

9th World Mathematics Team Championship 2018

Intermediate Level Individual Round 1

English Version

Instruction: This round has 15 questions (**20 minutes**).

Each question is worth 2 points. No point penalty for submitting wrong answer.

Blank answer will be assigned 0.5 point.

1. The number of positive integer divisors of 38808 equals:

- A) 144 B) 72 C) 36 D) 108 E) 180

2. Find x if $2^{x+1} \cdot 4^{x+2} \cdot 8^{x+3} = 16^{x+4}$.

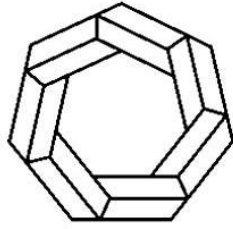
- A) 1 B) 6 C) 3 D) 2 E) 5

3. If $\left(1 - \frac{1}{2^2}\right) \cdot \left(1 - \frac{1}{3^2}\right) \cdots \left(1 - \frac{1}{100^2}\right) = \frac{a}{b}$ where a and b are relatively prime integers,

find $a + b$.

- A) 200 B) 300 C) 301 D) 302 E) 103

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4. Find $\frac{1+\sqrt{12}}{1-\sqrt{12}} + \frac{\sqrt{48}}{\sqrt{121}} + \frac{2}{11}$.

- A) 3 B) -2 C) $\sqrt{3}$ D) -1 E) $2\sqrt{3}$

5. Let O be the intersection point of the diagonals AC and BD of quadrilateral $ABCD$.

If $S_{ABO} = 35 \text{ cm}^2$, $S_{BCO} = 42 \text{ cm}^2$ and $S_{CDO} = 48 \text{ cm}^2$, find S_{ADO} .

- A) 28 cm^2 B) 32 cm^2 C) 40 cm^2 D) 48 cm^2 E) 56 cm^2

6. If $(a+bx)^3 + (a-bx)^3 = -16 - 108x^2$, find $a^2 + b^2$.

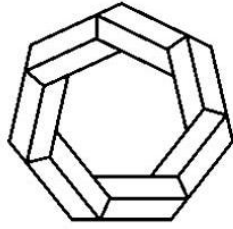
- A) 5 B) 8 C) 10 D) 13 E) 25

7. Find the shortest altitude of a triangle with side lengths 13 cm, 20 cm and 21 cm.

- A) 8 cm B) 9 cm C) 10 cm D) 11 cm E) 12 cm

8. The number of 3-digit numbers divisible by 7 but not divisible by 3 equals:

- A) 87 B) 90 C) 88 D) 91 E) 85



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9. Consider all words composed by two letters a and b . Find the length of the longest word w such that none of aba , aab , abb , $aaaa$ and $bbbb$ is a sub word of w .

- A) 5 B) 6 C) 7 D) 10 E) 2018

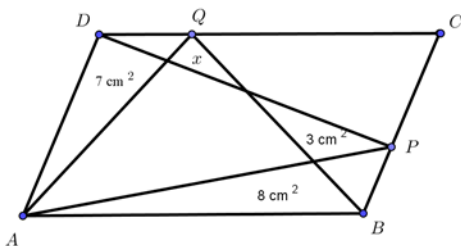
10. The least value of $2x^4 - 2x^2y^2 + y^4 - 8x^2 + 20$ equals:

- A) 2 B) 6 C) 4 D) 8 E) 3

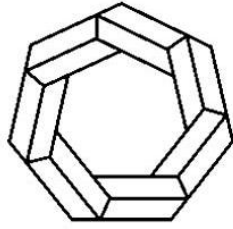
11. Find $2018^3 - 2019^3 + 1 + 3 \times 2018 \times 2019$.

- A) 0 B) 2018^2 C) 2019^2 D) 3 E) 2018

12. Points P and Q lie on the sides BC and CD of a parallelogram $ABCD$. The areas of three of the regions are shown on the picture. Find x (the area of the corresponding region).



- A) 1 cm^2 B) 2 cm^2 C) 3 cm^2 D) 4 cm^2 E) 5 cm^2



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13. The remainder when $3 - 3^2 + 3^3 - 3^4 + \dots - 3^{2016} + 3^{2017} - 3^{2018}$ is divided by 60 equals:
- A) 8 B) 10 C) 2 D) 54 E) 12
14. If $A = \frac{(2^1 + 3^1)(2^2 + 3^2)(2^4 + 3^4)(2^8 + 3^8)(2^{16} + 3^{16})(2^{32} + 3^{32})}{3^{60}}$, find the closest integer to A .
- A) 84 B) 80 C) 90 D) 81 E) 79
15. Find the sum of all prime divisors of $10^3 + 11^3 + \dots + 20^3$.
- A) 30 B) 33 C) 36 D) 37 E) 38