



The CENTRE for EDUCATION
in MATHEMATICS and COMPUTING
cemc.uwaterloo.ca

Gauss Contest

Grade 7

(The Grade 8 Contest is on the reverse side)

Wednesday, May 17, 2023
(in North America and South America)

Thursday, May 18, 2023
(outside of North America and South America)



Time: 1 hour

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Calculating devices are allowed, provided that they do not have any of the following features: (i) internet access, (ii) the ability to communicate with other devices, (iii) information previously stored by students (such as formulas, programs, notes, etc.), (iv) a computer algebra system, (v) dynamic geometry software.

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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.
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6. Diagrams are *not* drawn to scale. They are intended as aids only.
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The name, school and location of some top-scoring students will be published on the website, cemc.uwaterloo.ca. On this website, you will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.

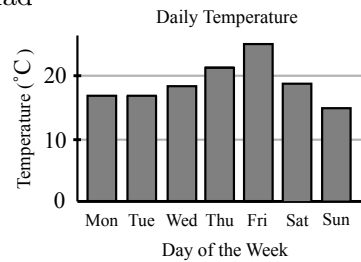
Grade 7

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

Part A: Each correct answer is worth 5.

1. Kiyana gives half of her 24 grapes to a friend. How many grapes does she give away?
(A) 2 (B) 4 (C) 6 (D) 12 (E) 48

2. Based on the graph shown, which day of the week had the highest temperature?
(A) Tuesday (B) Thursday (C) Friday
(D) Saturday (E) Sunday

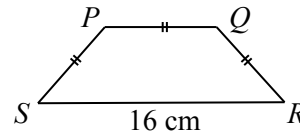


3. At a local farm, strawberries are sold at \$16.50 for each basket. What is the cost to buy 4 baskets of strawberries?
(A) \$64.00 (B) \$66.00 (C) \$64.50 (D) \$65.50 (E) \$65.00

4. The temperature last night was -5°C . It is now 3°C . How many degrees warmer is it now?
(A) 8°C (B) 3°C (C) 2°C (D) 13°C (E) 5°C

5. Sarah multiplied an integer by itself. Which of the following could be the result?
(A) 32 (B) 33 (C) 34 (D) 35 (E) 36

6. In the figure shown, $PQRS$ has three sides of equal length and $SR = 16$ cm. If the perimeter of $PQRS$ is 40 cm, then the length of PQ is
(A) 6 cm (B) 7 cm (C) 8 cm
(D) 9 cm (E) 10 cm



7. Which of the following is equal to a whole number?
(A) $\frac{52}{5}$ (B) $\frac{52}{7}$ (C) $\frac{52}{4}$ (D) $\frac{52}{3}$ (E) $\frac{52}{6}$
8. A circle has a radius of 4 cm. A line segment joins two points on the circle. What is the greatest possible length of the line segment?
(A) 10 cm (B) 8 cm (C) 4 cm (D) 12 cm (E) 6 cm
9. An integer is randomly chosen from the list 10, 11, 12, 13, 14, 15, 16, 17, 18, 19. What is the probability that the chosen integer is even?
(A) $\frac{3}{10}$ (B) $\frac{4}{10}$ (C) $\frac{5}{10}$ (D) $\frac{6}{10}$ (E) $\frac{7}{10}$

10. The grocery receipt shows the cost of three items before tax is added. When a 5% tax is added to the cost of the items, what is the total cost for the three items?

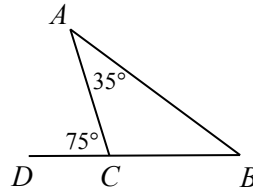
Sponge	\$4.20
Shampoo	\$7.60
Soap	\$3.20

- (A) \$15.16 (B) \$15.08 (C) \$15.22
(D) \$15.75 (E) \$15.38

Part B: Each correct answer is worth 6.

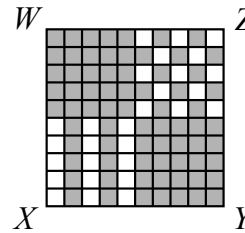
11. In the diagram, BCD is a straight line segment. The measure of $\angle ABC$ is

- (A) 35° (B) 40° (C) 60°
(D) 75° (E) 45°



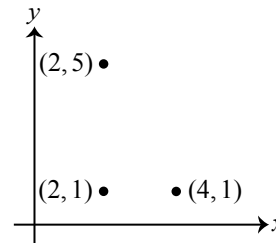
12. Square $WXYZ$ is divided into 100 small identical squares. Some small squares are shaded and some are unshaded, as shown. How many more of the small squares need to be shaded so that 75% of the area of $WXYZ$ is shaded?

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



13. In the diagram, the points $(2, 1)$, $(4, 1)$ and $(2, 5)$ are three vertices of a rectangle. What are the coordinates of the fourth vertex of the rectangle?

- (A) $(5, 2)$ (B) $(4, 4)$ (C) $(1, 5)$
(D) $(4, 5)$ (E) $(2, 4)$



14. The sum of two different prime numbers is 10. The product of these two numbers is
(A) 24 (B) 16 (C) 4 (D) 21 (E) 9

15. Suppose n is a number such that the mean (average) of the list of numbers 2, 9, 4, n , $2n$ is equal to 6. What is the value of n ?

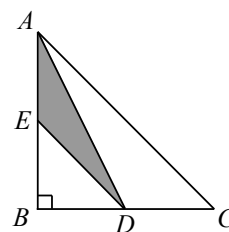
- (A) 9 (B) 12 (C) 10 (D) 5 (E) 6

16. Each number from 1 to 6 replaces one of the letters P, Q, R, S, T , and U . The sum of P and Q is 5 and the difference between R and S is 5. If T is greater than U , what number replaces the letter T ?

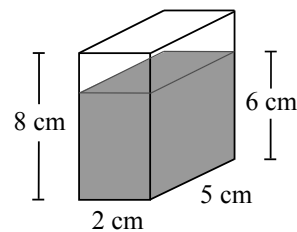
- (A) 4 (B) 6 (C) 2 (D) 3 (E) 5

17. In the diagram, $\triangle ABC$ is a right-angled isosceles triangle. D is the midpoint of BC and E is the midpoint of AB . If $AB = BC = 24$ cm, what is the area of $\triangle AED$?

- (A) 48 cm^2 (B) 36 cm^2 (C) 72 cm^2
(D) 9 cm^2 (E) 54 cm^2



18. A closed rectangular prism with height 8 cm is standing on a face with dimensions 2 cm by 5 cm. The prism contains water with a depth of 6 cm, as shown. When the prism is tipped so that it stands on a face with the greatest area, the depth of the water is



- (A) 0.75 cm (B) 1 cm (C) 1.25 cm
(D) 1.5 cm (E) 1.75 cm

19. Two standard dice are rolled. The product of the two numbers rolled is calculated. What is the probability that the ones digit of this product is 0?

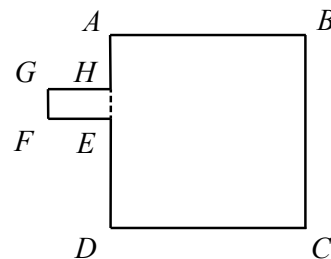
- (A) $\frac{11}{36}$ (B) $\frac{2}{9}$ (C) $\frac{1}{36}$ (D) $\frac{1}{6}$ (E) $\frac{5}{36}$

20. How many pairs of positive integers a and b satisfy the equation $\frac{a}{7} + \frac{2}{b} = 1$?

- (A) 4 (B) 1 (C) 0 (D) 5 (E) 2

Part C: Each correct answer is worth 8.

21. Eight-sided polygon $ABCDEFGH$ has integer side lengths. It can be divided into a rectangle and a square, as shown. The area of the square is greater than the area of the rectangle. The product of the two areas is equal to 98. Which of the following could be the perimeter of $ABCDEFGH$?



- (A) 51 (B) 32 (C) 44
(D) 34 (E) 33

22. A *Gareth sequence* is a sequence of numbers in which each number after the second is the *non-negative* difference between the two previous numbers. For example, if a Gareth sequence begins 15, 12, then

- the third number in the sequence is $15 - 12 = 3$,
- the fourth number is $12 - 3 = 9$,
- the fifth number is $9 - 3 = 6$,

and so the resulting sequence is 15, 12, 3, 9, 6, \dots . If a Gareth sequence begins 10, 8, what is the sum of the first 30 numbers in the sequence?

- (A) 40 (B) 72 (C) 34 (D) 56 (E) 64

23. The digits from 1 to 9 are each used exactly once to write three one-digit integers and three two-digit integers. The one-digit integers are equal to the length, width and height of a rectangular prism. The two-digit integers are equal to the areas of the faces of the same prism. What is the surface area of the rectangular prism?

- (A) 176 (B) 184 (C) 186 (D) 198 (E) 212

24. A circle is divided into six equal sections. Each section is to be coloured with a single colour so that three sections are red, one is blue, one is green, and one is yellow. Two circles have the same colouring if one can be rotated to match the other. In the diagram, Figure 1 and Figure 2 have the same colouring, while Figure 1 and Figure 3 have different colourings. How many different colourings are there for the circle?

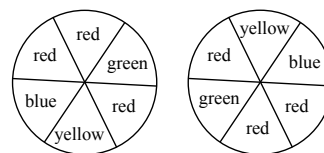


Figure 1

Figure 2

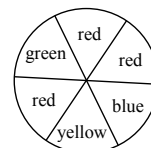


Figure 3

- (A) 14 (B) 12 (C) 24
(D) 10 (E) 20

25. A school trip offered its participants three activities: hiking, canoeing and swimming. Attendance records show that of all participants
- 10 students participated in all three activities,
 - 50% participated in at least hiking and canoeing,
 - 60% participated in at least hiking and swimming,
 - $k\%$ participated in at least canoeing and swimming, and
 - no students participated in fewer than two activities.

If k is a positive integer, what is the sum of all possible values of k ?

- (A) 191 (B) 185 (C) 261 (D) 95 (E) 175



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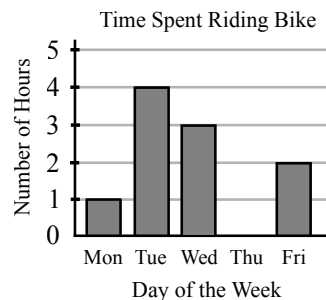
Part A: Each correct answer is worth 5.

1. Which of the following numbers is closest to 10?

(A) 1 (B) 5 (C) 8 (D) 13 (E) 19

2. The graph shows the number of hours that Gabe spent riding his bike from Monday to Friday. The day on which Gabe spent the greatest number of hours riding his bike is

(A) Monday
(B) Tuesday
(C) Wednesday
(D) Thursday
(E) Friday



3. If x is less than 5, a possible value of x could be

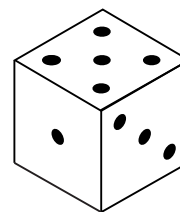
(A) 7 (B) 0 (C) 108 (D) 12 (E) 23

4. In a sequence of numbers, the first term is 3. Each new term is obtained by adding 5 to the previous term. The first four terms are 3, 8, 13, 18. What are the next three terms in the sequence?

(A) 25, 30, 35 (B) 5, 10, 15 (C) 23, 28, 33 (D) 23, 33, 43 (E) 19, 20, 21

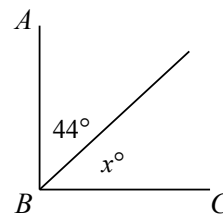
5. The faces of a cube are labelled with 1, 2, 3, 4, 5, and 6 dots. Three of the faces are shown. What is the total number of dots on the other three faces?

(A) 6 (B) 8 (C) 10
(D) 12 (E) 15



6. In the diagram, $\angle ABC = 90^\circ$. The value of x is

(A) 46 (B) 22 (C) 36
(D) 42 (E) 54



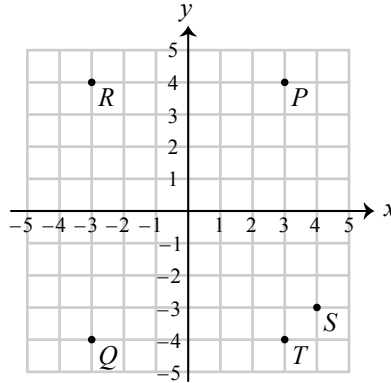
7. The singers in Saura's choir have heights

148 cm, 141 cm, 172.5 cm, 168 cm, 151.5 cm, 183.5 cm, and 178.5 cm

What is the range of their heights?

- (A) 42.5 cm (B) 27 cm (C) 52.5 cm (D) 37.5 cm (E) 31.5 cm
8. In the diagram, the point $(3, -4)$ is labelled

- (A) P (B) Q (C) R
 (D) S (E) T



9. While using a skipping rope, Emily jumps 52 times in 60 seconds. Jumping at this same rate, how many times does Emily jump in 75 seconds?
- (A) 66 (B) 52 (C) 65 (D) 67 (E) 73
10. A dime is worth \$0.10 and a quarter is worth \$0.25. Terry has a jar that contains \$1.00 worth of dimes and \$1.00 worth of quarters. If he randomly removes one coin from the jar, what is the probability that it is a dime?
- (A) $\frac{1}{10}$ (B) $\frac{2}{7}$ (C) $\frac{10}{11}$ (D) $\frac{2}{5}$ (E) $\frac{5}{7}$

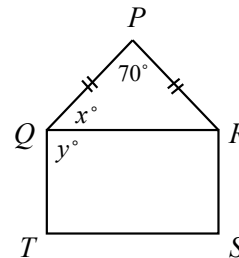
Part B: Each correct answer is worth 6.

11. The sum of the prime factors of 42 is

- (A) 23 (B) 43 (C) 12 (D) 17 (E) 13

12. In the diagram, $\triangle PQR$ is isosceles with $PQ = PR$, and $QRST$ is a rectangle. If $\angle QPR = 70^\circ$, $\angle PQR = x^\circ$, and $\angle RQT = y^\circ$, the value of $x + y$ is

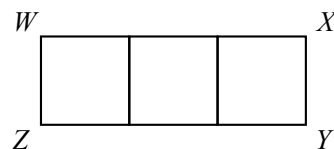
- (A) 70 (B) 90 (C) 160
 (D) 145 (E) 60



13. How many two-digit numbers have at least one digit that is a 4?

- (A) 17 (B) 11 (C) 18 (D) 10 (E) 19

14. Three identical squares form rectangle $WXYZ$, as shown. The perimeter of $WXYZ$ is 56 m. The area of $WXYZ$ is



- (A) 66 m^2 (B) 147 m^2 (C) 168 m^2
 (D) 196 m^2 (E) 348 m^2
15. A public holiday is always celebrated on the third Wednesday of a certain month. In that month, the holiday cannot occur on which of the following days?
 (A) 16th (B) 22nd (C) 18th (D) 19th (E) 21st
16. A standard fair coin is tossed three times. What is the probability that the three outcomes are all the same?
 (A) $\frac{1}{2}$ (B) $\frac{3}{16}$ (C) $\frac{1}{4}$ (D) $\frac{5}{16}$ (E) $\frac{1}{8}$
17. In the sum shown, each letter represents a digit from 1 to 9, inclusive. The value of $P + Q + R$ is
- | | | | | | |
|--|--|--|--|-------|-----|
| | | | | Q | R |
| | | | | P | P |
| | | | | P | P |
| | | | | $+$ | P |
| | | | | | P |
| | | | | | P |
| | | | | <hr/> | |
| | | | | 2 | 0 |
| | | | | 2 | 2 |
| | | | | 2 | 2 |
- (A) 13 (B) 14 (C) 15
 (D) 16 (E) 17
18. Box A contains one 100 g block, one 20 g block and three 5 g blocks. Box B contains one 50 g block and three 10 g blocks. Jasmine moves some of the blocks from Box A to Box B and some of the blocks from Box B to Box A. After these moves, Box A contains 65 g less than it originally did and Box B contains 65 g more. What is the fewest number of blocks that Jasmine could have moved from Box A to Box B?
 (A) 3 (B) 4 (C) 2 (D) 5 (E) 1
19. In a candy dish, the ratio of red to blue candies is 3 : 5. When 3 blue candies are removed, the ratio of red to blue candies becomes 2 : 3. How many more blue candies than red candies were in the dish before any candies were removed?
 (A) 10 (B) 12 (C) 6 (D) 8 (E) 14
20. Four friends, standing in a row for a picture, are in the following order:

Anyu Brad Chi Diego

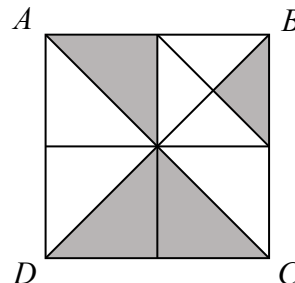
The friends then move so that Anyu is not in the 1st position, Brad is not in the 2nd position, Chi is not in the 3rd position, and Diego is not in the 4th position. In how many ways can the friends do this? That is, in how many ways can they rearrange themselves so that each person is not in their original position?

- (A) 6 (B) 9 (C) 12 (D) 18 (E) 24

Part C: Each correct answer is worth 8.

21. Square $ABCD$ is divided into four identical smaller squares, which are further divided into triangles, as shown. What fraction of $ABCD$ is shaded?

(A) $\frac{1}{4}$ (B) $\frac{15}{32}$ (C) $\frac{7}{16}$
 (D) $\frac{3}{8}$ (E) $\frac{7}{8}$



22. In the list p, q, r, s, t, u, v, w , each letter represents a positive integer. The sum of the values of each group of four consecutive letters in the list is 35. If $q + v = 14$, the largest possible value of p is

(A) 15 (B) 19 (C) 20 (D) 23 (E) 26

23. Ishari places the letters A, B, C, D, E, F clockwise around a circle, starting with A at the top. Jaxon writes a list beginning with A , and then, moving clockwise around the circle, writes down every third letter *that he has not yet written*. Doing this, Jaxon's list is A, D, B, F, C, E . Katharina *mixes up* the letters L, M, N, O, P, Q, R, S and places them in the mixed-up order around a circle, starting with L at the top. Jaxon writes a list beginning with L and then again moving clockwise around the circle, writes down every third letter that he has not yet written. Jaxon's list is L, M, N, O, P, Q, R, S . Starting with L , what was Katharina's clockwise order?

(A) L, O, R, N, S, Q, M, P (B) L, Q, O, M, S, R, N, P (C) L, R, O, M, S, Q, N, P
 (D) L, M, N, O, P, Q, R, S (E) L, O, R, M, Q, P, N, S

24. A palindrome is a positive integer whose digits are the same when read forwards or backwards. For example, 32523 is a palindrome. How many palindromes greater than 10 000 and less than 100 000 are multiples of 18?

(A) 41 (B) 42 (C) 43 (D) 44 (E) 45

25. Arjun has a bag that contains 5 balls and Becca has a bag that contains 3 balls. Arjun's bag contains 2 red balls, 1 green, 1 yellow, and 1 violet ball. Becca's bag contains 2 black balls and 1 orange ball. Arjun randomly chooses 1 ball from his bag and puts it into Becca's bag. Becca then randomly chooses 1 ball from her bag and puts it into Arjun's bag. Again, Arjun randomly chooses 1 ball from his bag and puts it into Becca's bag. After these exchanges, there are 4 balls in each bag. What is the probability that each bag contains exactly 3 different colours of balls?

(A) $\frac{3}{10}$ (B) $\frac{6}{25}$ (C) $\frac{9}{50}$ (D) $\frac{3}{25}$ (E) $\frac{9}{25}$



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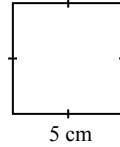
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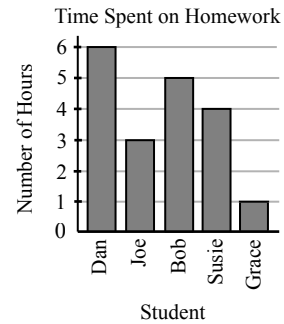
1. When the five numbers 10 000, 1, 10, 100, and 1000 are arranged from largest to smallest, the middle number is
 (A) 10 000 (B) 1 (C) 10 (D) 100 (E) 1000

2. What is the perimeter of the square shown?
 (A) 20 cm (B) 8 cm (C) 5 cm
 (D) 50 cm (E) 15 cm



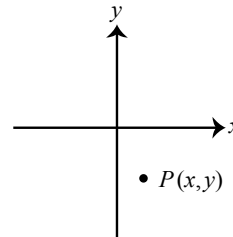
3. What value goes in the box to make the equation $5 + \square = 10 + 20$ true?
 (A) 30 (B) 15 (C) 35 (D) 20 (E) 25

4. The number of hours spent by five students on homework is shown on the graph. Which two students, adding their individual times together, spent the same amount of time on homework as Dan?
 (A) Joe and Grace
 (B) Joe and Bob
 (C) Bob and Grace
 (D) Dan and Bob
 (E) Susie and Grace

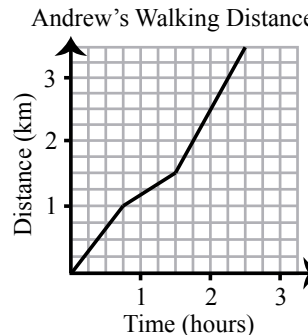


5. Which of the following fractions is closest to 0?
 (A) $\frac{1}{2}$ (B) $\frac{1}{8}$ (C) $\frac{1}{3}$ (D) $\frac{1}{6}$ (E) $\frac{1}{9}$
6. A bag contains a number of candies. The probability of Judith choosing a red candy from this bag is $\frac{5}{6}$. The total number of candies in the bag could be
 (A) 3 (B) 10 (C) 17 (D) 6 (E) 7

7. In the graph shown, which of the following statements is true about the coordinates of the point $P(x, y)$?
 (A) The values of both x and y are positive.
 (B) The value of x is positive and the value of y is negative.
 (C) The value of x is negative and the value of y is positive.
 (D) The values of both x and y are negative.
 (E) The value of x is 0 and the value of y is negative.



8. The line graph shows the distance that Andrew walked over time. How long did it take Andrew to walk the first 2 km?
 (A) 15 minutes
 (B) 1 hour, 15 minutes
 (C) 1 hour, 45 minutes
 (D) 2 hours
 (E) 45 minutes



9. A list of five numbers repeats to form the pattern

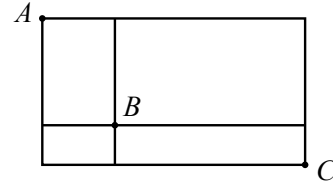
5, 6, 7, 8, 9, 5, 6, 7, 8, 9, 5, 6, 7, 8, 9, ...

What is the 221st number in the pattern?

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

10. An ant begins its path at A , travels only right or down, and remains on the line segments shown. The number of different paths from A to C that pass through B is

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



Part B: Each correct answer is worth 6.

11. Laila writes a list of numbers. Her first number is 4. Each number after the first is 7 more than the previous number. Which of the following numbers appears in Laila's list?

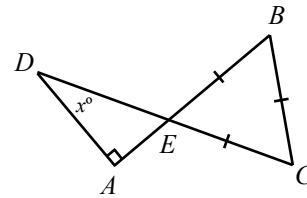
- (A) 45 (B) 46 (C) 47 (D) 48 (E) 49

12. The letter A has a vertical line of symmetry and the letter B does not. How many of the letters H L O R X D P E have a vertical line of symmetry?

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

13. In the diagram, AB and CD intersect at E . If $\triangle BCE$ is equilateral and $\triangle ADE$ is a right-angled triangle, what is the value of x ?

- (A) 90 (B) 60 (C) 25
(D) 45 (E) 30



14. Which of the following is the sum of three consecutive integers?

- (A) 17 (B) 11 (C) 25 (D) 21 (E) 8

15. A positive integer whose digits are the same when read forwards or backwards is called a *palindrome*. An example of a palindrome is 13931. What is the sum of the digits of the next palindrome greater than 13931?

- (A) 14 (B) 11 (C) 19 (D) 10 (E) 8

16. The number 6 has exactly 4 positive factors and the number 9 has exactly 3 positive factors. How many numbers in the list 14, 21, 28, 35, 42 have exactly 4 positive factors?

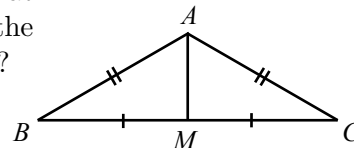
- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

17. The original price of a shirt is reduced by 50% to obtain a second price. The store advertises an additional sale, and so this second price is reduced by 40% to obtain a third price. What is the discount of the third price off the original price?

- (A) 80% (B) 10% (C) 70% (D) 65% (E) 45%

18. In the diagram, $\triangle ABC$ is isosceles. M is on BC so that $BM = MC$. If the perimeter of $\triangle ABC$ is 64 and the perimeter of $\triangle ABM$ is 40, what is the length of AM ?

- (A) 10 (B) 8 (C) 16
(D) 12 (E) 24



19. Two *different* digits from 1 to 9 are chosen. One digit is placed in each box to complete the two 2-digit numbers shown. The result of subtracting the bottom number from the top number is calculated. How many of the possible results are positive?

$$\begin{array}{r} 5 \square \\ - \square 5 \\ \hline \end{array}$$

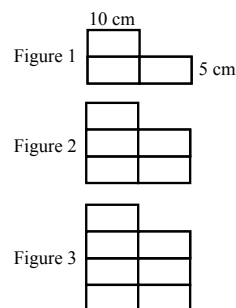
- (A) 36 (B) 32 (C) 30
(D) 34 (E) 38
20. Two standard dice are rolled. What is the probability that the sum of the numbers on the top faces is a prime number?
- (A) $\frac{5}{12}$ (B) $\frac{7}{12}$ (C) $\frac{1}{2}$ (D) $\frac{5}{6}$ (E) $\frac{1}{3}$

Part C: Each correct answer is worth 8.

21. A large number is written with a one followed by many zeros (1000...000). When 1 is subtracted from this number, the sum of the digits in the result is 252. How many zeros are in the original number?

(A) 27 (B) 28 (C) 29 (D) 42 (E) 252

22. In the diagram shown, each figure after Figure 1 is formed by joining two rectangles to the bottom of the previous figure. Each individual rectangle has dimensions 10 cm by 5 cm. If Figure n has a perimeter of 710 cm, the value of n is



(A) 29 (B) 43 (C) 66
(D) 172 (E) 65

23. To *encode* a message, James first replaces each letter within the message with its corresponding number, where $A = 1$, $B = 2$, \dots , $Y = 25$, and $Z = 26$. Next, James multiplies each number by 3 and then subtracts 5, and continues this process a total of n times. For example, when $n = 2$ the letter D is encoded to the number 16.

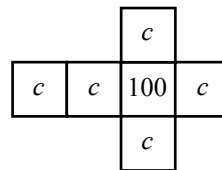
If James encoded a four letter message to the four numbers 367 205 853 1339, what is the value of n that he used?

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

24. How many different pairs of positive whole numbers have a greatest common factor of 4 and a lowest common multiple of 4620?

(A) 4 (B) 5 (C) 7 (D) 8 (E) 11

25. Jonas has 1728 copies of a $1 \times 1 \times 1$ cube with the net shown, where c is a positive integer and $c < 100$. Using these 1728 cubes, Jonas builds a large $12 \times 12 \times 12$ cube in such a way that the sum of the numbers on the exterior faces is as large as possible. For some values of c , the sum of the numbers on the exterior faces is between 80 000 and 85 000. The number of such values of c is



(A) 39 (B) 38 (C) 37
(D) 36 (E) 35



The CENTRE for EDUCATION
in MATHEMATICS and COMPUTING
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Gauss Contest

Grade 7

(The Grade 8 Contest is on the reverse side)

Wednesday, May 13, 2020
(in North America and South America)

Thursday, May 14, 2020
(outside of North America and South America)



Time: 1 hour

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Calculating devices are allowed, provided that they do not have any of the following features: (i) internet access, (ii) the ability to communicate with other devices, (iii) information previously stored by students (such as formulas, programs, notes, etc.), (iv) a computer algebra system, (v) dynamic geometry software.

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.

The name, school and location of some top-scoring students will be published on the Web site, cemc.uwaterloo.ca. On this website, you will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.

Grade 7

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

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

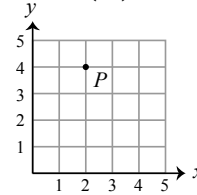
Part A: Each correct answer is worth 5.

1. One pen costs \$2. What is the cost of 10 pens?

(A) \$4 (B) \$10 (C) \$12 (D) \$2 (E) \$20

2. In the diagram shown, what are the coordinates of point P ?

(A) (4, 0) (B) (2, 2) (C) (2, 0)
(D) (4, 4) (E) (2, 4)



3. Which of the following integers is closest to 99×9 ?

(A) 10 000 (B) 100 (C) 100 000 (D) 1000 (E) 10

4. In the morning, the temperature was -3°C . In the afternoon, the temperature was 5°C . By how many degrees Celsius did the temperature increase?

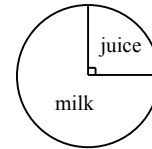
(A) 8 (B) 3 (C) 5 (D) 2 (E) 7

5. Alexis took a total of 243 000 steps during the 30 days in the month of April. What was her mean (average) number of steps per day in April?

(A) 7900 (B) 8100 (C) 8000 (D) 7100 (E) 8200

6. In the pie chart shown, 80 students chose juice. How many students chose milk?

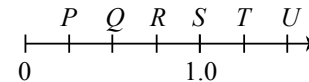
(A) 120 (B) 160 (C) 240
(D) 180 (E) 80



7. In an increasing list of consecutive integers, the 3^{rd} and 4^{th} numbers in the list add to 11. What is the 6^{th} number in the list?

(A) 10 (B) 11 (C) 9 (D) 8 (E) 12

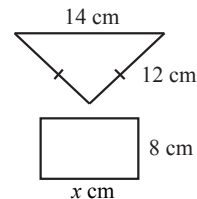
8. Tick marks are equally spaced along a number line with the numbers P , Q , R , S , T , and U labelled as shown. Which of the following best represents the value of R divided by the value of U ?



(A) 0.25 (B) 0.50 (C) 0.75
(D) 1.25 (E) 1.50

9. In the diagram, the perimeter of the triangle is equal to the perimeter of the rectangle. What is the value of x ?

(A) 8 (B) 10 (C) 11
(D) 14 (E) 15



10. The positive divisors of 12 (other than itself) are 1, 2, 3, 4, and 6. Their sum, $1 + 2 + 3 + 4 + 6$, is greater than 12. An *abundant number* is a number for which the sum of its positive divisors (other than itself) is greater than the number itself. This means that 12 is an abundant number. Which of the following is also an abundant number?

(A) 8 (B) 10 (C) 14 (D) 18 (E) 22

Part B: Each correct answer is worth 6.

11. Each of 7 boxes contains exactly 10 cookies. If the cookies are shared equally among 5 people, how many cookies does each person receive?

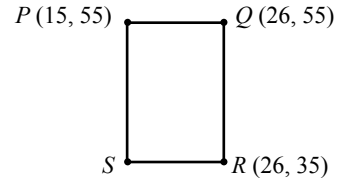
(A) 14 (B) 12 (C) 9 (D) 11 (E) 13

12. Abdul is 9 years older than Susie, and Binh is 2 years older than Susie. How many years older is Abdul than Binh?

(A) 11 (B) 9 (C) 14 (D) 2 (E) 7

13. Points $P(15, 55)$, $Q(26, 55)$ and $R(26, 35)$ are three vertices of rectangle $PQRS$. The area of this rectangle is

(A) 360 (B) 800 (C) 220
(D) 580 (E) 330



14. A box contains 15 red, 20 blue, and 16 green jelly beans. Jack first chooses a green jelly bean and eats it. Then he chooses a blue jelly bean and eats it. If each of the remaining jelly beans is equally likely to be chosen, what is the probability that Jack chooses a red jelly bean next?

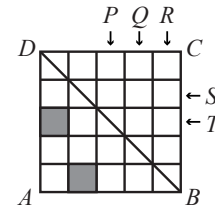
(A) $\frac{15}{31}$ (B) $\frac{34}{49}$ (C) $\frac{15}{49}$ (D) $\frac{2}{7}$ (E) $\frac{1}{15}$

15. Emil and Olivia ran a race. Their race times totalled 1 hour 52 minutes. If Emil's time was 4 minutes less than Olivia's time, how many minutes did it take Olivia to run the race?

(A) 78 (B) 56 (C) 58 (D) 74 (E) 55

16. In the diagram, which of the following squares should be shaded to make BD a line of symmetry of square $ABCD$?

(A) P and S (B) Q and S (C) P and T
(D) Q and T (E) P and R



17. Rosie is saving money. She has \$120 in her account today and will begin saving by making \$30 deposits into her account. If she makes m such deposits, the expression that best represents the number of dollars in her account is

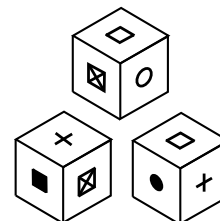
(A) $120 + m$ (B) $30m$ (C) $30 + 120m$ (D) $150m$ (E) $120 + 30m$

18. Two isosceles triangles each have at least one angle that measures 70° . In the first triangle, the measure in degrees of each of the remaining two angles is even. In the second triangle, the measure in degrees of each of the remaining two angles is odd. In the first triangle, the sum of the equal angles is S . In the second triangle, the sum of the equal angles is T . The value of $S + T$ is

(A) 280° (B) 250° (C) 220° (D) 200° (E) 300°

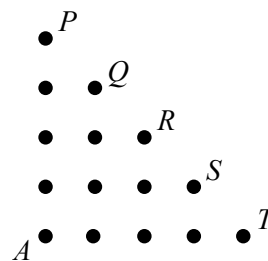
19. Three different views of the same cube are shown. The symbol on the face opposite \bullet is

(A) + (B) ■ (C) ☒
(D) □ (E) ○



20. On the grid shown, Jane starts at dot A . She tosses a fair coin to determine which way to move. If she tosses a head, she moves up one dot. If she tosses a tail she moves right one dot. After four tosses of the coin, Jane will be at one of the dots P, Q, R, S , or T . What is the probability that Jane will be at dot R ?

- (A) $\frac{1}{2}$ (B) $\frac{3}{8}$ (C) $\frac{9}{16}$
 (D) $\frac{7}{16}$ (E) $\frac{5}{16}$



Part C: Each correct answer is worth 8.

21. A four-digit number can be made by repeating a two-digit number. For example, 1111 is made by repeating 11, and 1919 is made by repeating 19. How many such numbers are there between 2000 and 10 000?

- (A) 80 (B) 81 (C) 79 (D) 72 (E) 70

22. Celyna bought 300 grams of candy A for \$5.00, and x grams of candy B for \$7.00. She calculated that the average price of all of the candy that she purchased was \$1.50 per 100 grams. What is the value of x ?

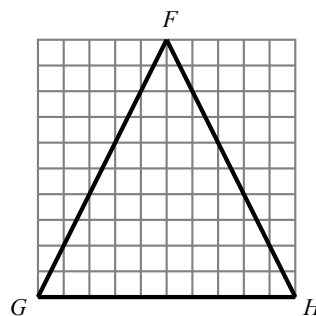
- (A) 525 (B) 600 (C) 500 (D) 450 (E) 900

23. The list 11, 20, 31, 51, 82 is an example of an increasing list of five positive integers in which the first and second integers add to the third, the second and third add to the fourth, and the third and fourth add to the fifth. How many such lists of five positive integers have 124 as the fifth integer?

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

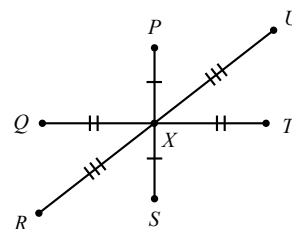
24. In the 10 by 10 grid of squares shown, point P can be at any of the 41 points of intersection of pairs of gridlines inside (and not on) $\triangle FGH$. For each possible location of P , exactly three triangles are formed: $\triangle FPG$, $\triangle GPH$, $\triangle HPG$. How many of these 123 triangles have an area that is exactly half of the area of $\triangle FGH$?

- (A) 5 (B) 7 (C) 3
 (D) 11 (E) 9



25. Every 12 minutes, Bus A completes a trip from P to X to S to X to P . Every 20 minutes, Bus B completes a trip from Q to X to T to X to Q . Every 28 minutes, Bus C completes a trip from R to X to U to X to R . At 1:00 p.m., Buses A, B and C depart from P , Q and R , respectively, each driving at a constant speed, and each turning around instantly at the endpoint of its route. Each bus runs until 11:00 p.m. At how many times between 5:00 p.m. and 10:00 p.m. will two or more buses arrive at X at the same time?

- (A) 18 (B) 19 (C) 20
 (D) 21 (E) 22





The CENTRE for EDUCATION
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Gauss Contest

Grade 7

(The Grade 8 Contest is on the reverse side)

Wednesday, May 15, 2019
(in North America and South America)

Thursday, May 16, 2019
(outside of North America and South America)



UNIVERSITY OF
WATERLOO

Time: 1 hour

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Calculating devices are allowed, provided that they do not have any of the following features: (i) internet access, (ii) the ability to communicate with other devices, (iii) information previously stored by students (such as formulas, programs, notes, etc.), (iv) a computer algebra system, (v) dynamic geometry software.

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2. You may use rulers, compasses and paper for rough work.
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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.
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7. When your supervisor instructs you to start, you will have *sixty* minutes of working time.

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Grade 7

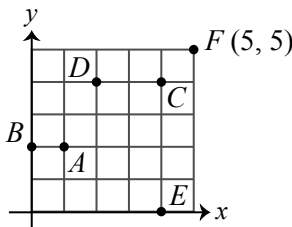
Scoring: There is *no penalty* for an incorrect answer.

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

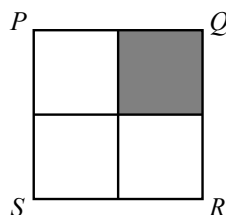
Part A: Each correct answer is worth 5.

1. Erin receives \$3 a day. How many days will it take Erin to receive a total of \$30?
 (A) 8 (B) 12 (C) 14 (D) 27 (E) 10

2. In the diagram, point F has coordinates $(5, 5)$. The point with coordinates $(2, 4)$ is located at
 (A) A (B) B (C) C
 (D) D (E) E

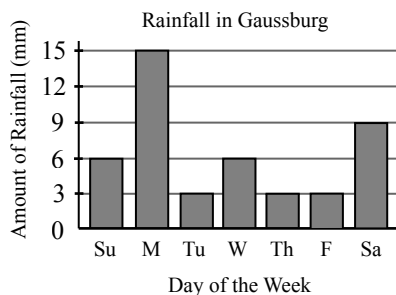


3. In the diagram, square $PQRS$ is divided into four identical squares. What percentage of square $PQRS$ is shaded?
 (A) 33% (B) 40% (C) 25%
 (D) 50% (E) 15%



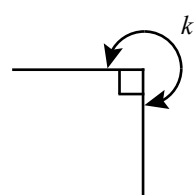
4. The value of $0.9 + 0.09$ is
 (A) 1.08 (B) 0.909 (C) 1.8 (D) 0.99 (E) 0.18

5. Based on the graph shown, what is the mode for the amount of rainfall for the week?
 (A) 9 mm (B) 12 mm (C) 3 mm
 (D) 15 mm (E) 6 mm



6. If $x = 3$, which of the following is true?
 (A) $2x = 5$ (B) $3x - 1 = 8$ (C) $x + 5 = 3$ (D) $7 - x = 2$ (E) $6 + 2x = 14$
7. When two numbers are added, the result is -26 . If one of the numbers is 11, what is the other number?
 (A) -37 (B) 37 (C) -15 (D) 15 (E) -48
8. Joshua is reading a 396-page book. He has read the first third of the book only. How many pages does he have left to read to finish the rest of the book?
 (A) 264 (B) 124 (C) 250 (D) 199 (E) 244

9. In the diagram, the value of k is
 (A) 180 (B) 210 (C) 240
 (D) 270 (E) 300



10. The mean (average) of the numbers 20, 30, 40 is equal to the mean of the numbers
 (A) 28, 30, 31 (B) 24, 30, 38 (C) 22, 30, 39
 (D) 23, 30, 37 (E) 25, 30, 34

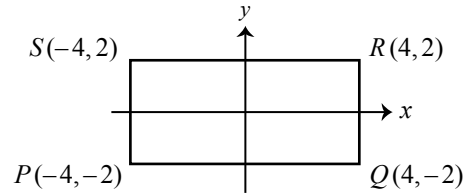
Part B: Each correct answer is worth 6.

11. The value of $\sqrt{81}$ is equal to

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

12. In the diagram, what is the area of rectangle $PQRS$?

(A) 36 (B) 32 (C) 40
 (D) 20 (E) 44

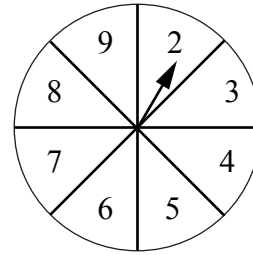


13. A piano has 52 white keys that occur in a repeating pattern of ABCDEFG. The first white key is A. What letter is associated with the 33rd white key?

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

14. A circular spinner is divided into 8 equal sections, as shown. An arrow is attached to the centre of the spinner. The arrow is spun once. What is the probability that the arrow stops in a section containing a prime number that is odd?

(A) $\frac{1}{8}$ (B) $\frac{2}{8}$ (C) $\frac{3}{8}$
 (D) $\frac{4}{8}$ (E) $\frac{7}{8}$



15. Canadian currency has coins with values \$2.00, \$1.00, \$0.25, \$0.10, and \$0.05. Barry has 12 coins including at least one of each of these coins. What is the smallest total amount of money that Barry could have?

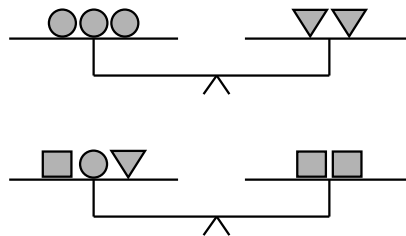
(A) \$3.75 (B) \$3.90 (C) \$3.70 (D) \$3.40 (E) \$3.95

16. A positive integer whose digits are the same when read forwards or backwards is called a *palindrome*. For example 474 and 222 are palindromes. How many palindromes are there between 100 and 1000?

(A) 10 (B) 90 (C) 100 (D) 900 (E) 1000

17. The two equal-arm scales shown are balanced. Of the following, $\bigcirc \nabla \nabla \nabla$ has the same mass as

(A) $\square \square \square$
 (B) $\nabla \nabla \square \square$
 (C) $\bigcirc \bigcirc \bigcirc \bigcirc$
 (D) $\bigcirc \bigcirc \bigcirc \square$
 (E) $\bigcirc \bigcirc \bigcirc$



18. A rectangle has length x and width y . A triangle has base 16 and height x . If the area of the rectangle is equal to the area of the triangle, then the value of y is

(A) 16 (B) 4 (C) 8 (D) 12 (E) 32

19. Each of a , b , c , and d is a positive integer and is greater than 3. If

$$\frac{1}{a-2} = \frac{1}{b+2} = \frac{1}{c+1} = \frac{1}{d-3}$$

then which ordering of these four numbers is correct?

- (A) $a < b < c < d$ (B) $c < b < a < d$ (C) $b < a < c < d$
 (D) $d < a < c < b$ (E) $b < c < a < d$
20. The positive integer n has exactly 8 positive divisors including 1 and n . Two of these divisors are 14 and 21. What is the sum of all 8 positive divisors of n ?
- (A) 35 (B) 47 (C) 53 (D) 96 (E) 103

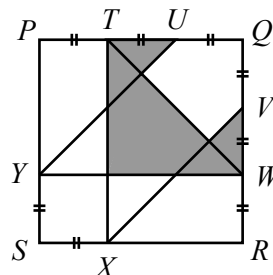
Part C: Each correct answer is worth 8.

21. Kathy owns more cats than Alice and more dogs than Bruce. Alice owns more dogs than Kathy and fewer cats than Bruce. Which of the statements *must* be true?
- (A) Bruce owns the fewest cats.
 (B) Bruce owns the most cats.
 (C) Kathy owns the most cats.
 (D) Alice owns the most dogs.
 (E) Kathy owns the fewest dogs.

22. Each of the integers 334 and 419 has digits whose product is 36. How many 3-digit positive integers have digits whose product is 36?
- (A) 21 (B) 15 (C) 18 (D) 24 (E) 12

23. Points T, U, V, W, X, Y lie on square $PQRS$, as shown. If $PT = TU = UQ = QV = VW = WR = XS = SY$, what fraction of the area of square $PQRS$ is shaded?

- (A) $\frac{5}{18}$ (B) $\frac{1}{3}$ (C) $\frac{2}{9}$
 (D) $\frac{1}{4}$ (E) $\frac{1}{6}$



24. A dot starts at $(20, 19)$. It can move one unit vertically or horizontally to one of the points $(21, 19)$, $(19, 19)$, $(20, 20)$, or $(20, 18)$. From there it can move two units in either direction that is perpendicular to the first move. All moves thereafter increase in length by one unit (three units, four units, five units, etc.) and must be perpendicular to the direction of the previous move. The dot stops after ten moves. Which of the following final locations is *not* possible?

- (A) $(27, 33)$ (B) $(30, 40)$ (C) $(21, 21)$ (D) $(42, 44)$ (E) $(37, 37)$
25. An $8 \times 8 \times n$ rectangular prism is made up from $1 \times 1 \times 1$ cubes. Suppose that A is the surface area of the prism and B is the combined surface area of the $1 \times 1 \times 1$ cubes that make up the prism. What is the sum of the values of n for which $\frac{B}{A}$ is an integer?
- (A) 86 (B) 90 (C) 70 (D) 78 (E) 96



The CENTRE for EDUCATION
in MATHEMATICS and COMPUTING
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Gauss Contest

Grade 7

(The Grade 8 Contest is on the reverse side)

Wednesday, May 16, 2018
(in North America and South America)

Thursday, May 17, 2018
(outside of North America and South America)



UNIVERSITY OF
WATERLOO

Time: 1 hour

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Calculating devices are allowed, provided that they do not have any of the following features: (i) internet access, (ii) the ability to communicate with other devices, (iii) previously stored information such as formulas, programs, notes, etc., (iv) a computer algebra system, (v) dynamic geometry software.

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.

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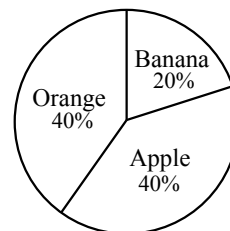
Grade 7

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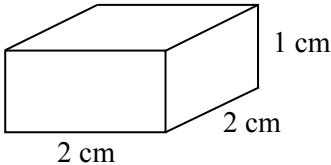
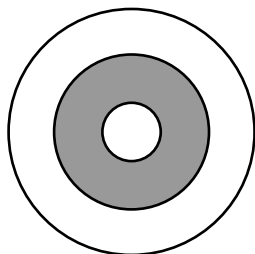
Each unanswered question is worth 2, to a maximum of 10 unanswered questions.

Part A: Each correct answer is worth 5.

- What number should be subtracted from 21 to give 8?
(A) 12 (B) 13 (C) 14 (D) 15 (E) 16
- In the diagram, the pie chart shows the results of a survey asking students to choose their favourite fruit. 100 students were surveyed. How many students chose banana?
(A) 40 (B) 80 (C) 100
(D) 20 (E) 60
- A class begins at 8:30 a.m. and ends at 9:05 a.m. on the same day. In minutes, what is the length of the class?
(A) 15 (B) 25 (C) 35 (D) 45 (E) 75
- A square has an area of 144 cm^2 . The side length of the square is
(A) 288 cm (B) 72 cm (C) 48 cm (D) 12 cm (E) 36 cm
- If there is no tax, which of the following costs more than \$18 to purchase?
(A) Five \$1 items and five \$2 items
(B) Nine \$1 items and four \$2 items
(C) Nine \$1 items and five \$2 items
(D) Two \$1 items and six \$2 items
(E) Sixteen \$1 items and no \$2 items
- Which of the following numbers lies between 3 and 4 on a number line?
(A) $\frac{5}{2}$ (B) $\frac{11}{4}$ (C) $\frac{11}{5}$ (D) $\frac{13}{4}$ (E) $\frac{13}{5}$
- An envelope contains 2 sunflower seeds, 3 green bean seeds, and 4 pumpkin seeds. Carrie randomly chooses one of the seeds from the envelope. What is the probability that Carrie chooses a sunflower seed?
(A) $\frac{2}{9}$ (B) $\frac{5}{9}$ (C) $\frac{9}{7}$ (D) $\frac{7}{9}$ (E) $\frac{1}{9}$
- If $x = 4$ and $y = 3x$, the value of y is
(A) 12 (B) 24 (C) 7 (D) 81 (E) 4
- The measure of one angle of an isosceles triangle is 50° . The measures of the other angles in this triangle could be
(A) 50° and 90° (B) 40° and 50° (C) 50° and 80°
(D) 30° and 100° (E) 60° and 70°
- The 26 letters of the alphabet are written in order, clockwise around a circle. The *ciphertext* of a message is created by replacing each letter of the message by the letter that is 4 letters clockwise from the original letter. (This is called a *Caesar cipher*.) For example, the message *ZAP* has ciphertext *DET*. What is the ciphertext of the message *WIN*?
(A) *ALN* (B) *ZLN* (C) *AMR* (D) *AMQ* (E) *ZMQ*

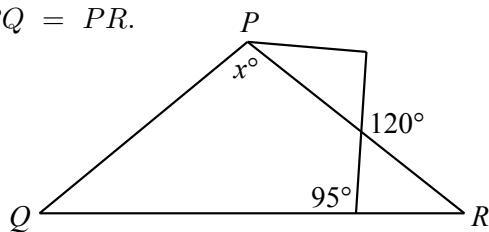


Part B: Each correct answer is worth 6.

11. A cube has exactly six faces and twelve edges. How many vertices does a cube have?
 (A) 4 (B) 5 (C) 6 (D) 7 (E) 8
12. What is the surface area of a 1 cm by 2 cm by 2 cm rectangular prism?
 (A) 10 cm^2 (B) 20 cm^2 (C) 12 cm^2
 (D) 24 cm^2 (E) 16 cm^2
- 
13. At a factory, 11 410 kg of rice is distributed equally into 3260 bags. A family uses 0.25 kg of rice each day. How many days would it take this family to use up one bag of rice?
 (A) 9 (B) 12 (C) 13 (D) 14 (E) 15
14. Dalia's birthday is on a Wednesday and Bruce's birthday is 60 days after Dalia's. On what day of the week is Bruce's birthday?
 (A) Monday (B) Tuesday (C) Friday (D) Saturday (E) Sunday
15. Karl has 30 birds. Some of his birds are emus and the rest are chickens. Karl hands out 100 treats to his birds. Each emu gets 2 treats and each chicken gets 4 treats. How many chickens does Karl have?
 (A) 10 (B) 15 (C) 25 (D) 20 (E) 6
16. The integers 1 to 32 are spaced evenly and in order around the outside of a circle. Straight lines that pass through the centre of the circle join these numbers in pairs. Which number is paired with 12?
 (A) 28 (B) 27 (C) 23 (D) 21 (E) 29
17. In the diagram, the area of the shaded middle ring is 6 times the area of the smallest circle. The area of the unshaded outer ring is 12 times the area of the smallest circle. What fraction of the area of the largest circle is the area of the smallest circle?
 (A) $\frac{1}{3}$ (B) $\frac{1}{6}$ (C) $\frac{1}{12}$
 (D) $\frac{1}{18}$ (E) $\frac{1}{19}$
- 
18. There are several groups of six integers whose product is 1. Which of the following cannot be the sum of such a group of six integers?
 (A) -6 (B) -2 (C) 0 (D) 2 (E) 6
19. The heights of 4 athletes on a team are 135 cm, 160 cm, 170 cm, and 175 cm. Laurissa joins the team. On the new team of 5 athletes, the mode height of the players is equal to the median height which is equal to the mean (average) height. How tall is Laurissa?
 (A) 135 cm (B) 160 cm (C) 170 cm (D) 175 cm (E) 148 cm

20. In the diagram, $\triangle PQR$ is isosceles with $PQ = PR$.
What is the value of x ?

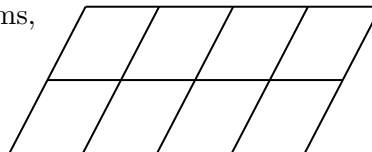
(A) 110 (B) 90 (C) 95
(D) 100 (E) 105



Part C: Each correct answer is worth 8.

21. The figure consists of 8 identical small parallelograms, joined as shown. Including these 8 small parallelograms, how many parallelograms appear in this figure?

(A) 29 (B) 30 (C) 26
(D) 27 (E) 28



22. In a jar, there are 50 coins with a total value of \$5.00. The coins are quarters (worth \$0.25 each), dimes (worth \$0.10 each), and nickels (worth \$0.05 each). The number of nickels in the jar is three times the number of quarters. The number of dimes is one more than the number of nickels. How many quarters are in the jar?

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

23. The digits from 1 to 9 are written in order so that the digit n is written n times. This forms the block of digits 1223334444...999999999. The block is written 100 times. What is the 1953rd digit written?

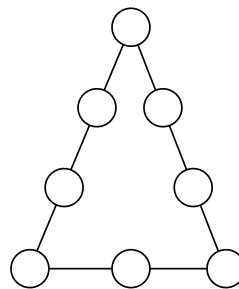
(A) 4 (B) 5 (C) 6 (D) 7 (E) 8

24. The number 2018 is used to create six-digit positive integers. These six-digit integers must contain the digits 2018 together and in this order. For example, 720186 is allowed, but 209318 and 210893 are not. How many of these six-digit integers are divisible by 9?

(A) 28 (B) 27 (C) 31 (D) 34 (E) 22

25. In the triangle, each of the numbers 1, 2, 3, 4, 5, 6, 7, 8 is placed into a different circle. The sums of the numbers on each of the three sides of the triangle are equal to the same number, S . The sum of all of the different possible values of S is

(A) 85 (B) 99 (C) 66
(D) 81 (E) 67





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Gauss Contest

Grade 7

(The Grade 8 Contest is on the reverse side)

Wednesday, May 10, 2017
(in North America and South America)

Thursday, May 11, 2017
(outside of North America and South America)



UNIVERSITY OF
WATERLOO

Time: 1 hour

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Instructions

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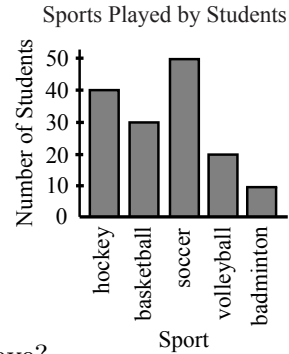
Grade 7

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.

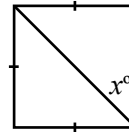
1. The value of $(2 + 4 + 6) - (1 + 3 + 5)$ is
 (A) 0 (B) 3 (C) -3 (D) 21 (E) 111

2. Based on the graph shown, which sport is played by the most students?
 (A) hockey (B) basketball (C) soccer
 (D) volleyball (E) badminton



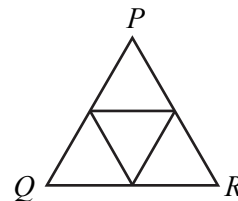
3. Michael has \$280 in \$20 bills. How many \$20 bills does he have?
 (A) 10 (B) 12 (C) 14 (D) 16 (E) 18
4. When two integers between 1 and 10 are multiplied, the result is 14. What is the sum of these two integers?
 (A) 2 (B) 5 (C) 7 (D) 9 (E) 33
5. Three thousandths is equal to
 (A) 300 (B) 0.3 (C) 0.03 (D) 30 (E) 0.003

6. In the square shown, x is equal to
 (A) 0 (B) 45 (C) 60
 (D) 180 (E) 360



7. Which integer is closest in value to $\frac{35}{4}$?
 (A) 10 (B) 8 (C) 9 (D) 7 (E) 6
8. When $n = 101$, which of the following expressions has an even value?
 (A) $3n$ (B) $n + 2$ (C) $n - 12$ (D) $2n - 2$ (E) $3n + 2$
9. The sum of three consecutive integers is 153. The largest of these three integers is
 (A) 52 (B) 50 (C) 53 (D) 54 (E) 51

10. In the diagram, $\triangle PQR$ is equilateral and is made up of four smaller equilateral triangles. If each of the smaller triangles has a perimeter of 9 cm, what is the perimeter of $\triangle PQR$?
 (A) 15 cm (B) 9 cm (C) 36 cm
 (D) 27 cm (E) 18 cm



Part B: Each correct answer is worth 6.

11. The number that goes into the \square to make $\frac{3}{7} = \frac{\square}{63}$ true is

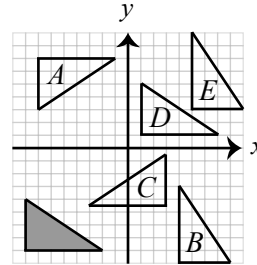
(A) 27 (B) 9 (C) 59 (D) 63 (E) 3

12. At the Gaussian Store, puzzles cost \$10 each or \$50 for a box of 6 puzzles. If a customer would like exactly 25 puzzles, what is the minimum possible cost?

(A) \$210 (B) \$230 (C) \$250 (D) \$220 (E) \$200

13. When the shaded triangle shown is translated, which of the following triangles can be obtained?

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



14. When the time in Toronto, ON is 1:00 p.m., the time in Gander, NL is 2:30 p.m. A flight from Toronto to Gander takes 2 hours and 50 minutes. If the flight departs at 3:00 p.m. (Toronto time), what time will the flight land in Gander (Gander time)?

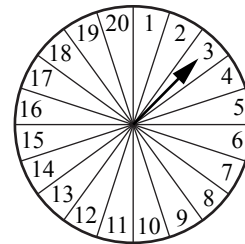
(A) 7:20 p.m. (B) 5:00 p.m. (C) 6:20 p.m. (D) 5:20 p.m. (E) 8:50 p.m.

15. Five students ran a race. Ryan was faster than Henry and Faiz. Henry was slower than Faiz. Toma was faster than Ryan but slower than Omar. Which student finished fourth?

(A) Faiz (B) Henry (C) Omar (D) Ryan (E) Toma

16. A circular spinner is divided into 20 equal sections, as shown. An arrow is attached to the centre of the spinner. The arrow is spun once. What is the probability that the arrow stops in a section containing a number that is a divisor of 20?

(A) $\frac{12}{20}$ (B) $\frac{14}{20}$ (C) $\frac{15}{20}$
(D) $\frac{7}{20}$ (E) $\frac{6}{20}$



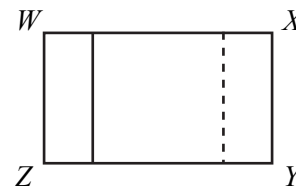
17. The mean (average) of the four integers 78, 83, 82, and x is 80. Which one of the following statements is true?

(A) x is 2 greater than the mean
(B) x is 1 less than the mean
(C) x is 2 less than the mean
(D) x is 3 less than the mean
(E) x is equal to the mean

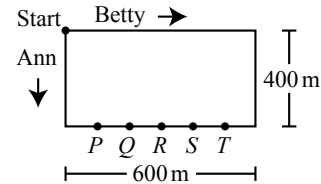
18. Sara goes to a bookstore and wants to buy a book that is originally priced at \$100. Which of the following options gives her the best discounted price?

(A) A discount of 20%
(B) A discount of 10%, then a discount of 10% off the new price
(C) A discount of 15%, then a discount of 5% off the new price
(D) A discount of 5%, then a discount of 15% off the new price
(E) All four options above give the same price

19. Two sheets of $11 \text{ cm} \times 8 \text{ cm}$ paper are placed on top of each other, forming an overlapping $8 \text{ cm} \times 8 \text{ cm}$ square in the centre, as shown. The area of rectangle $WXYZ$ is
 (A) 88 cm^2 (B) 112 cm^2 (C) 136 cm^2
 (D) 121 cm^2 (E) 176 cm^2

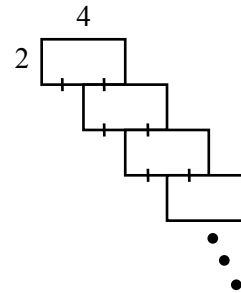


20. Betty and Ann are walking around a rectangular park with dimensions 600 m by 400 m , as shown. They both begin at the top left corner of the park and walk at constant but different speeds. Betty walks in a clockwise direction and Ann walks in a counterclockwise direction. Points P, Q, R, S, T divide the bottom edge of the park into six segments of equal length. When Betty and Ann meet for the first time, they are between Q and R . Which of the following could be the ratio of Betty's speed to Ann's speed?
 (A) $5 : 3$ (B) $9 : 4$ (C) $11 : 6$
 (D) $12 : 5$ (E) $17 : 7$



Part C: Each correct answer is worth 8.

21. Rectangles that measure 4×2 are positioned in a pattern in which the top left vertex of each rectangle (after the top one) is placed at the midpoint of the bottom edge of the rectangle above it, as shown. When a total of ten rectangles are arranged in this pattern, what is the perimeter of the figure?
 (A) 48 (B) 64 (C) 90
 (D) 84 (E) 100



22. In the six-digit number $1ABCDE$, each letter represents a digit. Given that $1ABCDE \times 3 = ABCDE1$, the value of $A + B + C + D + E$ is
 (A) 29 (B) 26 (C) 22 (D) 30 (E) 28
23. Given 8 dimes (10¢ coins) and 3 quarters (25¢ coins), how many different amounts of money can be created using one or more of the 11 coins?
 (A) 27 (B) 29 (C) 35 (D) 26 (E) 28
24. Four vertices of a quadrilateral are located at $(7, 6)$, $(-5, 1)$, $(-2, -3)$, and $(10, 2)$. The area of the quadrilateral in square units is
 (A) 60 (B) 63 (C) 67 (D) 70 (E) 72
25. Ashley writes out the first 2017 positive integers. She then underlines any of the 2017 integers that is a multiple of 2, and then underlines any of the 2017 integers that is a multiple of 3, and then underlines any of the 2017 integers that is a multiple of 5. Finally, Ashley finds the sum of all the integers which have *not* been underlined. What is this sum?
 (A) 542 708 (B) 543 213 (C) 542 203 (D) 543 326 (E) 543 618



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Gauss Contest

Grade 7

(The Grade 8 Contest is on the reverse side)

Wednesday, May 11, 2016
(in North America and South America)

Thursday, May 12, 2016
(outside of North America and South America)



UNIVERSITY OF
WATERLOO

Time: 1 hour

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Grade 7

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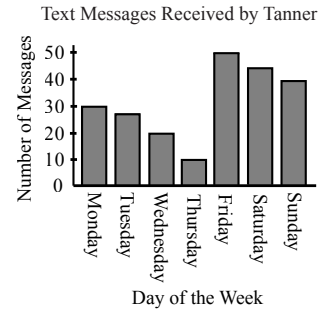
Part A: Each correct answer is worth 5.

1. The value of $333 + 33 + 3$ is

(A) 396 (B) 399 (C) 669 (D) 369 (E) 963

2. The graph shows the number of text messages received by Tanner in a given week. On what day did Tanner receive the most text messages?

(A) Friday (B) Tuesday (C) Thursday
(D) Saturday (E) Wednesday



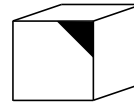
3. Which of the following is a multiple of 7?

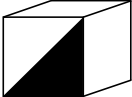
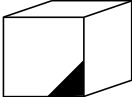
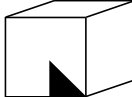
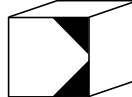
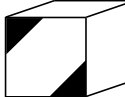
(A) 75 (B) 76 (C) 77 (D) 78 (E) 79

4. Which of these fractions is larger than $\frac{1}{2}$?

(A) $\frac{2}{5}$ (B) $\frac{3}{7}$ (C) $\frac{4}{7}$ (D) $\frac{3}{8}$ (E) $\frac{4}{9}$

5. A cube has exactly one face painted as shown. The other five faces of the cube are not painted. If the cube is rolled, which of the following could be the same cube?



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

6. The measures of two angles of a triangle are 25° and 70° . The measure of the third angle is

(A) 85° (B) 105° (C) 65° (D) 95° (E) 75°

7. A box of fruit contains 20 apples, 10 oranges, and no other fruit. When a fruit is randomly chosen from the box, what is the probability that the fruit is an orange?

(A) $\frac{1}{10}$ (B) $\frac{1}{20}$ (C) $\frac{1}{30}$ (D) $\frac{1}{3}$ (E) $\frac{2}{3}$

8. Alex pays \$2.25 to take the bus. Sam pays \$3.00 to take the bus. If they each take the bus 20 times, how much less would Alex pay than Sam in total?

(A) \$25 (B) \$10 (C) \$15 (D) \$45 (E) \$60

9. Carrie is travelling at a constant speed of 85 km/h. If Carrie is halfway through a 510 km trip, how much longer will the trip take?

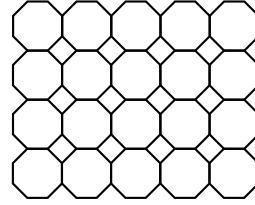
(A) 5 hours (B) 425 hours (C) 12 hours (D) 1.5 hours (E) 3 hours

10. Points P, Q and R are on a number line. Q is halfway between P and R . If P is at -6 and Q is at -1 , then R is at

(A) 4 (B) -11 (C) 3 (D) -7 (E) 5

Part B: Each correct answer is worth 6.

11. The diagram shown contains octagons and squares only. The ratio of the number of octagons to the number of squares is



- (A) 1 : 1 (B) 2 : 1 (C) 25 : 12
(D) 5 : 4 (E) 5 : 3

12. In the sum shown, P and Q each represent a digit. The value of $P + Q$ is

$$\begin{array}{r} PQQ \\ PPQ \\ + QQQ \\ \hline 876 \end{array}$$

- (A) 3 (B) 5 (C) 7
(D) 6 (E) 4
13. A larger cube has volume 64 cm^3 . A smaller cube has edges that are half the length of the edges of the larger cube. What is the volume of the smaller cube?

- (A) 24 cm^3 (B) 48 cm^3 (C) 8 cm^3 (D) 16 cm^3 (E) 27 cm^3

14. Ahmed chooses two different items for a snack. His choices are an apple, an orange, a banana, and a granola bar. How many different pairs of snacks could he choose?

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

15. Sophia did push-ups every day for 7 days. Each day after the first day, she did 5 more push-ups than the day before. In total she did 175 push-ups. How many push-ups did Sophia do on the last day?

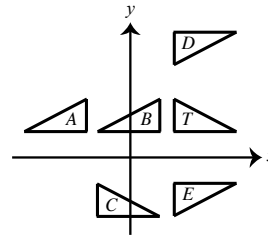
- (A) 55 (B) 35 (C) 50 (D) 45 (E) 40

16. Each of \square , \triangle and \blacklozenge represents a non-zero number. If $\square = \triangle + \triangle + \triangle$ and $\square = \blacklozenge + \blacklozenge$, then $\square + \blacklozenge + \triangle$ equals

- (A) $\square + \triangle$ (B) $\blacklozenge + \triangle + \triangle + \triangle + \triangle$ (C) $\blacklozenge + \blacklozenge + \square$
(D) $\triangle + \triangle + \triangle + \blacklozenge + \blacklozenge$ (E) $\blacklozenge + \blacklozenge + \blacklozenge + \triangle + \triangle$

17. Triangle T is reflected once. Which of the following triangles *cannot* be this reflection of triangle T ?

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



18. The mean (average) of a set of six numbers is 10. When the number 25 is removed from the set, the mean of the remaining numbers is

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

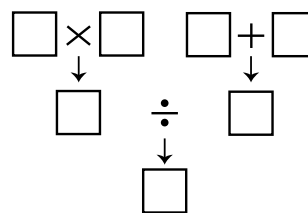
19. Suzy's 5 m long ribbon has shaded and unshaded sections of equal length, as shown. Points A, B, C, D, E are equally spaced along the ribbon.



If Suzy wants a ribbon that is $\frac{11}{15}$ of the size of this ribbon, at which point could she make a single vertical cut?

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

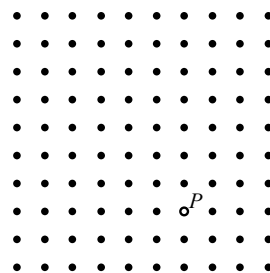
20. In the diagram, four different integers from 1 to 9 inclusive are placed in the four boxes in the top row. The integers in the left two boxes are multiplied and the integers in the right two boxes are added and these results are then divided, as shown. The final result is placed in the bottom box. Which of the following integers cannot appear in the bottom box?



- (A) 16 (B) 24 (C) 7
(D) 20 (E) 9

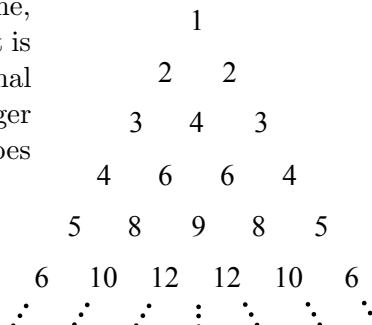
Part C: Each correct answer is worth 8.

21. A 10 by 10 grid is created using 100 points, as shown. Point P is given. One of the other 99 points is randomly chosen to be Q . What is the probability that the line segment PQ is vertical or horizontal?



- (A) $\frac{2}{11}$ (B) $\frac{1}{5}$ (C) $\frac{1}{10}$
(D) $\frac{4}{25}$ (E) $\frac{5}{33}$
22. The eight vertices of a cube are randomly labelled with the integers from 1 to 8 inclusive. Judith looks at the labels of the four vertices of one of the faces of the cube. She lists these four labels in increasing order. After doing this for all six faces, she gets the following six lists: (1, 2, 5, 8), (3, 4, 6, 7), (2, 4, 5, 7), (1, 3, 6, 8), (2, 3, 7, 8), and (1, 4, 5, 6). The label of the vertex of the cube that is farthest away from the vertex labelled 2 is
- (A) 3 (B) 4 (C) 5 (D) 6 (E) 7
23. Angie has a jar that contains 2 red marbles, 2 blue marbles, and no other marbles. She randomly draws 2 marbles from the jar. If the marbles are the same colour, she discards one and puts the other back into the jar. If the marbles are different colours, she discards the red marble and puts the blue marble back into the jar. She repeats this process a total of three times. What is the probability that the remaining marble is red?
- (A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{2}{3}$ (D) $\frac{1}{3}$ (E) 0
24. How many of the five numbers 101, 148, 200, 512, 621 cannot be expressed as the sum of two or more consecutive positive integers?
- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4
25. In the triangle shown, the first diagonal line, 1, 2, 3, 4, \dots , begins at 1 and each number after the first is one larger than the previous number. The second diagonal line, 2, 4, 6, 8, \dots begins at 2 and each number after the first is two larger than the previous number. The n^{th} diagonal line begins at n and each number after the first is n larger than the previous number. In which horizontal row does the number 2016 first appear?

- (A) 90 (B) 94 (C) 88
(D) 91 (E) 89





The CENTRE for EDUCATION
in MATHEMATICS and COMPUTING
cemc.uwaterloo.ca

Gauss Contest

Grade 7

(The Grade 8 Contest is on the reverse side)

Wednesday, May 13, 2015
(in North America and South America)

Thursday, May 14, 2015
(outside of North America and South America)



UNIVERSITY OF
WATERLOO

Time: 1 hour

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Calculators are allowed, with the following restriction: you may not use a device that has internet access, that can communicate with other devices, or that contains previously stored information. For example, you may not use a smartphone or a tablet.

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.

The name, school and location of some top-scoring students will be published on the Web site, cemc.uwaterloo.ca. You will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.

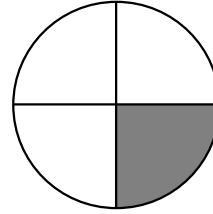
Grade 7

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. In the diagram, the fraction of the circle that is shaded is equal to

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

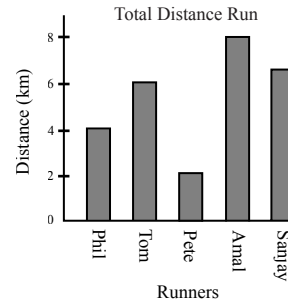


2. The value of $10 \times (5 - 2)$ is

(A) 13 (B) 70 (C) 7 (D) 30 (E) 50

3. The graph shows the total distance that each of five runners ran during a one-hour training session. Which runner ran the least distance?

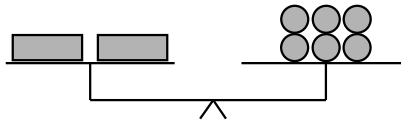
(A) Phil (B) Tom (C) Pete
 (D) Amal (E) Sanjay



4. The equal-arm scale shown is balanced.

One has the same mass as

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



5. Which of the following is closest to 5 cm?

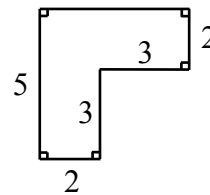
(A) The length of a full size school bus
 (B) The height of a picnic table
 (C) The height of an elephant
 (D) The length of your foot
 (E) The length of your thumb

6. The number of centimetres in 3.5 metres is

(A) 350 (B) 30.5 (C) 3.05 (D) 3.50 (E) 305

7. The perimeter of the figure shown is

(A) 18 (B) 17 (C) 23
 (D) 20 (E) 25



8. Hannah scored 312 points during the basketball season. If her average (mean) was 13 points per game, how many games did she play?

(A) 24 (B) 41 (C) 17 (D) 13 (E) 30

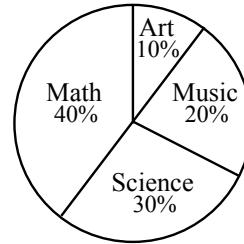
9. The number 6 has exactly four positive divisors: 1, 2, 3, and 6. How many positive divisors does 20 have?

(A) 2 (B) 6 (C) 3 (D) 5 (E) 8

10. How many different 3-digit whole numbers can be formed using the digits 4, 7 and 9, assuming that no digit can be repeated in a number?
 (A) 6 (B) 3 (C) 5 (D) 12 (E) 9

Part B: Each correct answer is worth 6.

11. At Gaussville School, a total of 480 students voted for their favourite subject. The results are summarized in the pie chart shown. How many students voted for math?
 (A) 184 (B) 192 (C) 96
 (D) 144 (E) 288

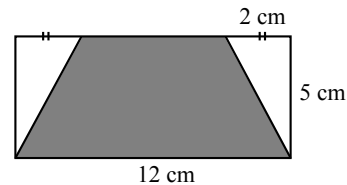


12. A piece of paper is folded in half, creating two layers of paper. The paper is then folded in half again. This is continued until the paper has been folded in half a total of five times. The total number of layers of paper in the folded sheet is
 (A) 16 (B) 32 (C) 25 (D) 8 (E) 64
13. How many even whole numbers between 1 and 99 are multiples of 5?
 (A) 5 (B) 7 (C) 9 (D) 11 (E) 13

14. In the 3×3 table shown, the numbers 1, 2 and 3 are placed so that each number occurs only once in each row and only once in each column. The value of $X + Y$ is
 (A) 3 (B) 2 (C) 5
 (D) 6 (E) 4

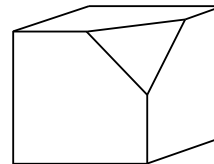
		1
3	X	
		Y

15. In the rectangle shown, the area of the shaded region is
 (A) 60 cm^2 (B) 20 cm^2 (C) 30 cm^2
 (D) 40 cm^2 (E) 50 cm^2

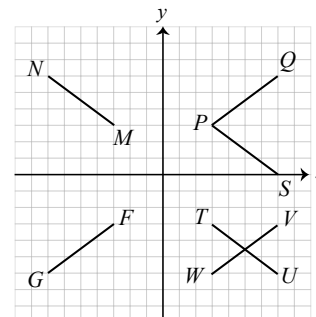


16. You have exactly \$4.40 (440¢) in quarters (25¢ coins), dimes (10¢ coins), and nickels (5¢ coins). You have the same number of each type of coin. How many dimes do you have?
 (A) 20 (B) 11 (C) 10 (D) 12 (E) 4

17. One corner of a cube is cut off, creating a new triangular face, as shown. How many edges does this new solid have?
 (A) 18 (B) 14 (C) 24
 (D) 15 (E) 13



18. In the graph shown, which of the following represents the image of the line segment PQ after a reflection across the x -axis?
 (A) PS (B) TU (C) MN
 (D) WV (E) FG



Grade 7

19. When expressed as a repeating decimal, the fraction $\frac{1}{7}$ is written as $0.142857142857\dots$ (The 6 digits 142857 continue to repeat.) The digit in the third position to the right of the decimal point is 2. In which one of the following positions to the right of the decimal point will there also be a 2?
 (A) 119^{th} (B) 121^{st} (C) 123^{rd} (D) 125^{th} (E) 126^{th}
20. In a triangle, the measure of one of the angles is 45° . The measures of the other two angles in the triangle are in the ratio 4 : 5. What is the measure of the largest angle in the triangle?
 (A) 80° (B) 90° (C) 75° (D) 85° (E) 100°

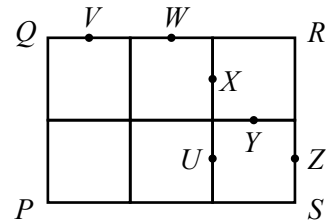
Part C: Each correct answer is worth 8.

21. The numbers 1 through 25 are arranged into 5 rows and 5 columns in the table below.

1	2	3	4	5
10	9	8	7	6
11	12	13	14	15
20	19	18	17	16
21	22	23	24	25

- What is the largest possible sum that can be made using five of these numbers such that no two numbers come from the same row and no two numbers come from the same column?
 (A) 75 (B) 73 (C) 71 (D) 70 (E) 68
22. The width of a rectangle is doubled and the length is halved. This produces a square with a perimeter of P . What is the perimeter of the original rectangle?
 (A) P (B) $2P$ (C) $\frac{1}{2}P$ (D) $\frac{5}{4}P$ (E) $\frac{5}{2}P$
23. A palindrome is a positive integer that is the same when read forwards or backwards. The numbers 101 and 4554 are examples of palindromes. The ratio of the number of 4-digit palindromes to the number of 5-digit palindromes is
 (A) 4 : 5 (B) 5 : 2 (C) 2 : 7 (D) 4 : 3 (E) 1 : 10

24. In the diagram, rectangle $PQRS$ is made up of six identical squares. Points $U, V, W, X, Y,$ and Z are midpoints of sides of the squares, as shown. Which of the following triangles has the greatest area?



- (A) PVU (B) PXZ (C) PVX
 (D) PYS (E) PQW
25. Two different 2-digit positive integers are called a *reversal pair* if the position of the digits in the first integer is switched in the second integer. For example, 52 and 25 are a reversal pair. The integer 2015 has the property that it is equal to the product of three different prime numbers, two of which are a reversal pair. Including 2015, how many positive integers less than 10 000 have this same property?
 (A) 18 (B) 14 (C) 20 (D) 17 (E) 19



The CENTRE for EDUCATION
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Gauss Contest

Grade 7

(The Grade 8 Contest is on the reverse side)

Wednesday, May 14, 2014
(in North America and South America)

Thursday, May 15, 2014
(outside of North America and South America)



Time: 1 hour

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Calculating devices are allowed, provided that they do not have any of the following features: (i) internet access, (ii) the ability to communicate with other devices, (iii) information previously stored by students (such as formulas, programs, notes, etc.), (iv) a computer algebra system, (v) dynamic geometry software.

Instructions

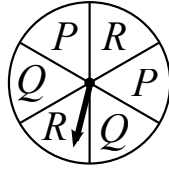
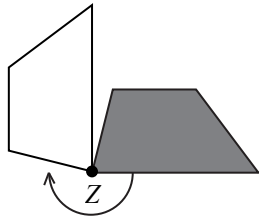
1. Do not open the contest booklet until you are told to do so.
2. You may use rulers, compasses and paper for rough work.
3. Be sure that you understand the coding system for your answer sheet. If you are not sure, ask your teacher to explain it.
4. This is a multiple-choice test. Each question is followed 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.

The name, school and location of some top-scoring students will be published on the website, cemc.uwaterloo.ca. On this website, you will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.

Grade 7

Scoring: There is *no penalty* for an incorrect answer.
Each unanswered question is worth 2, to a maximum of 10 unanswered questions.

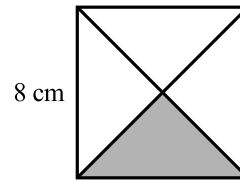
Part A: Each correct answer is worth 5.

1. The value of $(4 \times 3) + 2$ is
(A) 33 (B) 10 (C) 14 (D) 24 (E) 11
 2. Which of the following numbers is closest to 100 on the number line?
(A) 98 (B) 95 (C) 103 (D) 107 (E) 110
 3. Five times a number equals one hundred. The number is
(A) 50 (B) 10 (C) 15 (D) 25 (E) 20
 4. The spinner shown is divided into 6 sections of equal size. What is the probability of landing on a section that contains the letter *Q* using this spinner?
(A) $\frac{3}{6}$ (B) $\frac{4}{6}$ (C) $\frac{5}{6}$
(D) $\frac{2}{6}$ (E) $\frac{1}{6}$
- 
5. One scoop of fish food can feed 8 goldfish. How many goldfish can 4 scoops of fish food feed?
(A) 12 (B) 16 (C) 8 (D) 64 (E) 32
 6. Which of these fractions is equivalent to $\frac{15}{25}$?
(A) $\frac{3}{4}$ (B) $\frac{2}{3}$ (C) $\frac{3}{5}$ (D) $\frac{1}{2}$ (E) $\frac{5}{7}$
 7. How many positive two-digit whole numbers are divisible by 7?
(A) 11 (B) 9 (C) 15 (D) 12 (E) 13
 8. If $9210 - 9124 = 210 - \square$, the value represented by the \square is
(A) 296 (B) 210 (C) 186 (D) 124 (E) 24
 9. A clockwise rotation around point *Z* (that is, a rotation in the direction of the arrow) transforms the shaded quadrilateral to the unshaded quadrilateral. The angle of rotation is approximately
(A) 180° (B) 270° (C) 360°
(D) 45° (E) 135°
- 
10. Which one of the following is equal to 17?
(A) $3 - 4 \times 5 + 6$ (B) $3 \times 4 + 5 \div 6$ (C) $3 + 4 \times 5 - 6$
(D) $3 \div 4 + 5 - 6$ (E) $3 \times 4 \div 5 + 6$

Part B: Each correct answer is worth 6.

11. Consider the set $\{0.34, 0.304, 0.034, 0.43\}$. The sum of the smallest and largest numbers in the set is
(A) 0.77 (B) 0.734 (C) 0.077 (D) 0.464 (E) 0.338

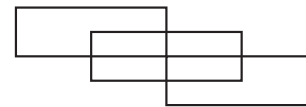
12. The diagonals have been drawn in the square shown. The area of the shaded region of the square is
 (A) 4 cm^2 (B) 8 cm^2 (C) 16 cm^2
 (D) 56 cm^2 (E) 64 cm^2



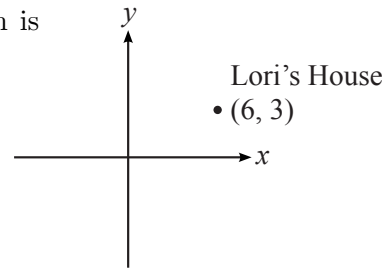
13. In the special square shown, the sum of the three numbers in each column equals the sum of the three numbers in each row. The value of x is
 (A) 3 (B) 4 (C) 5
 (D) 6 (E) 12

13	8	
14	x	10
9		

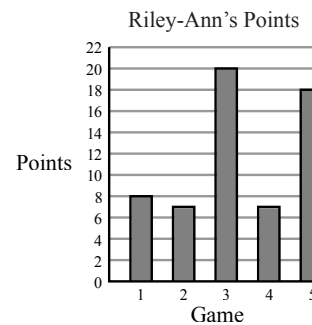
14. In the diagram shown, the number of rectangles of all sizes is
 (A) 11 (B) 15 (C) 7
 (D) 13 (E) 9



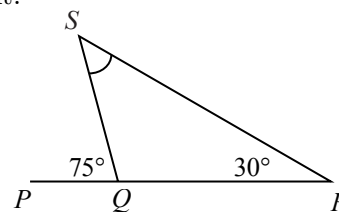
15. The diagram shows Lori's house located at $(6, 3)$. If Alex's house is located at $(-2, -4)$, what translation is needed to get from Lori's house to Alex's house?
 (A) 4 units left, 1 unit up
 (B) 8 units right, 7 units up
 (C) 4 units left, 1 unit down
 (D) 8 units left, 7 units down
 (E) 7 units right, 8 units down



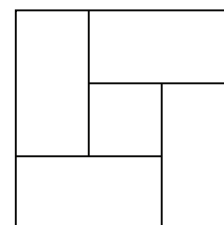
16. The graph shows points scored by Riley-Ann in her first five basketball games. The difference between the mean and the median of the number of points that she scored is
 (A) 1 (B) 2 (C) 3
 (D) 4 (E) 5



17. In the diagram shown, PQR is a straight line segment. The measure of $\angle QSR$ is
 (A) 25° (B) 30° (C) 35°
 (D) 40° (E) 45°



18. In the figure shown, the outer square has an area of 9 cm^2 , the inner square has an area of 1 cm^2 , and the four rectangles are identical. What is the perimeter of one of the four identical rectangles?
 (A) 6 cm (B) 8 cm (C) 10 cm
 (D) 9 cm (E) 7 cm

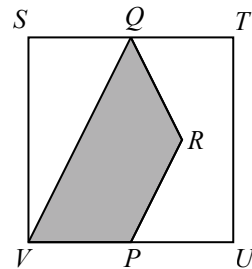


19. Sarah's hand length is 20 cm. She measures the dimensions of her rectangular floor to be 18 by 22 hand lengths. Which of the following is the closest to the area of the floor?
- (A) 160 000 cm² (B) 80 000 cm² (C) 200 000 cm²
 (D) 16 000 cm² (E) 20 000 cm²
20. The product of three consecutive odd numbers is 9177. What is the sum of the numbers?
- (A) 51 (B) 57 (C) 60 (D) 63 (E) 69

Part C: Each correct answer is worth 8.

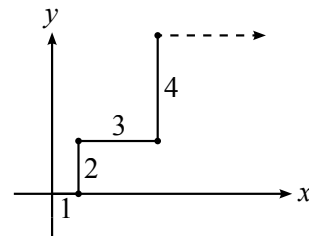
21. A bicycle at Store P costs \$200. The regular price of the same bicycle at Store Q is 15% more than it is at Store P. The bicycle is on sale at Store Q for 10% off of the regular price. What is the sale price of the bicycle at Store Q?
- (A) \$230.00 (B) \$201.50 (C) \$199.00 (D) \$207.00 (E) \$210.00
22. Each face of a cube is painted with exactly one colour. What is the smallest number of colours needed to paint a cube so that no two faces that share an edge are the same colour?
- (A) 2 (B) 3 (C) 4 (D) 5 (E) 6
23. Two standard six-sided dice are tossed. One die is red and the other die is blue. What is the probability that the number appearing on the red die is greater than the number appearing on the blue die?
- (A) $\frac{18}{36}$ (B) $\frac{25}{36}$ (C) $\frac{15}{36}$ (D) $\frac{12}{36}$ (E) $\frac{17}{36}$
24. In the diagram shown,

- $STUV$ is a square,
- Q and P are the midpoints of ST and UV ,
- $PR = QR$, and
- VQ is parallel to PR .



What is the ratio of the shaded area to the unshaded area?

- (A) 2 : 3 (B) 3 : 5 (C) 1 : 1
 (D) 7 : 9 (E) 5 : 7
25. On a coordinate grid, Paul draws a line segment of length 1 from the origin to the right, stopping at (1,0). He then draws a line segment of length 2 up from this point, stopping at (1,2). He continues to draw line segments to the right and up, increasing the length of the line segment he draws by 1 each time. One of his line segments stops at the point (529,506). What is the endpoint of the next line segment that he draws?
- (A) (529, 552) (B) (576, 506) (C) (575, 506)
 (D) (529, 576) (E) (576, 552)





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The CENTRE for EDUCATION
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Gauss Contest

Grade 7

(The Grade 8 Contest is on the reverse side)

Wednesday, May 15, 2013
(in North America and South America)

Thursday, May 16, 2013
(outside of North America and South America)

UNIVERSITY OF
WATERLOO

WATERLOO
MATHEMATICS

Deloitte.

Time: 1 hour

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Calculators are permitted.

Instructions

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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.
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The name, school and location of some top-scoring students will be published on the Web site, <http://www.cemc.uwaterloo.ca>. You will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.

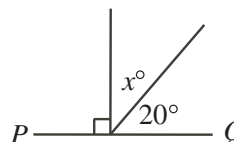
Grade 7

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Part A: Each correct answer is worth 5.

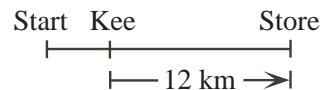
1. The value of $(5 \times 3) - 2$ is
 (A) 5 (B) 9 (C) 6 (D) 8 (E) 13
2. Which of the following numbers is a multiple of 9?
 (A) 50 (B) 40 (C) 35 (D) 45 (E) 55
3. Thirty-six hundredths is equal to
 (A) 0.36 (B) 360 (C) 3.6 (D) 0.036 (E) 0.0036
4. The value of $1 + 1 - 2 + 3 + 5 - 8 + 13 + 21 - 34$ is
 (A) -32 (B) 1 (C) 88 (D) 0 (E) -34

5. If PQ is a straight line segment, then the value of x is
 (A) 160 (B) 70 (C) 110
 (D) 20 (E) 80



6. Nick has six nickels (5¢ coins), two dimes (10¢ coins) and one quarter (25¢ coin). In cents (¢), how much money does Nick have?
 (A) 65 (B) 75 (C) 35 (D) 15 (E) 55
7. The smallest number in the set $\{\frac{1}{2}, \frac{2}{3}, \frac{1}{4}, \frac{5}{6}, \frac{7}{12}\}$ is
 (A) $\frac{1}{2}$ (B) $\frac{2}{3}$ (C) $\frac{1}{4}$ (D) $\frac{5}{6}$ (E) $\frac{7}{12}$

8. Ahmed is going to the store. One quarter of the way to the store, he stops to talk with Kee. He then continues for 12 km and reaches the store. How many kilometres does he travel altogether?



9. An expression that produces the values in the second row of the table shown, given the values of n in the first row, is
 (A) $3n - 2$ (B) $2(n - 1)$ (C) $n + 4$
 (D) $2n$ (E) $2n - 1$

n	1	2	3	4	5
value	1	3	5	7	9

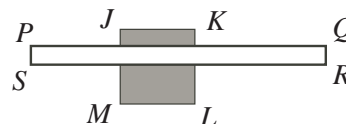
10. UVW and XYZ are each 3-digit integers. $U, V, W, X, Y,$ and Z are different digits chosen from the integers 1 to 9. What is the largest possible value for $UVW - XYZ$?
 (A) 678 (B) 864 (C) 885 (D) 888 (E) 975

Part B: Each correct answer is worth 6.

11. The length of each edge of a cube is 1 cm. The surface area of the cube, in cm^2 , is
 (A) 24 (B) 1 (C) 4 (D) 12 (E) 6

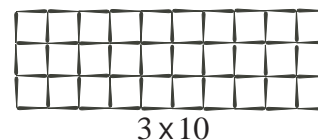
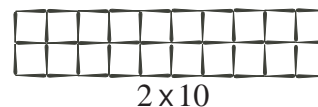
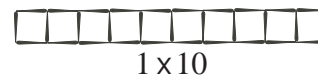
Grade 7

12. Which of the following pairs of numbers has a greatest common factor of 20?
 (A) 200 and 2000 (B) 40 and 50 (C) 20 and 40
 (D) 20 and 25 (E) 40 and 80
13. Jack, Kelly, Lan, Mihai, and Nate are sitting in the 5 chairs around a circular table. Lan and Mihai are sitting beside each other. Jack and Kelly are not sitting beside each other. The 2 people who are seated on either side of Nate are
 (A) Jack and Lan (B) Jack and Kelly (C) Kelly and Mihai
 (D) Lan and Mihai (E) Mihai and Jack
14. If $x = 4$ and $3x + 2y = 30$, what is the value of y ?
 (A) 18 (B) 6 (C) 3 (D) 4 (E) 9
15. Daniel begins with 64 coins in his coin jar. Each time he reaches into the jar, he removes half of the coins that are in the jar. How many times must he reach in and remove coins from his jar so that exactly 1 coin remains in the jar?
 (A) 5 (B) 32 (C) 6 (D) 7 (E) 63
16. The mean (average) of five consecutive even numbers is 12. The mean of the smallest and largest of these numbers is
 (A) 12 (B) 10 (C) 14 (D) 8 (E) 16
17. For every 3 chocolates that Claire buys at the regular price, she buys a fourth chocolate for 25 cents. Claire buys 12 chocolates in total for \$6.15. What is the regular price of one chocolate, in cents?
 (A) 180 (B) 45 (C) 60 (D) 54 (E) 57
18. $JKLM$ is a square and $PQRS$ is a rectangle. If JK is parallel to PQ , $JK = 8$ and $PS = 2$, then the total area of the shaded regions is
 (A) 32 (B) 16 (C) 56
 (D) 48 (E) 62



19. A special six-sided die is rolled. The probability of rolling a number that is a multiple of three is $\frac{1}{2}$. The probability of rolling an even number is $\frac{1}{3}$. A possibility for the numbers on the die is
 (A) 1, 2, 3, 5, 5, 6 (B) 1, 2, 3, 3, 5, 6 (C) 1, 2, 3, 4, 6, 6
 (D) 1, 2, 3, 3, 4, 6 (E) 2, 3, 3, 3, 5, 6

20. Toothpicks are used to make rectangular grids, as shown. Note that a total of 31 identical toothpicks are used in the 1×10 grid. How many toothpicks are used in a 43×10 grid?



- (A) 913 (B) 860 (C) 871
 (D) 903 (E) 946

Part C: Each correct answer is worth 8.

21. In the addition shown, P and Q each represent single digits, and the sum is $1PP7$. What is $P + Q$?

- (A) 9 (B) 12 (C) 14
(D) 15 (E) 13

$$\begin{array}{r} 77P \\ 6QP \\ + QQP \\ \hline 1PP7 \end{array}$$

22. An *arithmetic sequence* is a sequence in which each term after the first is obtained by adding a constant to the previous term. For example, 2, 4, 6, 8 and 1, 4, 7, 10 are arithmetic sequences.

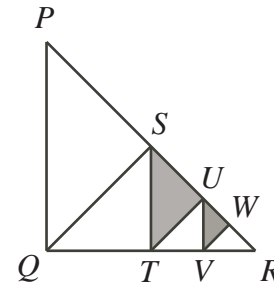
In the grid shown, the numbers in each row must form an arithmetic sequence and the numbers in each column must form an arithmetic sequence. The value of x is

- (A) 37 (B) 28 (C) 36
(D) 43.75 (E) 46

1			
4			25
7			x
10		36	

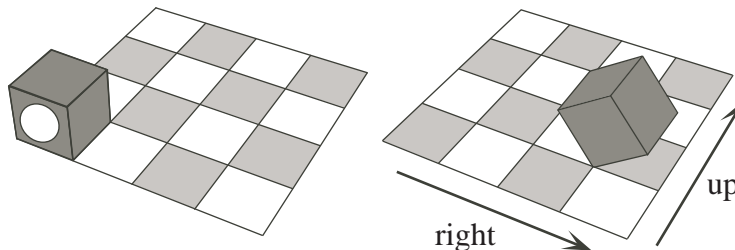
23. In the right-angled triangle PQR , $PQ = QR$. The segments QS, TU and VW are perpendicular to PR , and the segments ST and UV are perpendicular to QR , as shown. What fraction of $\triangle PQR$ is shaded?

- (A) $\frac{3}{16}$ (B) $\frac{3}{8}$ (C) $\frac{5}{16}$
(D) $\frac{5}{32}$ (E) $\frac{7}{32}$



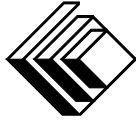
24. One face of a cube contains a circle, as shown. This cube rolls without sliding on a four by four checkerboard. The cube always begins a path on the bottom left square in the position shown and completes the path on the top right square. During each move, an edge of the cube remains in contact with the board. Each move of the cube is either to the right or up. For each path, a face of the cube contacts seven different squares on the checkerboard, including the bottom left and top right squares. The number of different squares that will not be contacted by the face with the circle on any path is

- (A) 9 (B) 11 (C) 8 (D) 12 (E) 10



25. A box contains a total of 400 tickets that come in five colours: blue, green, red, yellow and orange. The ratio of blue to green to red tickets is 1 : 2 : 4. The ratio of green to yellow to orange tickets is 1 : 3 : 6. What is the smallest number of tickets that must be drawn to ensure that at least 50 tickets of one colour have been selected?

- (A) 50 (B) 246 (C) 148 (D) 196 (E) 115



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UNIVERSITY OF
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MATHEMATICS

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Time: 1 hour ©2011 Centre for Education in Mathematics and Computing
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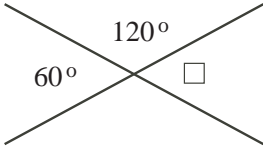
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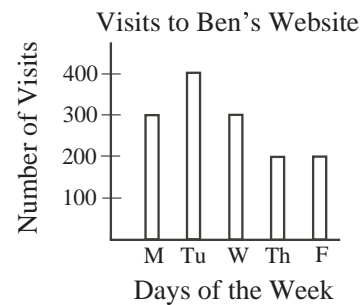
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Part A: Each correct answer is worth 5.

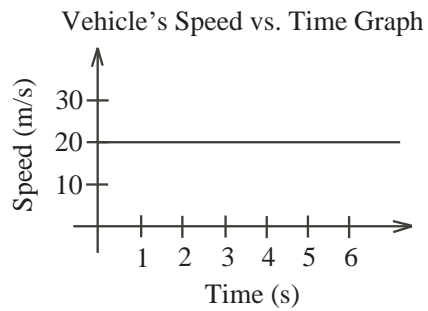
1. The value of $202 - 101 + 9$ is equal to
(A) 120 (B) 110 (C) 111 (D) 109 (E) 92
2. Which of the following numbers is equal to 33 million?
(A) 3 300 000 (B) 330 000 (C) 33 000 (D) 33 000 000 (E) 330 000 000
3. A six-sided die has the numbers one to six on its sides. What is the probability of rolling a five?
(A) $\frac{2}{6}$ (B) $\frac{1}{6}$ (C) $\frac{5}{6}$ (D) $\frac{3}{6}$ (E) $\frac{4}{6}$
4. The largest fraction in the set $\{\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{10}\}$ is
(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{1}{5}$ (E) $\frac{1}{10}$
5. Two straight lines intersect as shown.
The measure of the angle marked \square is
(A) 60° (B) 120° (C) 30°
(D) 300° (E) 180°


6. Fifteen times a number equals three hundred. The number is
(A) 20 (B) 10 (C) 60 (D) 30 (E) 25
7. Which of the following statements is true?
(A) 0 is less than -5 (B) 7 is less than -1 (C) 10 is less than $\frac{1}{4}$
(D) -1 is less than -3 (E) -8 is less than -2
8. Bailey scores on six of her eight shots. The percentage of shots that she *does not* score on is
(A) 2 (B) 40 (C) 10 (D) 20 (E) 25
9. Ben recorded the number of visits to his website from Monday to Friday as shown in the bar graph. The mean (average) number of visits per day to his website over the 5 days is
(A) less than 100
(B) between 100 and 200
(C) between 200 and 300
(D) between 300 and 400
(E) more than 400



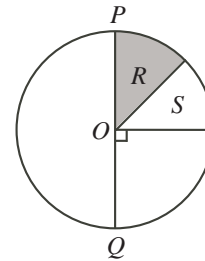
Grade 7

10. Using the graph, the number of seconds required for a vehicle to travel a total distance of 100 m is
 (A) 2.5 (B) 20 (C) 8
 (D) 10 (E) 5

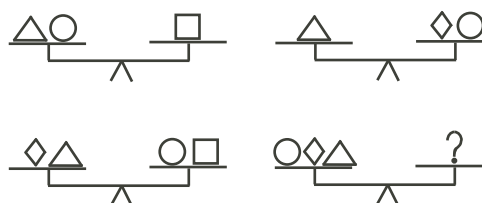


Part B: Each correct answer is worth 6.

11. The perimeter of a square is 36 cm. The area of the square, in cm^2 , is
 (A) 24 (B) 81 (C) 36 (D) 1296 (E) 324
12. Which of the following is *not* equal to $\frac{15}{4}$?
 (A) 3.75 (B) $\frac{14+1}{3+1}$ (C) $\frac{3}{4} + 3$ (D) $\frac{5}{4} \times \frac{3}{4}$ (E) $\frac{21}{4} - \frac{5}{4} - \frac{1}{4}$
13. On the spinner shown, PQ passes through centre O . If areas labelled R and S are equal, then what percentage of the time will a spin stop on the shaded region?
 (A) 50% (B) 22.5% (C) 25%
 (D) 45% (E) 12.5%



14. The digits 2, 4, 6 and 8 are each used once to create two 2-digit numbers. What is the largest possible difference between the two 2-digit numbers?
 (A) 66 (B) 62 (C) 58 (D) 44 (E) 36
15. If snow falls at a rate of 1 mm every 6 minutes, then how many *hours* will it take for 1 m of snow to fall?
 (A) 33 (B) 60 (C) 26 (D) 10 (E) 100
16. The number 503 is a prime number. How many positive integers are factors of 2012?
 (A) 2 (B) 3 (C) 7 (D) 6 (E) 8
17. The ratio of boys to girls at Gauss Public School is 8 : 5. If there are 128 boys at the school, then how many students are there at the school?
 (A) 218 (B) 253 (C) 208 (D) 133 (E) 198
18. All four scales shown are balanced. One possible replacement for the ? is

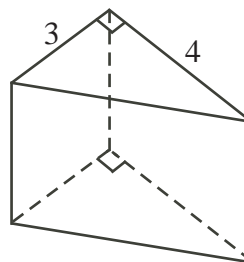


- (A) $\triangle \square$ (B) $\diamond \triangle$ (C) $\circ \square$
 (D) $\square \diamond$ (E) $\triangle \circ$

19. A set of five different positive integers has a mean (average) of 20 and a median of 18. What is the greatest possible integer in the set?
 (A) 60 (B) 26 (C) 46 (D) 12 (E) 61
20. Chris lies on Fridays, Saturdays and Sundays, but he tells the truth on all other days. Mark lies on Tuesdays, Wednesdays and Thursdays, but he tells the truth on all other days. On what day of the week would they both say: "Tomorrow, I will lie."?
 (A) Monday (B) Thursday (C) Friday (D) Sunday (E) Tuesday

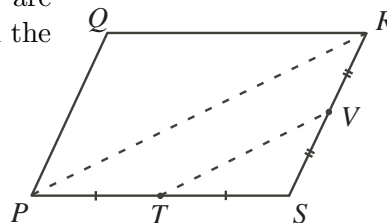
Part C: Each correct answer is worth 8.

21. A triangular prism has a volume of 120 cm^3 . Two edges of the triangular faces measure 3 cm and 4 cm, as shown. The height of the prism, in cm, is
 (A) 12 (B) 20 (C) 10
 (D) 16 (E) 8



22. A quiz has three questions, with each question worth one mark. If 20% of the students got 0 questions correct, 5% got 1 question correct, 40% got 2 questions correct, and 35% got all 3 questions correct, then the overall class mean (average) mark was
 (A) 1.8 (B) 1.9 (C) 2 (D) 2.1 (E) 2.35
23. The number N is the product of all positive odd integers from 1 to 99 that do not end in the digit 5. That is, $N = 1 \times 3 \times 7 \times 9 \times 11 \times 13 \times 17 \times 19 \times \dots \times 91 \times 93 \times 97 \times 99$. The units digit of N is
 (A) 1 (B) 3 (C) 5 (D) 7 (E) 9

24. $PQRS$ is a parallelogram with area 40. If T and V are the midpoints of sides PS and RS respectively, then the area of $PRVT$ is
 (A) 10 (B) 12 (C) 15
 (D) 16 (E) 18



25. The positive integers are arranged in rows and columns as shown below.

Row 1	1					
Row 2	2	3				
Row 3	4	5	6			
Row 4	7	8	9	10		
Row 5	11	12	13	14	15	
Row 6	16	17	18	19	20	21
						⋮

More rows continue to list the positive integers in order, with each new row containing one more integer than the previous row. How many integers less than 2000 are in the *column* that contains the number 2000?

- (A) 15 (B) 19 (C) 17 (D) 16 (E) 18



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Time: 1 hour

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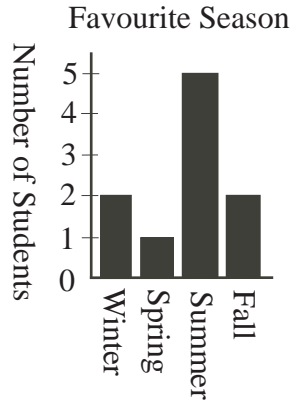
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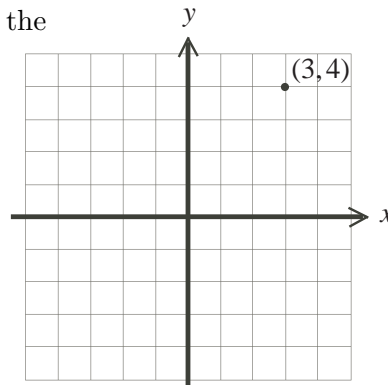
Each unanswered question is worth 2, to a maximum of 10 unanswered questions.

Part A: Each correct answer is worth 5.

1. The value of $5 + 4 - 3 + 2 - 1$ 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



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)

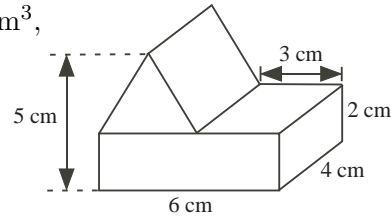


19. The sum of four numbers is T . Suppose that each of the four numbers is now increased by 1. These four new numbers are added together and then the sum is tripled. What is the value of this final result?

(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.

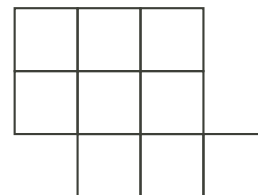
$$\begin{array}{r} A \ B \ E \\ A \ C \ E \\ + A \ D \ E \\ \hline 2 \ 0 \ 1 \ 1 \end{array}$$

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



STRONGER COMMUNITIES TOGETHER™



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

Calculators are permitted.

Instructions

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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.
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6. Diagrams are *not* drawn to scale. They are intended as aids only.
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Grade 7

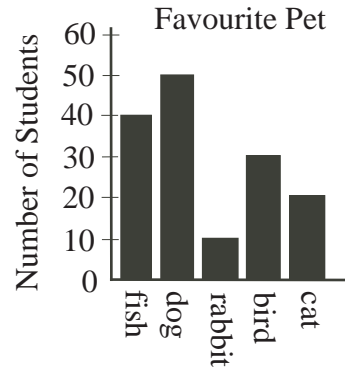
Scoring: There is *no penalty* for an incorrect answer.

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

Part A: Each correct answer is worth 5.

1. The 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?

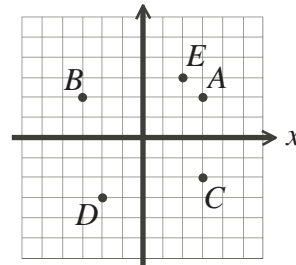
(A) 75 (B) 95 (C) 80 (D) 20 (E) 45

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?

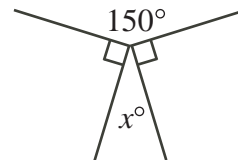
(A) 7th floor (B) 9th floor (C) 4th floor (D) 5th floor (E) 6th floor

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

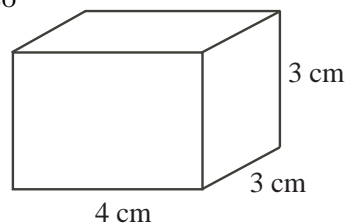
7. In the diagram, the value of x is

(A) 40 (B) 35 (C) 150
(D) 30 (E) 25



8. How many $1 \text{ cm} \times 1 \text{ cm} \times 1 \text{ cm}$ blocks are needed to build the solid rectangular prism shown?

(A) 10 (B) 12 (C) 33
(D) 66 (E) 36



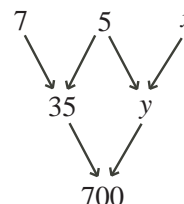
Grade 7

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 ?

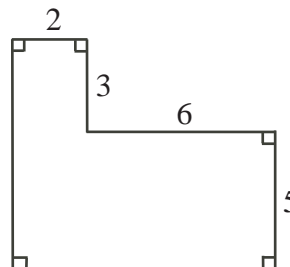
(A) 8 (B) 4 (C) 7
(D) 5 (E) 6



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 cm^2 . 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 ?

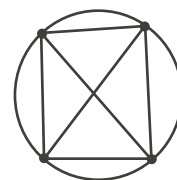
(A) -1 (B) 0 (C) -6
(D) $+2$ (E) -2

+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 \square , what is the largest possible sum of the fractions shown?
- (A) $\frac{19}{12}$ (B) $\frac{13}{7}$ (C) $\frac{5}{2}$
(D) $\frac{15}{4}$ (E) $\frac{23}{6}$

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

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 $\{1, 2, 3, \dots, 20\}$ 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



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C.M.C. Supporter



Time: 1 hour

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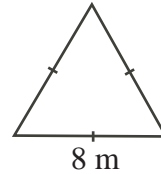
Part A: Each correct answer is worth 5.

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



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

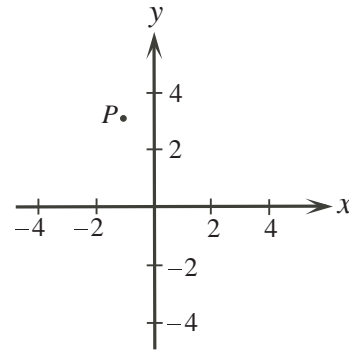
(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

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?



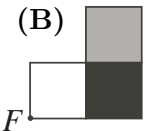
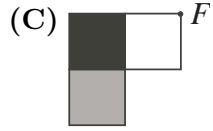
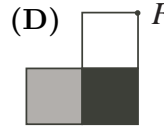
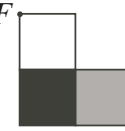
(A) 9 cm (B) 90 cm (C) 0.09 cm (D) 0.11 cm (E) 5.4 cm

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

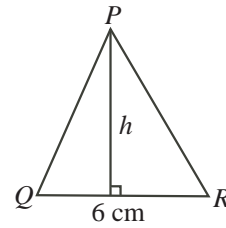
10. If the figure  is rotated 180° about point F , the result could be
- (A)  (B)  (C)  (D)  (E) 

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



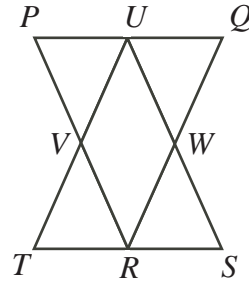
15. The product of three *different* positive integers is 144. What is the maximum possible sum of these three integers?
- (A) 20 (B) 75 (C) 146 (D) 52 (E) 29
16. A square has an area of 25. A rectangle has the same width as the square. The length of the rectangle is double its width. What is the area 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) $\frac{2}{3}$



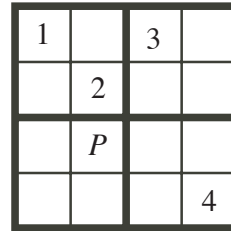
Part C: Each correct answer is worth 8.

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 4×4 grid is to be filled so that each of the digits 1, 2, 3, and 4 appears in each row and each column. The 4×4 grid is divided into four smaller 2×2 squares. Each of these 2×2 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

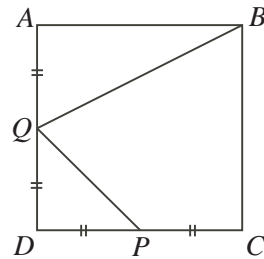


23. Each time Kim pours water from a jug into a glass, exactly 10% of the water remaining in the jug is used. What is the minimum number of times that she must pour water into a glass so that less than half the water remains in the jug?

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

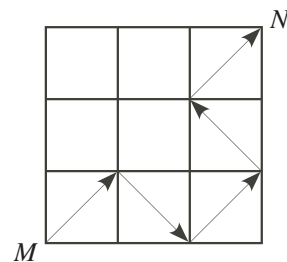
24. In square $ABCD$, P is the midpoint of DC and Q is the midpoint of AD . If the area of the quadrilateral $QBCP$ is 15, what is the area of square $ABCD$?

(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

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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

C.M.C. Sponsors



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Time: 1 hour

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Grade 7

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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 $6 \times 2 - 3$ is
 (A) 9 (B) -6 (C) 12 (D) 15 (E) 10

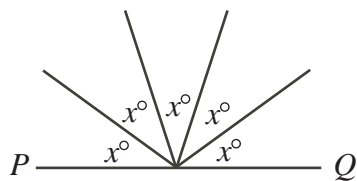
2. The value of $1 + 0.01 + 0.0001$ is
 (A) 1.0011 (B) 1.0110 (C) 1.1001 (D) 1.1010 (E) 1.0101

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

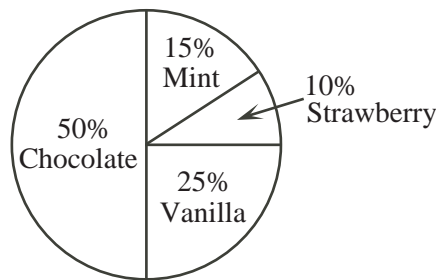
6. If PQ is a straight line, then the value of x is
 (A) 36 (B) 72 (C) 18
 (D) 20 (E) 45



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

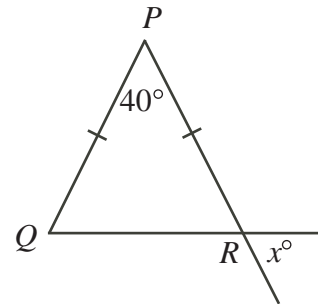
12. In the chart, each number below the top row is the positive difference of the two numbers to the right and left in the row immediately above it. What is the value of x ?

8	9	17	6	4
1	8	-	-	2
	7	-	-	
		-	-	
		x		

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

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?

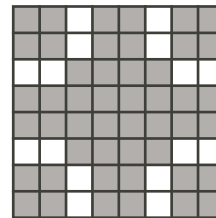
(A) 7 (B) 8 (C) 15 (D) 14 (E) 11

15. Using two transformations, the letter R is changed as shown: $R \rightarrow \mathfrak{R} \rightarrow \mathfrak{R}$.
Using the same two transformations, the letter L is changed as shown: $L \rightarrow \mathfrak{L} \rightarrow \mathfrak{L}$.
Using the same two transformations, the letter G is changed to

(A) G (B) \mathfrak{G} (C) \mathfrak{G} (D) \mathfrak{G} (E) \mathfrak{G}

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?

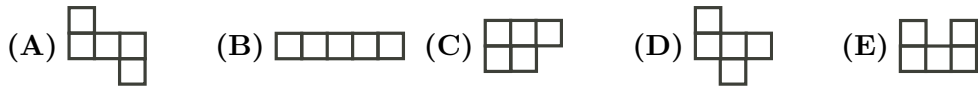
(A) 8 (B) 18 (C) 27 (D) 38 (E) 22

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

Grade 7

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



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

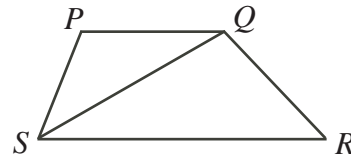
Part C: Each correct answer is worth 8.

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

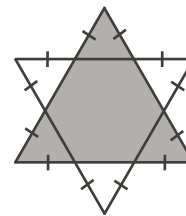


23. There are 24 ways in which Beverly, Dianne, Ethan, and Jamaal can arrange themselves to sit in a row of four seats. In how many ways can Beverly, Dianne, Ethan, and Jamaal arrange themselves in a row of four seats so that Ethan *does not* sit beside Dianne?

(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

C.M.C. Sponsors



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Maplesoft

Time: 1 hour

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Calculators are permitted.

Instructions

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The names of some top-scoring students will be published in the Gauss Report on our Web site, <http://www.cemc.uwaterloo.ca>.

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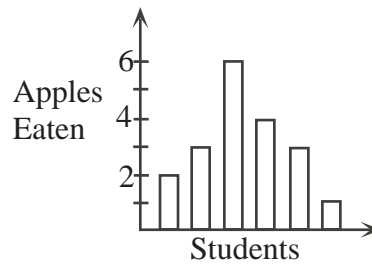
Grade 7

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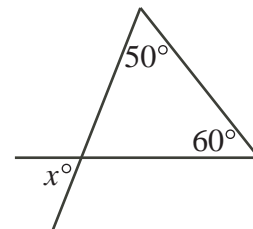
Part A: Each correct answer is worth 5.

- The value of $(4 - 3) \times 2$ is
(A) -2 (B) 2 (C) 1 (D) 3 (E) 5
- Which number represents ten thousand?
(A) 10 (B) $10\,000\,000$ (C) $10\,000$ (D) 100 (E) $1\,000$
- What integer should be placed in the \square to make the statement $\square - 5 = 2$ true?
(A) 7 (B) 4 (C) 3 (D) 1 (E) 8
- 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
- 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
- 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) $\$1.05$

- 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?

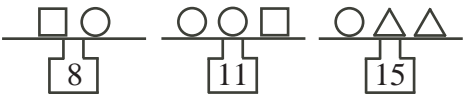
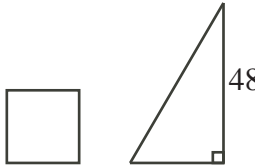


- In the diagram, what is the value of x ?
(A) 110 (B) 50 (C) 10
(D) 60 (E) 70



- 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) BANƆ (B) KNAƆ (C) ƆAƆK (D) ƆNAƆ (E) KNAB
- 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, \dots , 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 \triangle ?
 (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
- 



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

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Time: 1 hour

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Calculators are permitted.

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Grade 7

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

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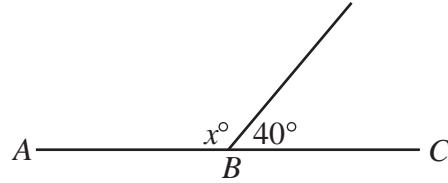
Part A: Each correct answer is worth 5.

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

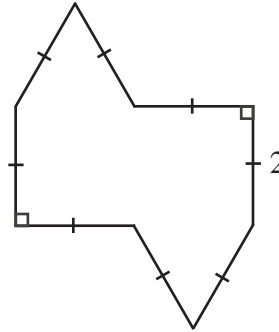


3. Mikhail has \$10 000 in \$50 bills. How many \$50 bills does he have?

(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

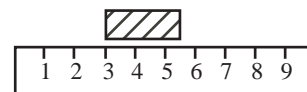
(A) 0 (B) 6 (C) 15 (D) 72 (E) 78

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) $\frac{7}{11}$

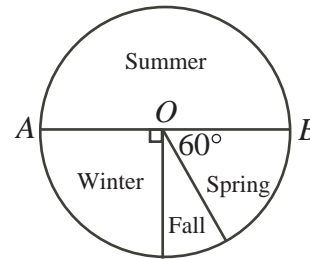
10. A small block is placed along a 10 cm ruler. Which of the following is closest to the length of the block?

(A) 0.24 cm (B) 4.4 cm (C) 2.4 cm
(D) 3 cm (E) 24 cm

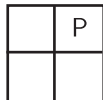
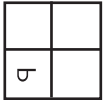
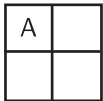
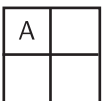
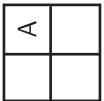
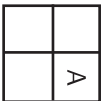
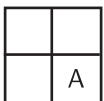
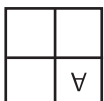


Part B: Each correct answer is worth 6.

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



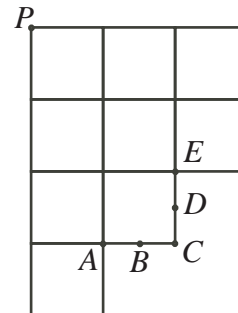
15. Harry charges \$4 to babysit for the first hour. For each additional hour, he charges 50% more than he did for the previous hour. How much money in total would Harry earn for 4 hours of babysitting?
 (A) \$16.00 (B) \$19.00 (C) \$32.50 (D) \$13.50 (E) \$28.00
16. A fraction is equivalent to $\frac{5}{8}$. 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) $22\,500 \text{ cm}^2$
 (D) $630\,000 \text{ cm}^2$ (E) $117\,600 \text{ cm}^2$
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) 

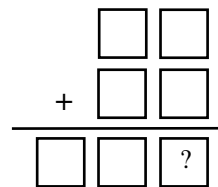
Part C: Each correct answer is worth 8.

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



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 11, 2005

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Time: 1 hour

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Grade 7

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 $\frac{3 \times 4}{6}$ is

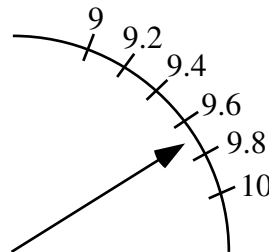
- (A) 1 (B) 2 (C) 3 (D) 4 (E) 6

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?

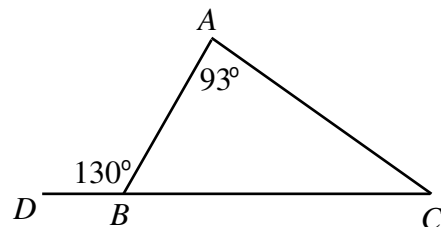
- (A) 15 (B) 9 (C) 21 (D) 7 (E) 18

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?

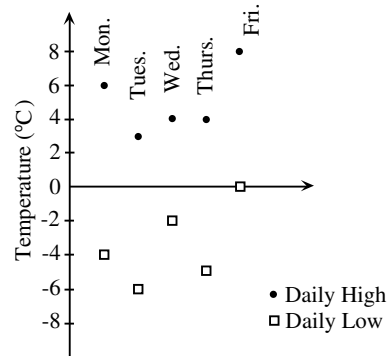
- (A) 176 (B) 186 (C) 165 (D) 170 (E) 171

Grade 7

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?

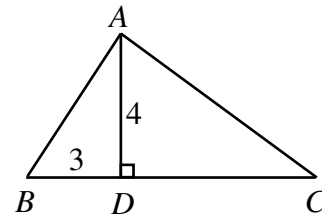


- (A) Monday (B) Tuesday (C) Wednesday
 (D) Thursday (E) Friday

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?

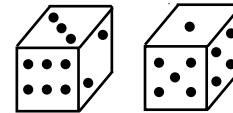
- (A) 10.40 (B) 8.30 (C) 3.05 (D) 7.35 (E) 9.35

13. In the diagram, the length of DC is twice the length of BD . The area of the triangle ABC is



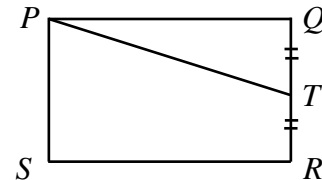
- (A) 24 (B) 72 (C) 12
 (D) 18 (E) 36

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 $\begin{array}{|c|c|} \hline 3 & 4 \\ \hline 5 & 6 \\ \hline \end{array}$ is evaluated as $3 \times 6 + 4 \times 5 = 38$. If $\begin{array}{|c|c|} \hline 2 & 6 \\ \hline 1 & \square \\ \hline \end{array}$ is evaluated as 16,

then the number that should be placed in the empty space is

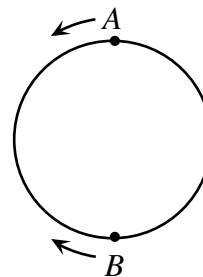
- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

Grade 7

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 $\square\square\square$ balances $\circ\circ$ and $\circ\circ\circ$ balances $\triangle\triangle$, which of the following would not balance $\triangle\circ\square$?
- (A) $\triangle\circ\square$ (B) $\square\square\square\triangle$ (C) $\square\square\circ\circ$ (D) $\triangle\triangle\square$ (E) $\circ\square\square\square$
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

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iAnywhere Solutions

Time: 1 hour

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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.
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 - 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

Scoring: There is *no penalty* for an incorrect answer.
Each unanswered question is worth 2, to a maximum of 10 unanswered questions.

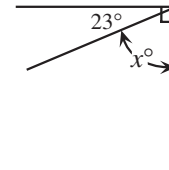
Part A: Each correct answer is worth 5.

1. The value of $\frac{10 + 20 + 30 + 40}{10}$ is
 (A) 90 (B) 91 (C) 10 (D) 64 (E) 9

2. The value of $\frac{1}{2} - \frac{1}{8}$ is
 (A) $\frac{3}{8}$ (B) $-\frac{1}{6}$ (C) $\frac{5}{8}$ (D) $\frac{1}{16}$ (E) $\frac{1}{4}$

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

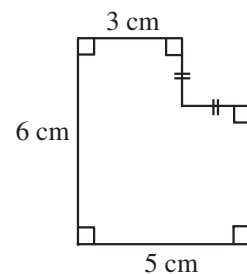


5. Five years ago today, Sally was 7 years old. In two more years, Sally will be
 (A) 12 (B) 14 (C) 9 (D) 13 (E) 10
6. At the Gauss Store, you earn 5 “reward points” for each \$25 you spend. When Stuart spends \$200 at the Gauss Store, the number of reward points that he earns is
 (A) 5 (B) 8 (C) 40 (D) 125 (E) 1000
7. Which of the following fractions has the largest value?
 (A) $\frac{8}{9}$ (B) $\frac{7}{8}$ (C) $\frac{66}{77}$ (D) $\frac{55}{66}$ (E) $\frac{4}{5}$
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) $\frac{2}{6}$ (C) $\frac{3}{6}$ (D) $\frac{4}{6}$ (E) $\frac{5}{6}$

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

14	19	
	15	
x	11	

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

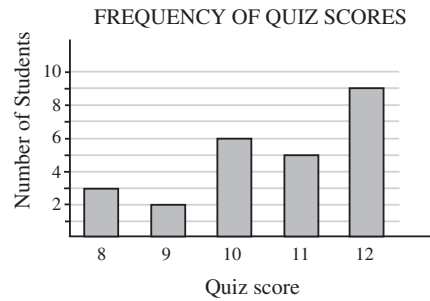


Grade 7

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



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 ?

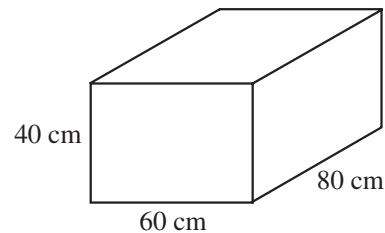
(A) 9 (B) 4 (C) 6 (D) 10 (E) 17

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) $\frac{P}{Q}$ (D) $\frac{Q}{P}$ (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 $40 \text{ cm} \times 60 \text{ cm} \times 80 \text{ cm}$?

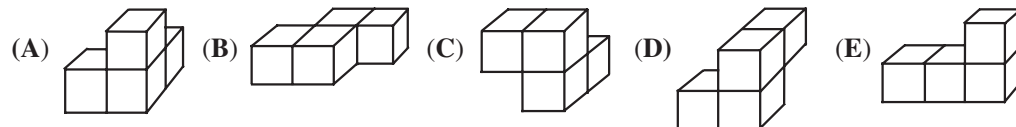
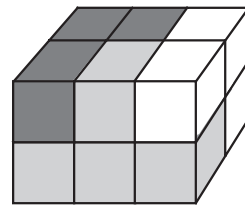
(A) 2 (B) 4 (C) 10
(D) 8 (E) 6



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?



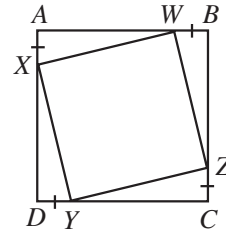
Grade 7

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 $AX = BW = CZ = DY = 2$.

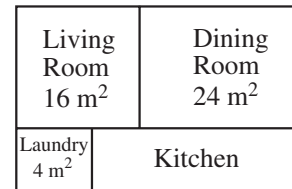
What is the area of square $WXYZ$?

- (A) 58 (B) 52 (C) 48
 (D) 40 (E) 36



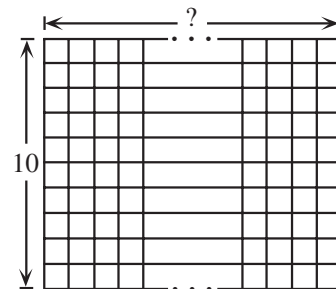
Part C: Each correct answer is worth 8.

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
 (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 ($\square\square$) 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



* * * * *

PUBLICATIONS

Please see our website <http://www.cemc.uwaterloo.ca> for information on publications which are excellent resources for enrichment, problem solving and contest preparation.



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

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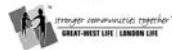
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C.M.C. Contributors:

Manulife
Financial

Time: 1 hour

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Calculators are permitted.

Instructions

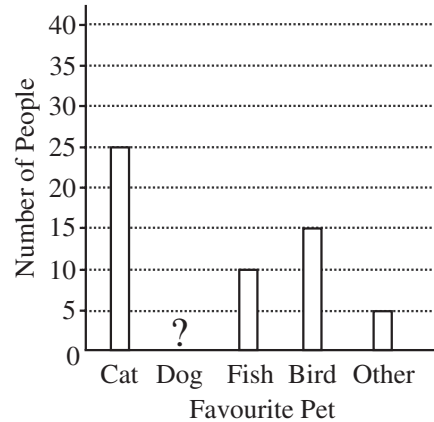
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Grade 7

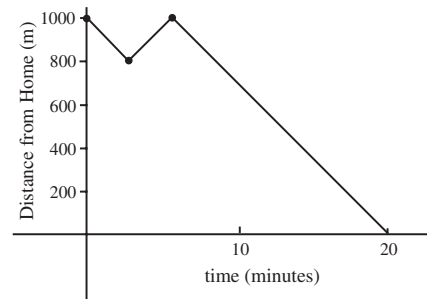
Scoring: There is *no penalty* for an incorrect answer.
Each unanswered question is worth 2, to a maximum of 10 unanswered questions.

Part A: Each correct answer is worth 5.

1. 3.26×1.5 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. $\frac{1+2+3}{4+5+6}$ 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

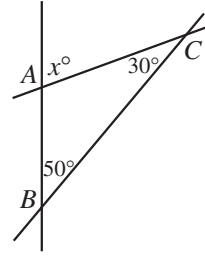


6. Travis spikes his hair using gel. If he uses 4 mL of gel every day, how many days will it take him to empty a 128 mL tube of gel?
(A) 32 (B) 33 (C) 40 (D) 30 (E) 28
7. An expression that can be placed in the box to make the equation $\frac{3 \times 6 \times 9}{3} = \frac{\square}{2}$ true is
(A) $2 \times 4 \times 6$ (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 $\angle ABC = 50^\circ$ and $\angle ACB = 30^\circ$, the value of x is
 (A) 80 (B) 30 (C) 100
 (D) 60 (E) 50

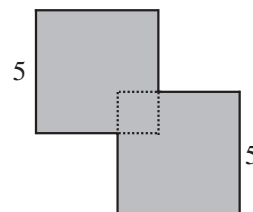


Part B: Each correct answer is worth 6.

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



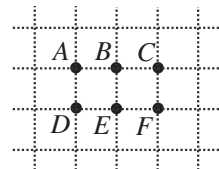
- (A) 2 (B) 3 (C) 4 (D) 8 (E) 9
12. The perimeter of a rectangular field is 3 times its length. If the perimeter is 240 m, the width of the field is
 (A) 80 m (B) 40 m (C) 20 m (D) 30 m (E) 120 m
13. Chris and Pat go on a 30 km run. They both usually run at 10 km/h. If Chris runs at $\frac{1}{2}$ his 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 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



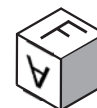
Part C: Each correct answer is worth 8.

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:

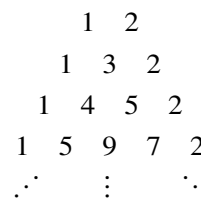


What letter belongs on the shaded face of this cube in the following diagram?

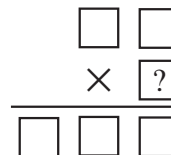
- (A) T (B) P (C) X
 (D) E (E) V



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



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



PUBLICATIONS

Please see our website <http://www.cemc.uwaterloo.ca> for information on publications which are excellent resources for enrichment, problem solving and contest preparation.



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

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Time: 1 hour

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Calculators are permitted.

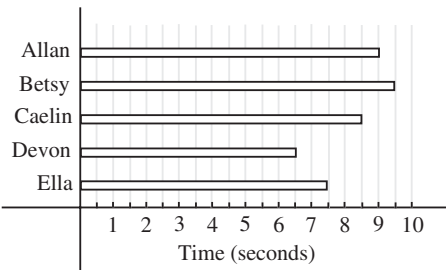
Instructions

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Grade 7

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Part A: Each correct answer is worth 5.

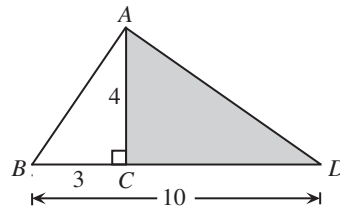
- When the numbers 8, 3, 5, 0, 1 are arranged from smallest to largest, the middle number is
(A) 5 (B) 8 (C) 3 (D) 0 (E) 1
 - The value of $0.9 + 0.99$ is
(A) 0.999 (B) 1.89 (C) 1.08 (D) 1.98 (E) 0.89
 - $\frac{2+1}{7+6}$ equals
(A) $\frac{3}{13}$ (B) $\frac{21}{76}$ (C) $\frac{1}{21}$ (D) $\frac{2}{13}$ (E) $\frac{1}{14}$
 - 20% of 20 is equal to
(A) 400 (B) 100 (C) 5 (D) 2 (E) 4
 - 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
 - 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
- 
- | Rat | Time (seconds) |
|--------|----------------|
| Allan | 9.5 |
| Betsy | 9.2 |
| Caelin | 8.5 |
| Devon | 6.5 |
| Ella | 7.5 |
- The mean (average) of the numbers 12, 14, 16, and 18, is
(A) 30 (B) 60 (C) 17 (D) 13 (E) 15
 - 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) $\frac{P}{Q}$ (D) $\frac{Q}{P}$ (E) P^Q
 - Four friends equally shared $\frac{3}{4}$ of a pizza, which was left over after a party. What fraction of a whole pizza did each friend get?
(A) $\frac{3}{8}$ (B) $\frac{3}{16}$ (C) $\frac{1}{12}$ (D) $\frac{1}{16}$ (E) $\frac{1}{8}$
 - Two squares, each with an area of 25 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



Grade 7

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.

$$1^3 = 1$$

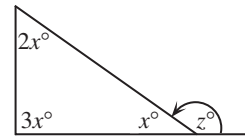
$$a^3 = 1 + 7$$

$$3^3 = 1 + 7 + b$$

$$4^3 = 1 + 7 + c$$

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

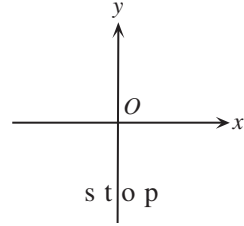


18. A perfect number is an integer that is equal to the sum of all of its positive divisors, except itself. For example, 28 is a perfect number because $28 = 1 + 2 + 4 + 7 + 14$. Which of the following is a perfect number?
 (A) 10 (B) 13 (C) 6 (D) 8 (E) 9
19. Subesha wrote down Davina's phone number 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



Grade 7

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?

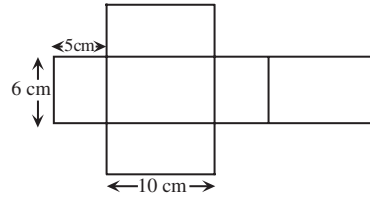


- (A) (B) (C) (D) (E)

Part C: Each correct answer is worth 8.

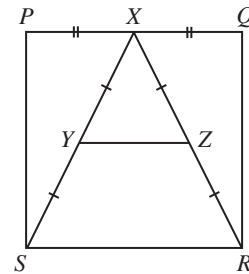
21. Five people are in a room for a meeting. When the meeting ends, each person shakes hands with each of the other people in the room exactly once. The total number of handshakes that occurs is
(A) 5 (B) 10 (C) 12 (D) 15 (E) 25

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

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Wednesday, May 16, 2001

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Time: 1 hour

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Instructions

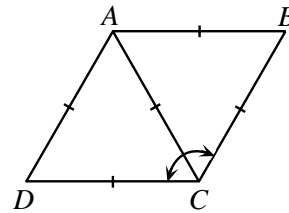
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Grade 7

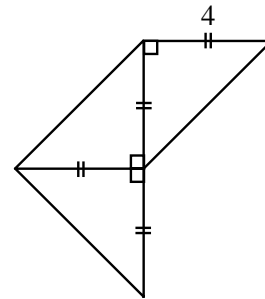
Scoring: There is *no penalty* for an incorrect answer.
Each unanswered question is worth 2, to a maximum of 20.

Part A: Each correct answer is worth 5.

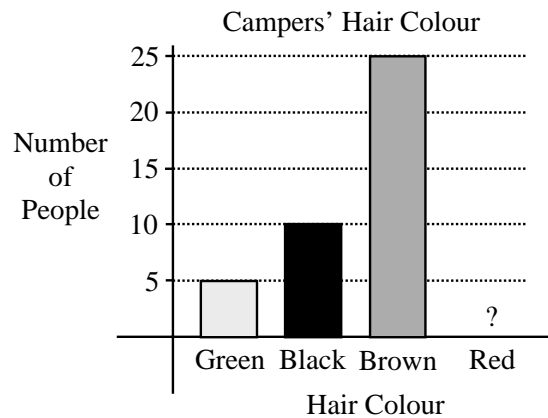
1. The largest number in the set $\{0.01, 0.2, 0.03, 0.02, 0.1\}$ is
(A) 0.01 (B) 0.2 (C) 0.03 (D) 0.02 (E) 0.1
2. In 1998, the population of Canada was 30.3 million. Which number is the same as 30.3 million?
(A) 30 300 000 (B) 303 000 000 (C) 30 300 (D) 303 000 (E) 30 300 000 000
3. The value of $0.001 + 1.01 + 0.11$ 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



Grade 7

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.

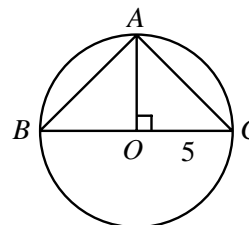
11. A fair die is constructed by labelling the faces of a wooden cube with the numbers 1, 1, 1, 2, 3, and 3. If this die is rolled once, the probability of rolling an odd number is
- (A) $\frac{5}{6}$ (B) $\frac{4}{6}$ (C) $\frac{3}{6}$ (D) $\frac{2}{6}$ (E) $\frac{1}{6}$
12. The ratio of the number 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

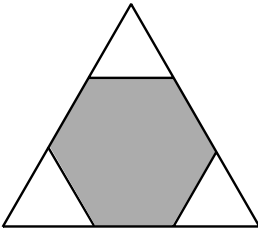
15. A prime number is called a "Superprime" if doubling it, and then subtracting 1, results in another prime number. The number of Superprimes less than 15 is
- (A) 2 (B) 3 (C) 4 (D) 5 (E) 6

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 m^2 (B) 144 m^2 (C) 36 m^2 (D) 9 m^2 (E) 56.25 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

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



PUBLICATIONS

Students and parents who enjoy solving problems for fun and recreation may find the following publications of interest. They are an excellent resource for enrichment, problem solving, and contest preparation.

COPIES OF PREVIOUS CONTESTS (WITH FULL SOLUTIONS)

Copies of previous contests, together with solutions, are available as described below. Each item in the package has two numbers. Numbers prefixed with E are English language supplies - numbers prefixed with F are French language supplies. Each package is considered as one title. Included is one copy of any one contest, together with solutions, for each of the past three years. Recommended for individuals.

Gauss Contests (Grades 7,8) E 213, F 213 \$10.00 **Pascal/Cayley/Fermat Contests** (Grades 9,10,11) E 513, F 513 \$14.00
Euclid Contests (Grade 12) E 613, F 613 \$10.00 **Descartes Contests** (Grade 13/OAC) E 713, F 713 \$10.00

PROBLEMS PROBLEMS PROBLEMS BOOKS

Each volume is a collection of problems (multiple choice and full solution), grouped into 9 or more topics. Questions are selected from previous Canadian Mathematics Competition contests, and full solutions are provided for all questions. The price is \$15.00 per volume.

Available in English only. Problems Problems Problems - Volume 1 only is currently available in French.

Volume 1 - 300 problems (Grades 9, 10, and 11) **Volume 2** - 325 problems (Grades 9, 10, and 11)
Volume 3 - 235 problems (Senior high school students) **Volume 4** - 325 problems (Grades 7, 8, and 9)
Volume 5 - 200 problems (Senior high school students) **Volume 6** - 300 problems (Grades 7, 8, and 9)

PROBLEMS AND HOW TO SOLVE THEM - VOLUME 3

This new book continues the collection of problems available for enrichment of students in grades 7 and 8. Included for each of the eight chapters is a discussion on solving problems, with suggested approaches. There are more than 179 new problems, almost all from Canadian Mathematics Competitions, with complete solutions. **The price is \$20. (Available in English only.)**

Orders should be addressed to: Canadian Mathematics Competition, Faculty of Mathematics, University of Waterloo, Waterloo, Ontario, N2L 3G1. Cheques or money orders in Canadian funds should be made payable to "Centre for Education in Mathematics and Computing". In Canada, add \$3.00 for the first item ordered for shipping and handling, plus \$1.00 for each subsequent item. No Provincial Sales Tax is required, but 7% GST must be added, and 15% HST must be added in New Brunswick, Newfoundland and Nova Scotia. Orders *outside of Canada ONLY*, add \$10.00 for the first item ordered for shipping and handling, plus \$2.00 for each subsequent item. **Prices for these publications will remain in effect until September 1, 2001.**

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Canadian Mathematics Competition

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University of Waterloo, Waterloo, Ontario

Gauss Contest (Grade 7)

(Grade 8 Contest is on the reverse side)

Wednesday, May 17, 2000

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of Canada

Time: 1 hour

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Grade 7

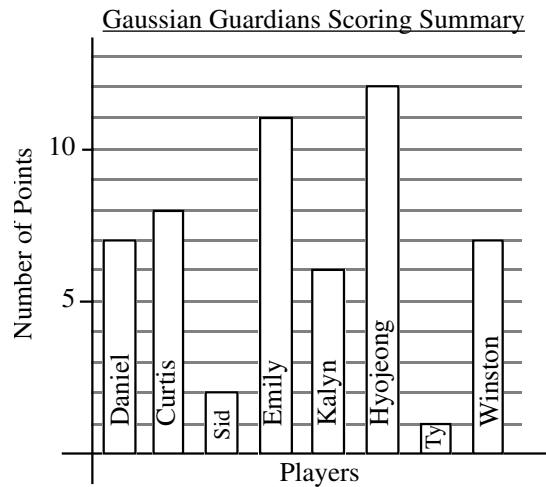
Scoring: There is *no penalty* for an incorrect answer.
Each unanswered question is worth 2 credits, to a maximum of 20 credits.

Part A (5 credits each)

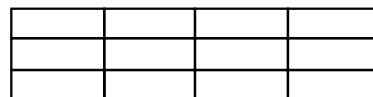
1. The value of $987 + 113 - 1000$ is
(A) 90 (B) 10 (C) 110 (D) 2000 (E) 100
2. As a decimal, $\frac{9}{10} + \frac{8}{100}$ is
(A) 1.098 (B) 0.98 (C) 0.098 (D) 0.0908 (E) 9.8
3. What integer is closest in value to $7 \times \frac{3}{4}$?
(A) 21 (B) 9 (C) 6 (D) 5 (E) 1
4. The value of the expression $5^2 - 4^2 + 3^2$ 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

$$\begin{array}{r} 863 \\ \square 91 \\ 7\square 8 \\ \hline 2182 \end{array}$$

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



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

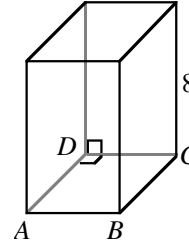


Grade 7

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



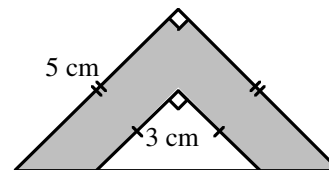
12. A recipe requires 25 mL of butter to be used along with 125 mL of sugar. If 1000 mL of sugar is used, how much butter would be required?
 (A) 100 mL (B) 500 mL (C) 200 mL (D) 3 litres (E) 400 mL
13. Karl had his salary reduced by 10%. He was later promoted and his salary was increased by 10%. If 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

		4
	4	
	3	

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

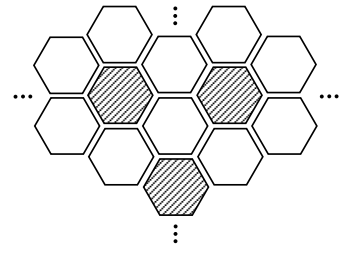
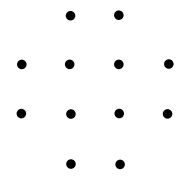


20. A dishonest butcher priced his meat so that meat advertised at \$3.79 per kg was actually sold for \$4.00 per kg. He sold 1 800 kg of meat before being caught and fined \$500. By how much was he ahead or behind where he would have been had he not cheated?
 (A) \$478 loss (B) \$122 loss (C) Breaks 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:



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Time: 1 hour

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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.

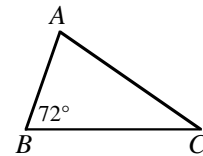
Grade 7

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

Part A (5 credits each)

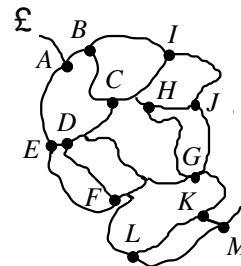
1. $1999 - 999 + 99$ equals
(A) 901 (B) 1099 (C) 1000 (D) 199 (E) 99
2. The integer 287 is exactly divisible by
(A) 3 (B) 4 (C) 5 (D) 7 (E) 6
3. Susan wants to place 35.5 kg of sugar in small bags. If each bag holds 0.5 kg, how many bags are needed?
(A) 36 (B) 18 (C) 53 (D) 70 (E) 71
4. $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8}$ 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) 9×24 (D) $96 \div 8$ (E) 9×41

6. In $\triangle ABC$, $\angle B = 72^\circ$. What is the sum, in degrees, of the other two angles?
(A) 144 (B) 72 (C) 108
(D) 110 (E) 288

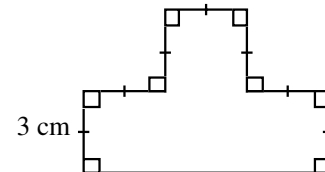


7. If the numbers $\frac{4}{5}$, 81% and 0.801 are arranged from smallest to largest, the correct order is
(A) $\frac{4}{5}$, 81%, 0.801 (B) 81%, 0.801, $\frac{4}{5}$ (C) 0.801, $\frac{4}{5}$, 81%
(D) 81%, $\frac{4}{5}$, 0.801 (E) $\frac{4}{5}$, 0.801, 81%
8. The average of 10, 4, 8, 7, and 6 is
(A) 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

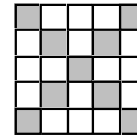


Grade 7

Part B (6 credits each)

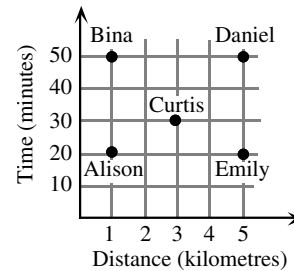
11. The floor of a rectangular room is covered with square tiles. The room is 10 tiles long and 5 tiles wide. The number of tiles that touch the walls of the room is
 (A) 26 (B) 30 (C) 34 (D) 46 (E) 50
12. Five students named Fred, Gail, Henry, Iggy, and Joan are seated around a circular table in that 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



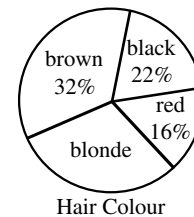
14. Which of the following numbers is an odd integer, contains the digit 5, is divisible by 3, and lies between 12^2 and 13^2 ?
 (A) 105 (B) 147 (C) 156 (D) 165 (E) 175
15. A box contains 36 pink, 18 blue, 9 green, 6 red, and 3 purple cubes that are identical in size. If a cube is selected at random, 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

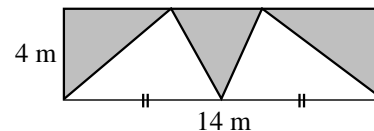


17. In a “Fibonacci” sequence of numbers, each term beginning with the third, is the sum of the previous two terms. The first number in such a sequence is 2 and the third is 9. What is the eighth term in the sequence?
 (A) 34 (B) 36 (C) 107 (D) 152 (E) 245

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



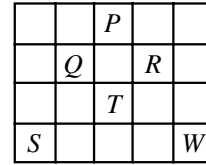
20. The first 9 positive odd integers are placed in the magic square so that the sum of the numbers in each row, column and diagonal are equal. Find the value of $A + E$.
 (A) 32 (B) 28 (C) 26
 (D) 24 (E) 16

A	1	B
5	C	13
D	E	3

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?



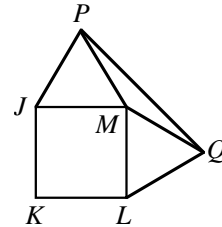
- (A) P (B) Q (C) R (D) T (E) W

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

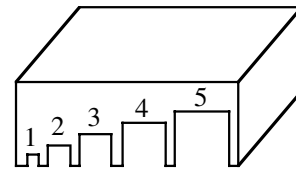
- (A) 1 (B) 2 (C) $\frac{7}{3}$ (D) 3 (E) 4

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



Anniversary
1963 – 1998

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 13, 1998

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Time: 1 hour

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Calculators are permitted.

Instructions

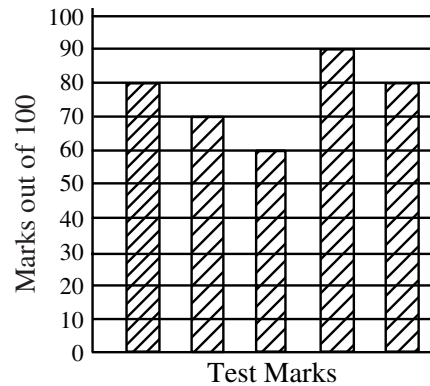
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 - Each unanswered question is worth 2 credits, to a maximum of 20 credits.
6. Diagrams are *not* drawn to scale. They are intended as aids only.
7. When your supervisor instructs you to begin, you will have *sixty* minutes of working time.

Grade 7

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

Part A (5 credits each)

1. The value of $\frac{1998 - 998}{1000}$ 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

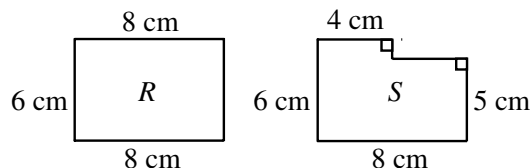


5. If a machine produces 150 items in one minute, how many would it produce in 10 seconds?
 (A) 10 (B) 15 (C) 20 (D) 25 (E) 30
 6. In the multiplication question, the sum of the digits in the four boxes is
 (A) 13 (B) 12 (C) 27
 (D) 9 (E) 22
- $$\begin{array}{r}
 879 \\
 \times 492 \\
 \hline
 \square 758 \\
 7\square 11 \\
 35\square 6 \\
 \hline
 43\square 468
 \end{array}$$
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



- (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 $\triangle \bullet \square \blacktriangle \circ$ is repeated in the sequence



The 214th figure in the sequence is

- (A) \triangle (B) \bullet (C) \square (D) \blacktriangle (E) \circ
14. A cube has a volume of 125 cm^3 . What is the area of one face of the cube?

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

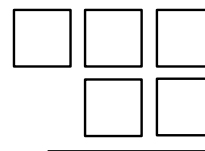
15. The diagram shows a magic square in which the sums of the numbers in any row, column or diagonal are equal. What is the value of n ?

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

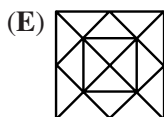
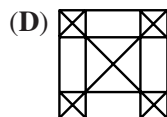
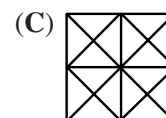
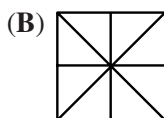
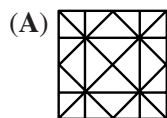
8		
9		5
4	n	

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



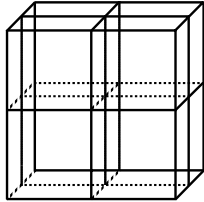
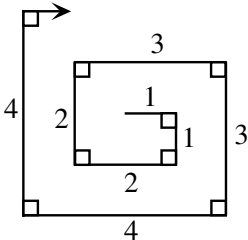
17. Claire takes a square piece of paper and folds it in half four times without unfolding, making an isosceles right triangle each time. After unfolding the paper to form a square again, the creases on the paper would look like



Grade 7

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 cm^2 (B) 800 cm^2 (C) 1200 cm^2
(D) 600 cm^2 (E) 0 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