ASMOPSS THAILAND 2026

Asian Science & Mathematics Olympiad for Primary and Secondary Schools (Thailand)

Mathematics Secondary G.12

Sunday, August 9, 2026

8:30 – 10:00 a.m. (90 minutes)

$$\sum x^2$$

B

Instructions

1. This exam includes 25 questions, with a total score of 100.
2. Fill out your name, grade, school, test center, room, seat number, and identification number either in pen or in pencil.
3. Use a 2B black pencil or darker one to fill in the circles corresponding to your answer written at the top.
4. Use a pen or a pencil to write your answer in the box at the top of the column.
5. If you want to change an answer that you have already marked, use a clean eraser to erase the incorrect answer and mark the new one.
6. It should be noted that figures in the exam are not drawn to scale.
7. Dictionaries, calculators, and electronic devices are not permitted in the test room.
8. Note taking can be done on the test paper only, with no extra sheet provided.
9. If the answer is a number that is more than 3-digit number or decimal number, please answer as the following pattern:
   - 9.1 If the answer is more than 3-digit number, then answer the last 3 digits.
   - 9.2 If the answer is more than two decimal places, then round the answer to the nearest hundredth.
10. Do not write anything or make any symbols in the black barcode area along the edge of the paper except the answers on the answer sheet. Make sure the answersheet is not crumpled.
11. Submit the answer sheet to the proctor when the time is up.
12. Cheating in the exam may cause serious consequences including disqualification from receiving any award or joining the second round of the test held by ASMOPSS THAILAND.

Should any disagreement arise, the judgment of the panel is deemed final.

Announcement of the results via https://asmopssthailand.com on September 18, 2026

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1. Let $n(A)$ denote the number of elements in set A, where $19 \le n(A) \le 25$. Find the sum of all possible remainders when the number of elements in the power set, $n(P(A))$, is divided by 10. (2.5 points)

2. Let a_n be an arithmetic sequence such that $a_4 + a_{21} + a_{23} = 50$, and let b_n be a geometric sequence such that $b_3 \cdot b_4 \cdot b_{11} = 9,261$. Find the value of $a_{16}\, b_6$. (2.5 points)

3. Let $B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}, C = \begin{bmatrix} 6 & -5 \\ 3 & -1 \end{bmatrix}$ and $D = \begin{bmatrix} -8 & -1 \\ -9 & 5 \end{bmatrix}$. If $B = C + D^T$, determine the sum of the squares of all entries in matrix B. (2.5 points)

4. Let $\vec{A}$ be a unit vector and $\vec{B} = 3\hat{i} - \frac{2}{5}\hat{j} + t\hat{k}$, where t is a constant. If $\left|\vec{A} \cdot \vec{B}\right|^2 + \left|\vec{A} \times \vec{B}\right|^2 = 14$, determine the value of $|t|$. (2.5 points)

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5. Given that $2x^2 - 10x + 2 = 0$, find the value of $x^4 - 10x^3 + 15x^2 + 50x + 56$. (2.5 points)

6. Given $x = \log a - \log\left(a^2 + a\right) + \log\left(a^2 + 3a + 2\right) - \log\left(a^2 + 5a + 6\right) + \log\left(a + 3\right)$ and $y = \dfrac{\sqrt{42 - 10\sqrt{17}} + \sqrt{33 + \sqrt{1088}}}{3}$, find the value of $\dfrac{y - x}{y + x}$. (2.5 points)

7. A shooter has a probability of 0.9 of hitting the target on each shot, where all shots are independent. If k the probability that the shooter misses the target for the second time on the fifth shot, determine the value of $1,000k$. (2.5 points)

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8. A circle has its center $C\left(3,k\right)$ on the line $2x+y=11$. If the circle passes through the points $A\left(-1,2\right)$ and $B\left(8,5\right)$, determine the area of triangle ABC. (4.5 points)

9. Let $f\left(x\right)=\left(\tan 3x\tan x+1\right)\left(4\cos^2 x-3\right)$ for all real numbers x such that the function $f\left(x\right)$ is defined. Determine the maximum value of $f\left(x\right)$. (4.5 points)

10. Let $f=\left\{\left(x,y\right)\middle| y=\log\left(x^2+3x-1\right)-\log\left(2-x\right)+\dfrac{\sqrt{x+8}}{x}\right\}$ and $g=\left\{\left(x,y\right)\middle| y=2-3^x\wedge x\geq 0\right\}$. If $A=\left\{z\in I\middle| z\in D_f\cap R_g\right\}$. Determine the value of $n\left(A\right)$. (4.5 points)

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11. Let $f\left(x\right)=x^2-10x+25$. Suppose L_1 is the tangent line to the curve $f\left(x\right)$ at $x=3$. Let L_2 be the tangent line to the curve $f\left(x\right)$ at $x=9$. Determine the area of the region bounded by the curve $f\left(x\right)$ and the tangent lines L_1 and L_2. (4.5 points)

12. Given $f\left(x\right)=x^2+\sqrt{x}$, find the value of $\lim\limits_{h\to0}\dfrac{f\left(x+h\right)-f\left(x-h\right)}{h}$ at $x=1$. (4.5 points)

13. Let $ABCD$ be a parallelogram. Let M be the midpoint of BC. Points P and N lie on CD and AD respectively, with the ratio $\dfrac{CP}{CD}=\dfrac{2}{3}$ and $\dfrac{AN}{AD}=\dfrac{1}{5}$. Let Q be the midpoint of the line segment MN. Given $\overrightarrow{AD}=\vec{u},\overrightarrow{AB}=\vec{v}$ and $\overrightarrow{PQ}=a\vec{u}+b\vec{v}$, determine the value of $3b-5a$. (4.5 points)

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14. In the ASMOPSS mathematics competition, the test scored are normally distributed. It found that 22.66% of the students scored less than 57.5 points, and 6.68% of the students scored more than 80 points. Determine the coefficient of variation for these test scores.

Z	-2.66	-0.75	0.66	1.50
Area to the left of Z	0.0039	0.2266	0.7454	0.9332

(4.5 points)

15. A data set consists of $40,\ 43,\ 30,\ 35,\ 38,\ 35,\ 54,\ 40,\ 33,\ 29,\ 39,\ 40$. Given the following assigned numbers for each statistical value:

- Number 1: Mean
- Number 2: Median
- Number 3: Mode

Arrange the corresponding numbers of these statistical values in ascending order.

(For example: Enter 231 if Median < Mode < Arithmetic Mean.) (4.5 points)

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16. Let $A=\begin{bmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{bmatrix}$ and $B=\begin{bmatrix} a_1 & a_2 & a_3 \\ c_1 & c_2 & c_3 \\ 2b_1+2c_1 & 2b_2+2c_2 & 2b_3+2c_3 \end{bmatrix}$. Given that $|A|=-2$, determine $\det\left(A^2B^{-1}+A+BAB^{-1}+B\right)$. (6 points)

17. Determine the truth values of the propositions p, q, r and s based on the following conditions:

p is the truth value of the propositions "$\forall x \in \mathbb{R}\left[3^{2x+1}-10\cdot 3^x+3=0 \rightarrow x \in I\right]$".

q is the truth value of the propositions "$\exists x \in (0,1)\left[\log_x\left(\frac{1}{2}\right)>1\right]$".

r is the truth value of the propositions "$\log_2\left(\log_3 81\right)+\log_{\sqrt{5}} 25=5$".

s is the truth value of the propositions "$x \in (1,4)$ is a solution to the inequality $\log_{0.5}(x-1)>\log_{0.5} 3$".

Find values of $x=\left|10\cdot(p\rightarrow q)-5\cdot(r\leftrightarrow s)+2\cdot(\sim p\wedge r)\right|$. (6 points)

(Note: A value of 1 if the proposition is true, and 0 if it is false.)

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18. Let $a,b,c,d \in \mathbb{N}$ be the radii of circles centered at $(2,0)$ that intersect the hyperbola $\frac{x^2}{36}-\frac{y^2}{64}=1$ at exactly $1,2,3$, and 4 points, respectively. Given that $A=\frac{b^4c^3d^2}{a^5} \in \mathbb{N}$, find the number of factors of A, where A has the minimum possible value. (6 points)

19. A coffee shop recorded the number of cups sold daily over a period of 5 days. The data has the properties: Mean = Median = Mode = 69. Let M be the maximum number of cups sold and N be the minimum number of cups sold. If no day had zero sales, what is the maximum possible value of $M-N$? (6 points)

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20. Given that a dataset consisting of N elements with an arithmetic mean of 2,026 and a variance of 81. If $\sum_{i=1}^{N}\left(x_i - 2021\right)^2 = 6,890$, determine the value of N. (6 points)

21. Let $A = \left\{x \in \mathbb{R} \middle| 2x^4 + x^3 - 29x^2 - 16x - 48 = 0\right\}$,

$\mathrm{B} = \{y \in \mathbb{N} \middle| y$ is a factor of $6669\}$,

$C = \left\{z \in \left[-2\pi, 2\pi\right] \middle| \sin z = \sin^3 z\right\}$.

Find the value of $n\left(A\right) + n\left(B\right) - n\left(C\right)$. (2.5 points)

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22. Let $z_1, z_2, \ldots, z_6$ be the sixth roots of a complex number z. Given that $\left(\sqrt{3}+i\right)z_1 = 4$, determine the value of $\sum_{i=1}^{6}\left|\mathrm{Im}\left(z_i\right)\right|$. (4.5 points)

23. Air is being pumped into a spherical balloon such that its volume increases at a rate of 15 cubic meters per second. Find the rate of change of the surface area of the balloon at the instant when the radius is 50 meters. (2.5 points)

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24. A first data set $\left(x_i\right)$ consists of 5 elements arranged in ascending order: $5,\ 10,\ a,\ b,\ 30$, where $a,\ b$ are prime numbers. A second data set is related to the first data set by the equation $y_i = 3x_i - 1$. If the arithmetic mean of the first data set $\left(\mu_x\right)$ is 17, find the value of $\frac{1}{3}\left(\sigma_y\right)^2$, where σ_y represents the standard deviation of the second data set.

(2.5 points)

25. In a coin-tossing game, a player pays 5 baht to play each round. Four fair coins are tossed simultaneously, and the player receives 3 baht for each coin that lands on heads. Find the expected value of the player's profit from playing this game once. (4.5 points)

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GRADE 12 ANSWER KEY

No.	Answer	No.	Answer
1	20	**14**	0.15
2	350	**15**	123
3	220	**16**	4
4	2.2	**17**	10
5	67	**18**	14
6	1	**19**	203
7	29.16	**20**	65
8	7.5	**21**	9
9	1	**22**	8
10	6	**23**	0.6
11	18	**24**	238.8
12	5	**25**	1
13	3.75		

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