

UNIVERSITY OF NEW BRUNSWICK

UNIVERSITÉ DE MONCTON

**37th NEW BRUNSWICK
MATHEMATICS COMPETITION**

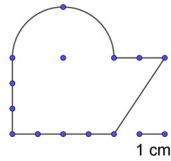
Friday, May 10th, 2019

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 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.

8. What is the perimeter, in centimeters, of the figure shown below? The curved part is a semi-circle.



- (A) $9 + 2\pi + \sqrt{10}$ (B) $9 + 2\pi + \sqrt{13}$ (C) $14 + 2\pi$ (D) $9 + 4\pi + \sqrt{10}$ (E) $9 + 4\pi + \sqrt{13}$
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9. What is the next term of the sequence 1, 3, 7, 15, 31, ... ?

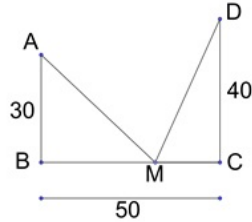
- (A) 39 (B) 47 (C) 55 (D) 63 (E) 127
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10. Three numbers are said to be related if the product of the first two is equal to the sum of the last two. For example the three numbers of the triple (3, 4, 8) are related because $3 \times 4 = 4 + 8$. Which of the following triples does not contain three related numbers ?

- (A) (2, 3, 3) (B) (2, 5, 5) (C) (3, 3, 6) (D) (4, 5, 15) (E) (4, 6, 20)
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Part B

11. Points B, M and C are on the same straight line. If the two triangles $\triangle MBA$ and $\triangle MCD$ are right angled and the two hypotenuses AM and DM have the same length, then the length of the segment BM is :



- (A) 18 (B) 22 (C) 32 (D) 36 (E) 40
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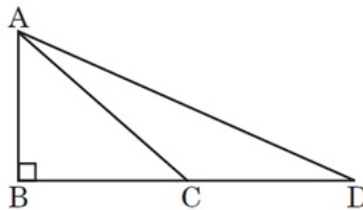
12. Some boys and girls go to pick apples. The boys pick as many apples per bag as they have bags; and the girls also pick as many apples per bag as they have bags, but three apples per bag less than the boys. At home, the apples are placed in a large basket and the total number of apples is 117. How many bags did the boys have?

- (A) 5 (B) 9 (C) 13 (D) 15 (E) 17
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13. Two planes depart at 9 am from cities A and B located 4,500 km apart. The first plane goes from A to B. Its speed is 1,100 km/h. The second plane goes from B to A. Its speed is 900 km/h. At what time do they meet?

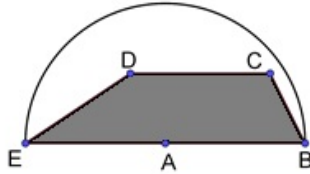
- (A) 11 am (B) 11:15 am (C) 11:30 am (D) 11:45 am (E) noon
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14. If $AB = 12$, $AC = 13$ and $AD = 15$, what is the area of the triangle $\triangle ACD$?



- (A) 24 (B) 34 (C) 44 (D) 54 (E) 64
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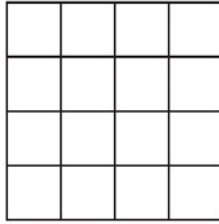
15. The coordinates of the points in the figure below are $A : (0, 0)$, $B : (4, 0)$, $C : (3, 2)$, $D : (-1, 2)$ and $E : (-4, 0)$. The radius of the semi-circle is 4. What is the area of the white region inside the semi-circle?



- (A) $8\pi - 16$ (B) $8\pi - 12$ (C) $8\pi - 8$ (D) $16\pi - 16$ (E) $16\pi - 12$
-
16. Claude owns 55 movies in DVD format. He has suspense movies, action movies and romance movies. He has 5 more suspense movies than action movies and 3 times fewer action movies than romance movies. How many action movies does he have?
- (A) 10 (B) 15 (C) 20 (D) 25 (E) 30
-
17. Paul rides a bicycle for 9 hours. His speed is 30 km/h on the first third of the total distance, 20 km/h on the second third and 15 km/h on the final third. Find the distance traveled in kilometers by Paul.
- (A) 150 (B) 180 (C) 200 (D) 220 (E) 240
-
18. Lina wants to arrange a certain number of tokens in a square (for example with 9 tokens she can make a square of 3 by 3). In trying to form a first square, she realizes that there are 14 tokens left. She then tries to make a second square by putting one more token per side. She then has 11 too few tokens. How many tokens did Lina have at the start?
- (A) 128 (B) 138 (C) 148 (D) 158 (E) 168
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19. Ed writes all the numbers from 1 to 100 one after the other (12345 ... 9899100). How many even digits has he written? (0, 2, 4, 6 and 8 are the even digits)
- (A) 88 (B) 90 (C) 91 (D) 92 (E) 96
-
20. A tank is filled by two faucets. Using the first faucet, it fills up in 4 hours. Using the second faucet, it fills up in 6 hours. You open the two faucets at the same time. If the tank is already half filled, how long, in minutes, will it take to fill?
- (A) 72 (B) 75 (C) 90 (D) 120 (E) 144
-

Part C

21. How many rectangles (including squares) are in the following figure?



- (A) 60 (B) 80 (C) 96 (D) 100 (E) 105
-

22. How many numbers from 1 to 201 are multiples of six or eight but not both?

- (A) 42 (B) 46 (C) 50 (D) 54 (E) 58
-

23. In a magic square, when you add up all the numbers in a row, a column, or a diagonal, you always get the same result. The square below is magic and contains all the natural numbers from 1 to 16. We have already placed some of them.

What should the number in the shaded box be?

7	12	1	14
	13		11
	3		
9			

- (A) 4 (B) 5 (C) 6 (D) 10 (E) 15
-

24. Two dimes with a nickel or five nickels give you two distinct ways of having a sum of 25 cents. In how many distinct ways can you have a sum of 1 dollar using nickels, dimes and quarters?

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

25. What is the last digit of 2019^{10} ?

- (A) 1 (B) 3 (C) 5 (D) 7 (E) 9
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26. How many 3-digit numbers can you form which have only two different digits? For example, 636 is a 3-digit number which has only two different digits.

- (A) 180 (B) 243 (C) 252 (D) 324 (E) 729
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