UNIVERSITY OF NEW BRUNSWICK

UNIVERSITÉ DE MONCTON

34th NEW BRUNSWICK MATHEMATICS COMPETITION

Friday, May 13th, 2016

GRADE 9

INSTRUCTIONS TO THE STUDENT:

1. Do not start the examination until you are told to do so.

2. You are permitted to use rough paper. No other aids are necessary.

3. This is a multiple choice test. Each question is followed by five answers marked A, B, C, D, E. Only one answer is correct. When you have decided on your choice, mark the appropriate letter on your answer sheet using the pencil provided.

4. Problems are worth 3 points each in part A, 4 points each in part B, and 5 points each in part C. The penalty for incorrect answers is one quarter of the points assigned for that question. No penalty is assessed for answers which are left blank.

5. Diagrams are NOT drawn to scale. They are intended as aids only.

6. You have 60 minutes to answer the questions.

7. The use of calculators in the examination room is not allowed.

Part A

1. Which of these is **not** a prime number?

    (A) 31   (B) 41   (C) 51   (D) 61   (E) 71

2. An operation ♣ is defined such that $a \clubsuit b = a^b - b^a$. What is the value of $3 \clubsuit 2$?

    (A) -3   (B) -1   (C) 0   (D) 1   (E) 3

3. The tens digit in $\sqrt{10049}$ is?

    (A) 0   (B) 2   (C) 4   (D) 7   (E) 9

4. You are offered two plans for text messages. Plan A offers unlimited texting for $20 monthly. Plan B charges a fee of $5 monthly plus an additional charge of 5 cents for each text message. For the monthly charges to be exactly the same, how many text messages would a Plan B user need to send?

   (A) 100   (B) 200   (C) 300   (D) 400   (E) 500

5. The Principal lines up all 63 students in the Grade 9 level of a middle school. It can be seen that there are never more than 3 girls together, what is the largest possible number of girls in this Grade 9 group?

    (A) 21   (B) 28   (C) 32   (D) 39   (E) 48

6. Which of the following products would represent the number of seconds in a week?

(A) $60 \times 24 \times 7$

(B) $60 \times 60 \times 24$

(C) $60 \times 60 \times 24 \times 7$

(D) $60 \times 60 \times 60 \times 24 \times 7$

(E) none of the above

7. What is the area of the shaded region?
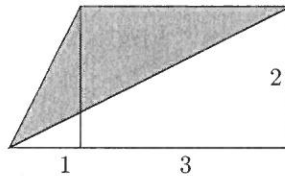
(A) 1.5   (B) 2   (C) 2.5   (D) 3   (E) 4

8. If $\frac{x-1}{x+1} = \frac{10}{14}$, what is the value of $(x + 3)$?

(A) 7   (B) 8   (C) 9   (D) 12   (E) 16

9. A 2 cm cube (2 cm x 2 cm x 2 cm) of silver is worth $40. How many dollars is a 3 cm cube (3 cm x 3 cm x 3 cm) of silver worth?

(A) 60   (B) 90   (C) 120   (D) 135   (E) 270

10. Peter's mean score on his first three math tests is 64. What does he require as his mean score on the next two math tests to bring his overall mean on the five math tests up to 70?

(A) 76   (B) 77   (C) 78   (D) 79   (E) 80

Part B

11. A square has a perimeter of P metres and an area of $2P$ square metres. If P is a positive integer, what is the value of P?

(A) 2   (B) 8   (C) 16   (D) 32   (E) 64

12. A collection of coins was shared. Mary received $\frac{1}{3}$ of the coins, Amir received $\frac{1}{5}$ of the coins, and Samita received $\frac{1}{6}$ of the coins. The remaining 36 coins were given to Troy. How many coins were in the entire collection?

(A) 84   (B) 90   (C) 108   (D) 120   (E) 144

13. A pair of numbers has a lowest common multiple of 105 and a greatest common factor of 5. Which of the following could be the sum of the two numbers?

(A) 21   (B) 25   (C) 49   (D) 50   (E) 105

14. How many odd numbers between 100 and 1000 have digits that sum to 10?

(A) 15   (B) 20   (C) 25   (D) 30   (E) 35

15. The even positive integers are multiplied together, as in $2 \times 4 \times 6 \times \cdots \times n$, where n is some even integer. What is the smallest value of n for which this product is divisible by 2016?

(A) 12   (B) 14   (C) 18   (D) 24   (E) 28

16. Four numbers add up to 58. The following amounts are all equal to one another: the first number plus 1; the second number minus 2; the third number multiplied by 3; and the fourth number divided by 4. What is the second number?

    (A) 7   (B) 8   (C) 9   (D) 10   (E) 11

17. A car travels from one town to another at an average speed of 60 kilometres per hour and then returns along the same road at an average speed of 30 kilometres per hour. What is the average speed in kilometres per hour that the car travels over the entire trip?

    (A) 40   (B) 42   (C) 45   (D) 48   (E) 50

18. In the sequence 2016, 2013, 2005, 2002, 1994, 1991, ..., every number except for 2016 and 2013 is 11 less than some other number in this sequence. Which of these numbers will appear in the sequence?

    (A) 1   (B) 2   (C) 3   (D) 5   (E) 8

19. The large equilateral triangle below is broken into 9 smaller equilateral triangles, as shown. How many parallelograms appear in the diagram?
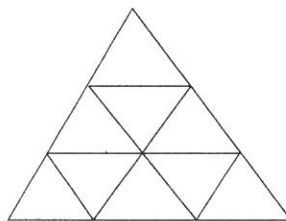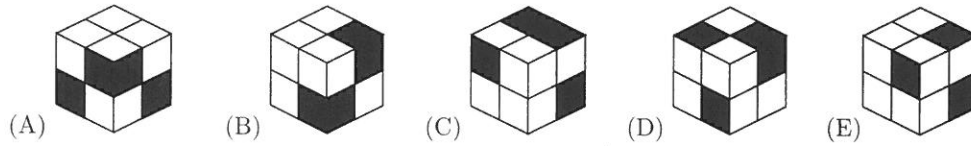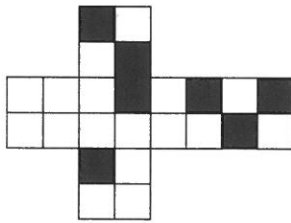

    (A) 8   (B) 10   (C) 12   (D) 13   (E) 15

20. Patrick rolls a standard six-sided die and Caroline rolls another standard six-sided die. What is the probability that the amounts rolled have a difference of 1?

    (A) $\frac{1}{6}$ (B) $\frac{1}{4}$ (C) $\frac{5}{18}$ (D) $\frac{1}{3}$ (E) $\frac{5}{12}$
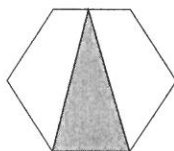
Part C

21. Which of the cubes shown could be made from this net?

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

22. Let K be the smallest positive integer that has digits that sum to 2016. What is the sum of the digits in the number $(K + 5)$?

(A) 5   (B) 6   (C) 8   (D) 9   (E) 12

23. What fraction of the area of the regular hexagon is the shaded triangle?

(A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{3}{8}$ (D) $\frac{2}{5}$ (E) $\frac{5}{12}$

24. If all blips are blops and some blups are blips, which of the statements X, Y, Z *must* be true?

X: All blips are blups.
Y: Some blops are blups.
Z: Some blips are not blups.

(A) X only   (B) Y only   (C) Z only   (D) X and Y (E) Y and Z

25. Two walkers depart at sunrise, each moving at a constant speed. One person is going from point A to point B and the other from point B to point A. They pass each other at noon without stopping. If the first walker arrives at B at 4:00 pm and the second walker arrives at A at 9:00 pm, at what time was sunrise that day?

(A) 5:00 am   (B) 5:30 am   (C) 6:00 am   (D) 6:30 am   (E) 7:00 am

26. A coin is tossed at most six times and the result recorded as H (Heads) or T (Tails) on each toss. Heads is declared the winner (and the game ends) if three H's appear consecutively or if at any time the number of H's is three more than the number of T's. (Note that the game only ends after six tosses or if H wins in less than six tosses.) Each possible sequence defines a different game. For example, two possible winning games for Heads would be THHH and HHTHH. *Including the two possible games listed,* how many possible winning games for Heads are there?

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