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, 2020
(in North America and South America)

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

UNIVERSITY OF WATERLOO

Time: 1 hour   ©2020 University of Waterloo

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.

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)** $(2,4)$
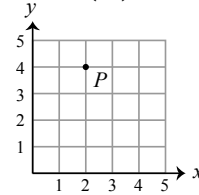
3. Which of the following integers is closest to 99×9?

    (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?

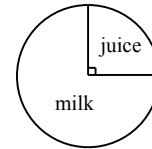   **(A)** 8   **(B)** 3   **(C)** 5   **(D)** 2   **(E)** 7

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?
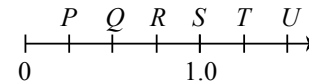
    (A) 120   **(B)** 160   **(C)** 240

    (D) 180   **(E)** 80

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

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

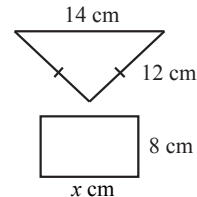8. Tick marks are equally spaced along a number line with the numbers P, Q, R, S, T, and U labelled as shown. Which of the following best represents the value of R divided by the value of U?

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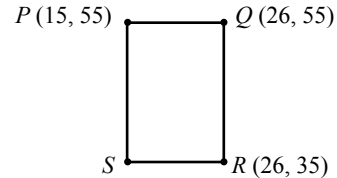
    (A) 14   **(B)** 12   **(C)** 9   **(D)** 11   **(E)** 13

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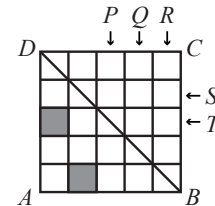
    (A) $\frac{15}{31}$ **(B)** $\frac{34}{49}$ **(C)** $\frac{15}{49}$ **(D)** $\frac{2}{7}$ **(E)** $\frac{1}{15}$

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 ● is

    (A) +   **(B)** ■   **(C)** ⊠

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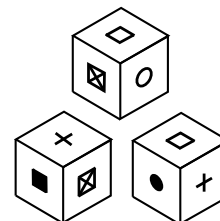
20. On the grid shown, Jane starts at dot A. She tosses a fair coin to determine which way to move. If she tosses a head, she moves up one dot. If she tosses a tail she moves right one dot. After four tosses of the coin, Jane will be at one of the dots P, Q, R, S, or T. What is the probability that Jane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

    (A) $\frac{1}{2}$ (B) $\frac{3}{8}$ (C) $\frac{9}{16}$

    (D) $\frac{7}{16}$ (E) $\frac{5}{16}$
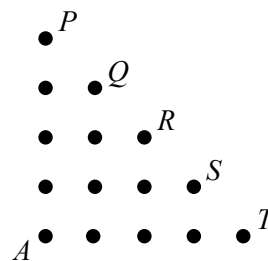
Part C: Each correct answer is worth 8.

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: $\triangle FPG$, $\triangle GPH$, $\triangle HPF$. 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
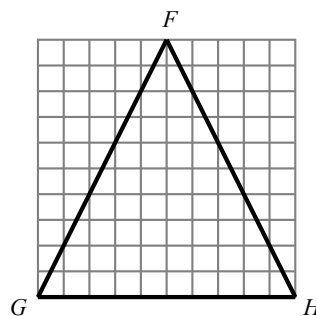
25. Every 12 minutes, Bus A completes a trip from P to X to S to X to P. Every 20 minutes, Bus B completes a trip from Q to X to T to X to Q. Every 28 minutes, Bus C completes a trip from R to X to U to X to R. At 1:00 p.m., Buses A, B and C depart from P, Q and R, respectively, each driving at a constant 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