ASMOPSS THAILAND 2026

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

Mathematics Secondary G.11

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 z be a complex number satisfying the equation $z+\frac{1}{z}=2\cos(3^\circ)$.

   Find the value of $z^{120}+\frac{1}{z^{120}}$. (2.5 points)

2. Given that $P(x)=x^3+x^2+ax+b$, where $a,b\in\mathbb{R}$. If -2 is a root of $P(x)$ and the remainder from dividing $P(x)$ by x is equal to 12, then find the value of ab. (2.5 points)

3. Let $a\in I$. Find the least value of $|a|$ such that the equation

$$\log_2\left(\log_3\left(\log_3\left(3x^2+ax+6\right)\right)\right)=0$$

   has a prime number solution x. (2.5 points)

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4. Let $f(x) = 1 + x^3$, find the value of $f(2) + f(0) + f(2) + f(6)$. (2.5 points)

5. Solve the equation $\log_2(x-1) + \log_2(x+2) = \log_2(3x+13)$. (2.5 points)

6. Find the value of $\sin(2\tan^{-1}(\frac{1}{3}))$. (2.5 points)

7. There are 6 wooden planks numbered 0, 1, 2, 3, 4, and 5. If 3 planks are randomly selected and arranged to form a 3-digit number, how many distinct numbers can be formed such that they are divisible by 4? (2.5 points)

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8. Let $D_r = (a,b)$ and $R_r = (c,d)$ be the domain and range of the relation r, respectively, where $r = \left\{ (x,y) \mid y - 4 < x \text{ and } \frac{y+4x}{2} \geq x^2 + 3 \right\}$. Find the value of $a^4 + b^3 + c^2 + d$.

(4.5 points)

9. Let A be an 2×2 matrix defined by $A = \begin{bmatrix} \cos 20^\circ & -\sin 20^\circ \\ \sin 20^\circ & \cos 20^\circ \end{bmatrix}$. If x and y are real numbers satisfying the matrix equation $A^{2026} \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$, find the value of $4x^2 + 4y^2 + 69$.

(4.5 points)

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10. Let A be a 3×3 matrix satisfying $\det\left(A^{-1}+adj\left(A\right)\right)=13.5$. Find the absolute value of the sum of all possible values of $\det\left(A\right)$, where $\det\left(A\right)\in\mathbb{R}$. (4.5 points)

11. Let $\vec{p}=2^{x}\vec{i}+\vec{j}$ and $\vec{q}=\vec{i}+2^{-x}\vec{j}$. If $|\vec{p}+\vec{q}|^{2}=48$ for $x>0$, find the positive integer α such that $\alpha<x<\alpha+1$. (4.5 points)

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12. Let $x, y \in I^+$ satisfy the conditions $0 < y < x < 20$ and

$$\sqrt{\sqrt{\log_2(x)\sqrt{\log_2(x)\sqrt{\log_2(x)\sqrt{\ldots}}}}} - \sqrt{\log_2(y)\sqrt{\log_2(y)\sqrt{\log_2(y)\sqrt{\ldots}}}} = \sqrt{2}\,.$$

Find the sum of all possible values of x. (4.5 points)

13. Let $P\left(\cos(\theta), \sin(\theta)\right)$, $Q\left(\cos(2\theta), \sin(2\theta)\right)$ be points on the unit circle. Find the maximum value of the distance PQ, given that $0 \le \theta \le 2\pi$. (4.5 points)

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14. A group of 15 students all have distinct heights. If 3 students are selected at random, the probability that at least one of them has a height greater than or equal to the third quartile is $\frac{M}{N}$, where the greatest common divisor (GCD) of M and N is 1. Find the value of $\frac{N^2 - M^2}{10}$. (4.5 points)

15. A data set consists of 10 values: 35, a, 25, 18, c, 16, 9, 32, b, and 7. If the range of this data set is 40, the first quartile $\left(Q_1\right)$ is 12, and the sixth decile $\left(D_6\right)$ is 28, find the arithmetic mean of this data set. (4.5 points)

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16. Let $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$ be vectors in a three-dimensional space, and let θ_A be the angle between $\vec{a}$ and $\vec{b}+\vec{d}$. Suppose that $\vec{a}\bullet\vec{b}+\vec{b}\bullet\vec{c}=20$, $\vec{a}\bullet\vec{b}+\vec{b}\bullet\vec{c}+\vec{a}\bullet\vec{d}=25$, $\vec{a}-\vec{b}=\vec{c}$, $\left|\vec{a}\right|=4$, and $\vec{c}=10\vec{i}+4\vec{j}+2\vec{k}$. If $\vec{b}\perp\vec{c}$ and $\vec{d}=k\vec{b}$, for some $k\in\mathbb{R}^{+}$, find the value of $\left|\vec{b}+\vec{d}\right|$. (6 points)

17. In an experiment, a single wave is generated by combining multiple wave of different frequencies. The signal function is given by $S\left(x\right)=\sin\left(x\right)+\sin\left(2x\right)+\sin\left(4x\right)+\sin\left(5x\right)$ for $0\le x\le 2\pi$. Find the total number of x-intercepts of the graph of $S\left(x\right)$. (6 points)

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18. Let $P\left(x,y\right)$ be a point in the plane satisfying the equation $\begin{vmatrix} x-1 & y-1 \\ 2 & 1 \end{vmatrix} = \sqrt{5}\sqrt{\left(x-1\right)^2+\left(y-1\right)^2}$. Let d be the distance from the point P to the line $2x+y-6=0$. Find the minimum value of d^2. (6 points)

19. Given $S=\left\{(a,b)\in I\times I \mid -5\le a,b\le 5\right\}$. A point (a,b) is chosen uniformly at random from S. If the probability that is point lies on the parabola $y=x^2-4x$ is $\frac{M}{N}$, where M and N are relatively prime positive integers, find the value of $M+N$. (6 points)

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20. In a mathematics examination taken by a group of 50 students, the sum of their scores is 1,000, and the standard deviation is $\sqrt{96}$. If 10 additional students take the exam and each of them scores exactly 32 points, find the standard deviation of scores for all 60 students. (6 points)

21. Find the value of the following expression: $\dfrac{\cos(\frac{6\pi}{4})+\sin(-\frac{56\pi}{3})\tan\left(\frac{9\pi}{4}\right)}{\sin\left(-\frac{7\pi}{2}\right)-\csc\left(\frac{41\pi}{6}\right)}$. (2.5 points)

(Given that $\sqrt{2}=1.4, \sqrt{3}=1.7, \sqrt{5}=2.2$.)

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22. Let f be a function defined by

$f\left(\frac{4x-5}{2}\right)=\frac{16x^2-52x+42}{8x-15}$. Find the value of $-13f(-2)$. (4.5 points)

23. Find the product of the lengths of the major and minor axes of the ellipse defined by the equation: $25x^2+16y^2+100x-64y=236$. (2.5 points)

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24. The probability that a randomly selected individual enjoys drinking coffee is 0.7. If 10 people are selected at random independently, and the probability that at most 2 of them enjoy drinking coffee is $\left(0.3\right)^{8}k$, find the value of k. (2.5 points)

25. In a coin-tossing game, the cost to play is 5 baht per round. Four coins are tossed simultaneously, and the player receives 3 baht for each coin that lands on heads. If the probability that the player makes a profit in a single round is $\frac{P}{Q}$, where P and Q are relatively prime positive integers, find the value of PQ. (4.5 points)

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GRADE 11 ANSWER KEY

No.	Answer	No.	Answer
1	2	**14**	491.7
2	48	**15**	23.2
3	2	**16**	15
4	236	**17**	7
5	5	**18**	1.8
6	0.6	**19**	128
7	24	**20**	10
8	30.06	**21**	0.85
9	73	**22**	30
10	3	**23**	80
11	2	**24**	24.24
12	40	**25**	176
13	2		

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