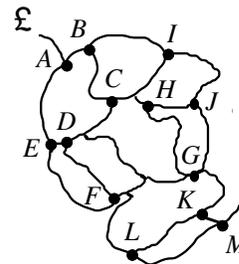
10. In the diagram, line segments meet at $90°$ as shown. If the short line segments are each 3 cm long, what is the area of the shape?
    (**A**) 30          (**B**) 36          (**C**) 40
    (**D**) 45          (**E**) 54

    3 cm
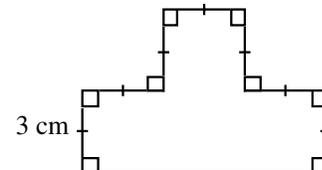
# Grade 7

**Part B** (6 credits each)

11. The floor of a rectangular room is covered with square tiles. The room is 10 tiles long and 5 tiles wide. The number of tiles that touch the walls of the room is
    (**A**) 26      (**B**) 30      (**C**) 34      (**D**) 46      (**E**) 50

12. Five students named Fred, Gail, Henry, Iggy, and Joan are seated around a circular table in that order. To decide who goes first in a game, they play "countdown". Henry starts by saying '34', with Iggy saying '33'. If they continue to count down in their circular order, who will eventually say '1'?
    (**A**) Fred      (**B**) Gail      (**C**) Henry      (**D**) Iggy      (**E**) Joan

13. In the diagram, the percentage of small squares that are shaded is
    (**A**) 9      (**B**) 33      (**C**) 36
    (**D**) 56.25      (**E**) 64
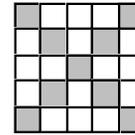
14. Which of the following numbers is an odd integer, contains the digit 5, is divisible by 3, and lies between $12^2$ and $13^2$?
    (**A**) 105      (**B**) 147      (**C**) 156      (**D**) 165      (**E**) 175

15. A box contains 36 pink, 18 blue, 9 green, 6 red, and 3 purple cubes that are identical in size. If a cube is selected at random, what is the probability that it is green?
    (**A**) $\frac{1}{9}$      (**B**) $\frac{1}{8}$      (**C**) $\frac{1}{5}$      (**D**) $\frac{1}{4}$      (**E**) $\frac{9}{70}$

16. 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
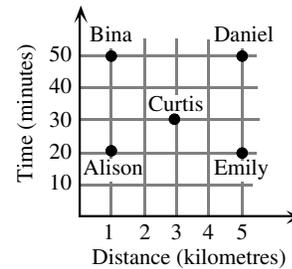
17. In a "Fibonacci" sequence of numbers, each term beginning with the third, is the sum of the previous two terms. The first number in such a sequence is 2 and the third is 9. What is the eighth term in the sequence?
    (**A**) 34      (**B**) 36      (**C**) 107      (**D**) 152      (**E**) 245

18. The results of a survey of the hair colour of 600 people are shown in this circle graph. How many people have blonde hair?
    (**A**) 30      (**B**) 160      (**C**) 180
    (**D**) 200      (**E**) 420
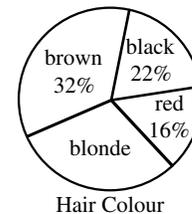
19. What is the area, in $m^2$, of the shaded part of the rectangle?
    (**A**) 14      (**B**) 28      (**C**) 33.6
    (**D**) 56      (**E**) 42
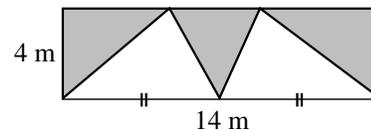
20. The first 9 positive odd integers are placed in the magic square so that the sum of the numbers in each row, column and diagonal are equal. Find the value of $A + E$.
    (**A**) 32      (**B**) 28      (**C**) 26
    (**D**) 24      (**E**) 16

# Grade 7

**Part C** (8 credits each)

21. 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?
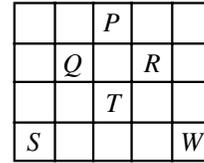
    (**A**) *P*  (**B**) *Q*  (**C**) *R*  (**D**) *T*  (**E**) *W*

22. Forty-two cubes with 1 cm edges are glued together to form a solid rectangular block. If the perimeter of the base of the block is 18 cm, then the height, in cm, is

    (**A**) 1  (**B**) 2  (**C**) $\frac{7}{3}$  (**D**) 3  (**E**) 4

23. *JKLM* is a square. Points *P* and *Q* are outside the square such that triangles *JMP* and *MLQ* are both equilateral. The size, in degrees, of angle *PQM* is
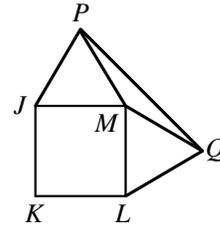
    (**A**) 10  (**B**) 15  (**C**) 25
    (**D**) 30  (**E**) 150

24. Five holes of increasing size are cut along the edge of one face of a box as shown. The number of points scored when a marble is rolled through that hole is the number above the hole. There are three sizes of marbles: small, medium and large. The small marbles fit through any of the holes, the medium fit only through holes 3, 4 and 5 and the large fit only through hole 5. You may choose up to 10 marbles of each size to roll and every rolled marble goes through a hole. For a score of 23, what is the maximum number of marbles that could have been rolled?
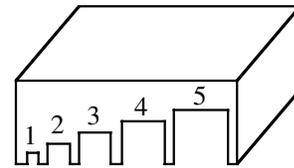
    (**A**) 12  (**B**) 13  (**C**) 14  (**D**) 15  (**E**) 16

25. In a softball league, after each team has played every other team 4 times, the total accumulated points are: Lions 22, Tigers 19, Mounties 14, and Royals 12. If each team received 3 points for a win, 1 point for a tie and no points for a loss, how many games ended in a tie?

    (**A**) 3  (**B**) 4  (**C**) 5  (**D**) 7  (**E**) 10

# Canadian Mathematics Competition

**35th Anniversary 1963 – 1998**

# Gauss Contest (Grade 7)

## (Grade 8 Contest is on the reverse side)

### Wednesday, May 13, 1998

---

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

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

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

# Grade 7

**Part A** (5 credits each)

1. The value of $\dfrac{1998-998}{1000}$ is
   (A) 1      (B) 1000      (C) 0.1      (D) 10      (E) 0.001

2. The number 4567 is tripled. The ones digit (units digit) in the resulting number is
   (A) 5      (B) 6      (C) 7      (D) 3      (E) 1

3. If $S = 6 \times 10\,000 + 5 \times 1000 + 4 \times 10 + 3 \times 1$, what is $S$?
   (A) 6543      (B) 65\,043      (C) 65\,431      (D) 65\,403      (E) 60\,541

4. Jean writes five tests and achieves the marks shown on the graph. What is her average mark on these five tests?
   (A) 74      (B) 76      (C) 70
   (D) 64      (E) 79
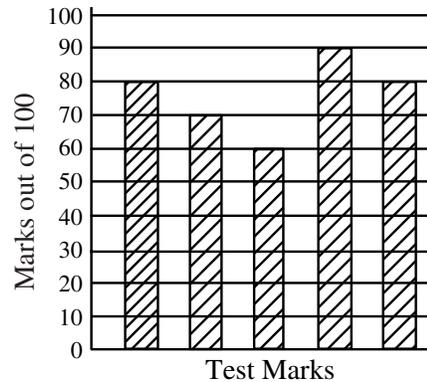
5. If a machine produces 150 items in one minute, how many would it produce in 10 seconds?
   (A) 10      (B) 15      (C) 20      (D) 25      (E) 30

6. In the multiplication question, the sum of the digits in the four boxes is
   (A) 13      (B) 12      (C) 27
   (D) 9      (E) 22

$$
\begin{array}{r}
879 \\
\times\, 492 \\
\hline
\square\,758 \\
7\square\,11 \\
35\,\square\,6 \\
\hline
43\,\square\,468
\end{array}
$$

7. A rectangular field is 80 m long and 60 m wide. If fence posts are placed at the corners and are 10 m apart along the 4 sides of the field, how many posts are needed to completely fence the field?
   (A) 24      (B) 26      (C) 28      (D) 30      (E) 32

8. Tuesday's high temperature was $4°C$ warmer than that of Monday's. Wednesday's high temperature was $6°C$ cooler than that of Monday's. If Tuesday's high temperature was $22°C$, what was Wednesday's high temperature?
   (A) $20°C$      (B) $24°C$      (C) $12°C$      (D) $32°C$      (E) $16°C$

9. Two numbers have a sum of 32. If one of the numbers is $-36$, what is the other number?
   (A) 68      (B) $-4$      (C) 4      (D) 72      (E) $-68$

10. At the waterpark, Bonnie and Wendy decided to race each other down a waterslide. Wendy won by 0.25 seconds. If Bonnie's time was exactly 7.80 seconds, how long did it take for Wendy to go down the slide?
    (A) 7.80 seconds      (B) 8.05 seconds      (C) 7.55 seconds      (D) 7.15 seconds      (E) 7.50 seconds

# Grade 7

**Part B** (6 credits each)

11. Kalyn cut rectangle *R* from a sheet of paper. A smaller rectangle is then cut from the large rectangle *R* to produce figure *S*. In comparing *R* to *S*

8 cm

4 cm

6 cm | *R* | 6 cm | *S* | 5 cm

8 cm

8 cm
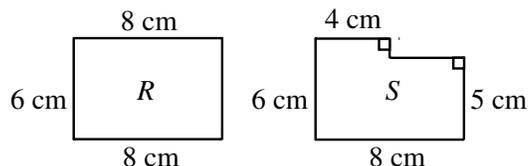
   (A) the area and perimeter both decrease
   (B) the area decreases and the perimeter increases
   (C) the area and perimeter both increase
   (D) the area increases and the perimeter decreases
   (E) the area decreases and the perimeter stays the same

12. Steve plants ten trees every three minutes. If he continues planting at the same rate, how long will it take him to plant 2500 trees?

   (A) $1\frac{1}{4}$ h          (B) 3 h          (C) 5 h          (D) 10 h          (E) $12\frac{1}{2}$ h

13. The pattern of figures $\triangle \bullet \square \blacktriangle \bigcirc$ is repeated in the sequence
   $\triangle, \bullet, \square, \blacktriangle, \bigcirc, \triangle, \bullet, \square, \blacktriangle, \bigcirc,$ ... .
   The 214th figure in the sequence is

   (A) $\triangle$          (B) $\bullet$          (C) $\square$          (D) $\blacktriangle$          (E) $\bigcirc$

14. A cube has a volume of $125 \text{ cm}^3$. What is the area of one face of the cube?

   (A) $20 \text{ cm}^2$          (B) $25 \text{ cm}^2$          (C) $41\frac{2}{3} \text{ cm}^2$          (D) $5 \text{ cm}^2$          (E) $75 \text{ cm}^2$

15. The diagram shows a magic square in which the sums of the numbers in any row, column or diagonal are equal. What is the value of *n*?

   (A) 3          (B) 6          (C) 7
   (D) 10          (E) 11

| 8 | | |
| 9 | | 5 |
| 4 | *n* | |

16. Each of the digits 3, 5, 6, 7, and 8 is placed one to a box in the diagram. If the two digit number is subtracted from the three digit number, what is the smallest difference?
   (A) 269          (B) 278          (C) 484
   (D) 271          (E) 261
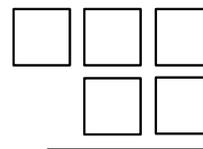
17. Claire takes a square piece of paper and folds it in half four times without unfolding, making an isosceles right triangle each time. After unfolding the paper to form a square again, the creases on the paper would look like

   (A)          (B)          (C)

   (D)          (E)
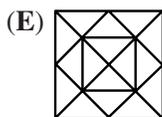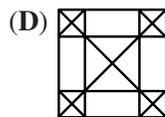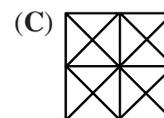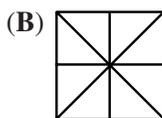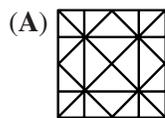
18. The letters of the word 'GAUSS' and the digits in the number '1998' are each cycled separately and then numbered as shown.
    1. AUSSG   9981
    2. USSGA   9819
    3. SSGAU   8199
       etc.
    If the pattern continues in this way, what number will appear in front of GAUSS 1998?
    (**A**) 4          (**B**) 5          (**C**) 9          (**D**) 16          (**E**) 20

19. Juan and Mary play a two-person game in which the winner gains 2 points and the loser loses 1 point. If Juan won exactly 3 games and Mary had a final score of 5 points, how many games did they play?
    (**A**) 7          (**B**) 8          (**C**) 4          (**D**) 5          (**E**) 11

20. Each of the 12 edges of a cube is coloured either red or green. Every face of the cube has at least one red edge. What is the smallest number of red edges?
    (**A**) 2          (**B**) 3          (**C**) 4          (**D**) 5          (**E**) 6

---

**Part C** (8 credits each)

21. Ten points are spaced equally around a circle. How many different chords can be formed by joining any 2 of these points? (A chord is a straight line joining two points on the circumference of a circle.)
    (**A**) 9          (**B**) 45          (**C**) 17          (**D**) 66          (**E**) 55

22. Each time a bar of soap is used, its volume decreases by 10%. What is the minimum number of times a new bar would have to be used so that less than one-half its volume remains?
    (**A**) 5          (**B**) 6          (**C**) 7          (**D**) 8          (**E**) 9

23. A cube measures $10 \text{ cm} \times 10 \text{ cm} \times 10 \text{ cm}$. Three cuts are made parallel to the faces of the cube as shown creating eight separate solids which are then separated. What is the increase in the total surface area?

    (**A**) $300 \text{ cm}^2$     (**B**) $800 \text{ cm}^2$     (**C**) $1200 \text{ cm}^2$

    (**D**) $600 \text{ cm}^2$     (**E**) $0 \text{ cm}^2$
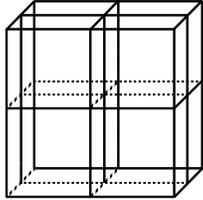
24. On a large piece of paper, Dana creates a "rectangular spiral" by drawing line segments of lengths, in cm, of 1, 1, 2, 2, 3, 3, 4, 4, ... as shown. Dana's pen runs out of ink after the total of all the lengths he has drawn is 3000 cm. What is the length of the longest line segment that Dana draws?
    (**A**) 38          (**B**) 39          (**C**) 54
    (**D**) 55          (**E**) 30
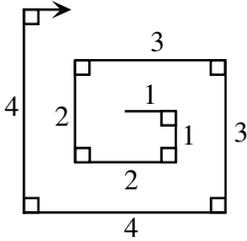
25. Two natural numbers, $p$ and $q$, do not end in zero. The product of any pair, $p$ and $q$, is a power of 10 (that is, 10, 100, 1000, 10 000, ...). If $p > q$, the last digit of $p - q$ cannot be
    (**A**) 1          (**B**) 3          (**C**) 5          (**D**) 7          (**E**) 9