

UNIVERSITY OF NEW BRUNSWICK

UNIVERSITÉ DE MONCTON

**38th NEW BRUNSWICK
MATHEMATICS COMPETITION**

Friday May 12th, 2023

GRADE 8

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. What is the value of $10 - (9 - 8) - (7 - 6) - (5 - 4) - (3 - 2) - (1 - 0)$?

- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5
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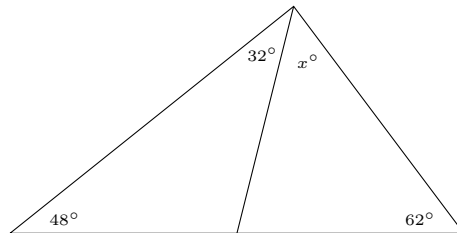
2. What is the value of 10 divided by 0.5?

- (A) 2 (B) 5 (C) 20 (D) 50 (E) 200
-

3. Today is Friday. What day of the week will it be 40 days from today?

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

4. In the triangle shown, what is the value of x ?



- (A) 28 (B) 38 (C) 48 (D) 58 (E) 68
-

5. Which of these fractions is equivalent to $\frac{3}{4}$?

- (A) $\frac{4}{5}$ (B) $\frac{76}{101}$ (C) $\frac{27}{36}$ (D) $\frac{36}{44}$ (E) $\frac{4}{3}$
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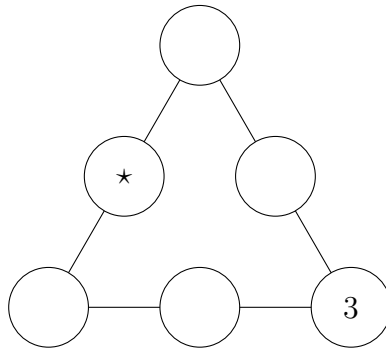
6. Doubling the length of all sides of a square would increase the perimeter by 36 cm. What is the perimeter of the original square?

(A) 18 cm (B) 24 cm (C) 36 cm (D) 72 cm (E) 81 cm

7. Which of these expressions is equal to $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$?

(A) $2 \times 4 \times 6 \times 9$ (B) $8 \times 9 \times 9$ (C) $4 \times 4 \times 9$ (D) 12×12 (E) 8×27

8. The numbers 1, 2, 4, 5, and 6 must each be placed once in the open circles so that the sum of the numbers along each side of the triangle equals 9. Which number must be placed where the \star appears?



(A) 1 (B) 2 (C) 4 (D) 5 (E) 6

9. Which of these is not a prime number?

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

10. Which of these sets of three side lengths could be the lengths of a right triangle?

(A) 2, 3, 4 (B) 3, 4, 5 (C) 4, 5, 6 (D) 5, 6, 7 (E) 6, 7, 8

17. Mary has a bag that contains marbles that are red or blue or green. The total number of red marbles and blue marbles is 19. The total number of blue marbles and green marbles is 22. The total number of red marbles and green marbles is 29. How many marbles are in Mary's bag?

(A) 32 (B) 35 (C) 41 (D) 51 (E) 70

18. A Latin square is a square array where each letter in the square appears in each row and each column exactly once. For example,

A	C	B	D
B	A	D	C
D	B	C	A
C	D	A	B

What letter goes in the space marked by \star when the following Latin square is complete?

A	B	C		D	
B	E		F	A	
	C	F	A		
E	A		C		
		A		B	
F					\star

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

19. Two identical fair coins are tossed. What is the probability that one coin lands heads and the other coin lands tails?

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

20. We can write the positive integers in an ever expanding square-shaped spiral as follows ...

21	22	23	24	25	26
20	7	8	9	10	27
19	6	1	2	11	28
18	5	4	3	12	29
17	16	15	14	13	30
			...	32	31

The number 8 appears directly under 23, and the number 33 will appear directly under 14.
What number will appear directly under 81?

- (A) 50 (B) 80 (C) 82 (D) 99 (E) 116
-

Part C

21. The area of a circle is $\pi \times r \times r$ square units where r is the radius of the circle. The ratio of the area of a small circle to the area of a large circle is 1 : 4. If the small circle has a *diameter* of 10 cm, what is the circumference (in cm) of the large circle?

- (A) 20π (B) 40π (C) 60π (D) 80π (E) 100π
-

22. All 30 students in a sports club play at least one of volleyball or basketball. When the sports club members are surveyed, it is found that 23 play basketball and 19 play volleyball. How many of these students play only basketball (and not volleyball)?

- (A) 4 (B) 7 (C) 11 (D) 12 (E) 18
-

23. A sequence of positive integers starts with a number. Each subsequent number is the largest integer less than or equal to one-third of the previous number. The sequence ends when it reaches 1 or 2.

For example, a sequence with a starting number of 100 would go 100, 33, 11, 3, 1.

A sequence with a starting number of 22 would go 22, 7, 2.

Which of the following starting numbers produces a sequence ending with 1?

- (A) 63 (B) 64 (C) 71 (D) 80 (E) 81
-

24. How many two-digit numbers meet both of the following requirements?

- The digit 0 is not in the number.
- The product of the two digits is a perfect square.

(A) 9 (B) 11 (C) 13 (D) 15 (E) 17

25. The multiples of 12 are written in a string, as shown:

12243648...

How many times does the digit 0 appear in the first 125 digits of this string?

(A) 12 (B) 13 (C) 14 (D) 15 (E) 16

26. Consider a cube of surface area S . Identical cubes, each of surface area S are attached to each face of the original cube so that the faces touch and corners align. What is the surface area of this new solid?

(A) $3S$ (B) $5S$ (C) $6S$ (D) $7S$ (E) $8S$

Scrap Paper

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