## Math Kangaroo Lebanon 2025

## Student: Grade 11 and Grade 12

Saturday, March 22, 2025

Duration: 75 minutes

| Full Name:     |  |
|----------------|--|
| School Name:   |  |
| Class:         |  |
| Date of Birth: |  |
|                |  |

Please write the letter (A, B, C, D, E) of the correct answer in the square under the question number. Write clearly and carefully!

| A1 | A2 | A3 | A4 | A5 | A6 | Α7 | A8 | A9 | A10 |
|----|----|----|----|----|----|----|----|----|-----|
|    |    |    |    |    |    |    |    |    |     |

| B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | B10 |
|----|----|----|----|----|----|----|----|----|-----|
|    |    |    |    |    |    |    |    |    |     |

| C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 |
|----|----|----|----|----|----|----|----|----|-----|
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Year 11 and 12 (English Version)

Saturday, March 22nd 2025

Time allowed: 75 minutes

- 1. For each question exactly one of the 5 options is correct.
- Each participant is given 30 points at the beginning. For each correct answer 3, 4 or 5 points are added. No answer means 0 points are added. If a wrong answer is given, one quarter of the points is subtracted, i. e. 0.75 points, 1 point or 1.25 points, respectively. At the end, the maximum number of points is 150, the minimum is 0.
- 3. Calculators and other electronic devices are not allowed.

3 point problems

A1 Which of the following fractions has the largest value?



- **A9** Two normal 6-sided dice are rolled at the same time and their scores are multiplied together. What is the probability of obtaining a result that is a prime number?
  - (A)  $\frac{1}{3}$  (B)  $\frac{1}{4}$  (C)  $\frac{1}{5}$  (D)  $\frac{1}{6}$  (E)  $\frac{1}{7}$

A10 Johanna's favourite cereal bars come in packets. Each packet used to contain 5 bars. Now each packet only contains 4 bars, but the packet still costs the same. By what percentage has the price per bar increased?

(**A**) by 10% (**B**) by 15% (**C**) by 25% (**D**) by 30% (**E**) by 40%

4 point problems

**B1** On a coordinate grid, some points in the region where  $0 \le x \le 1$  and  $0 \le y \le 1$  are painted black. The point (x, y) is painted black if for both x and y the first digit after the decimal point is odd. What does the result look like?



 $(\mathbf{D}) D$ 

- **B2** Let *M* be the largest of 10 different positive integers of which exactly 5 are divisible by 5 and exactly 7 are divisible by 7. What is the smallest possible value of *M*?
  - (**A**) 105 (**B**) 77 (**C**) 75 (**D**) 70 (**E**) 63
- **B3** Robert removes one of the five marked points *A*, *B*, *C*, *D*, *E* from the grid. The 6 distances between any 2 of the 4 remaining points are all different lengths. Which point did Robert remove?

(**C**) *C* 

(**A**) *A* 

(**B**) *B* 

**B4** Four circular discs with radii  $r_1$ ,  $r_2$ ,  $r_3$  and  $r_4$  are centred at 0, 1, 3 and 6, respectively. The discs may touch but not overlap.

What is the largest possible value of  $r_1 + r_2 + r_3 + r_4$ ?

(**E**) *E* 

Ω



Α

С

D

Ε

∫ x

- (A) 3 (B) 4 (C) 5 (D) 7 (E) 9 A square piece of card has side length 2. A square of side length x is cut
- **B5** A square piece of card has side length 2. A square of side length x is cut from each corner of the card, leaving a cross as shown. The area of the cross is given by the function A(x). What does the graph of A(x) look like?



**B6** How many 5-digit numbers of the form A18AA are divisible by 18? (A) one (**B**) two (**C**) three (**D**) four (E) five **B7** On a  $4 \times 4$  chessboard there are 16 kangaroos, one in each square. On each turn, all of the kangaroos jump to a neighbouring square: up, down, left or right. All kangaroos stay on the board. There can be several kangaroos on any square. After 10 turns, what is the largest possible number of empty squares? (**A**) 15 (**B**) 14 (**C**) 13 (**D**) 12 (E) 11 **B8** What is the smallest positive integer N such that  $\sqrt{2 \times \sqrt{3 \times \sqrt{N}}}$  is an integer? R (A)  $2^6 \times 3^6$  (B)  $2^2 \times 3^8$  (C)  $2^4 \times 3^{10}$  (D)  $2^6 \times 3^8$  (E)  $2^4 \times 3^6$ **B9** The diagram shows a quarter-circle with radius r and a right-angled triangle. The two grey regions have the same area. What is the length of OR? (A)  $\frac{\pi r}{2}$  (B)  $\frac{3r}{2}$  (C)  $\pi r$  (D)  $\frac{\pi^2 r}{6}$  (E)  $\sqrt{3}r$ Ρ 0 **B10** When grandma started knitting woollen baby socks, she had a huge ball of wool with a diameter of 20 cm. After finishing 14 socks, she still has a ball of wool with a diameter of 10 cm. How many more socks can grandma knit with the wool that is left? (**A**) 8 (**C**) 4 (**E**) 2 **(B)** 6 (**D**) 3 5 point problems C1 Jawad wrote a small computer program, which returns the sum and the positive difference of two numbers and repeats the program for the results. He wants to find out how the numbers develop. He starts the program with the numbers 5 and 3. After the first iteration, the results are 8 and 2. Which two numbers does he get after the 50<sup>th</sup> iteration? (A)  $5 \times 2^{25}$  and  $3 \times 2^{25}$  (B)  $5^{25}$  and  $3^{25}$ (D)  $5^{26}$  and  $3^{26}$  (E)  $2 \times 5^{25}$  and  $2^{25}$ (**B**)  $5^{25}$  and  $3^{25}$ (**E**)  $2 \times 5^{25}$  and  $2 \times 3^{25}$ (**C**)  $2^{28}$  and  $2^{26}$  $(\mathbf{D}) 5^{26}$  and  $3^{26}$ **C2** Three aliens from Mars,  $M_1$ ,  $M_2$  and  $M_3$ , and three aliens from Jupiter,  $J_1$ ,  $J_2$  and  $J_3$ ,  $M_1$ sit around a table as shown. All the aliens from one planet only tell the truth and all  $M_3$ No the aliens from the other planet only tell lies. One of the six aliens has the key to their shared spaceship. To the question: "Does one of the aliens sitting next to you have the Yes key?"  $J_1$ ,  $M_1$  and  $M_3$  answer "No" and the rest of the aliens answer "Yes".  $M_2$ Who has the key? (**A**)  $J_1$  (**B**)  $J_2$  (**C**)  $J_3$ (**D**)  $M_1$  $(E) M_{2}$ G C3 On a semicircle with diameter AD, points B and C lie on the diameter and Ε Н

points E, F, G and H lie on the arc of the semicircle. How many different triangles can be formed with their vertices at 3 of these 8 points?

(**C**) 50 (**A**) 48 (**B**) 49

(E) 54

(**D**) 52

Č

D

B

Α



4

C8 The diagram shows a regular hexagon ABCDEF. Point P lies on BC so that the

**C4** The area of the grey semicircle is  $12 \text{ cm}^2$ . What is the area of the big quarter circle?

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