

Hong Kong Mathematics Olympiad (2023/24)
 Finals (Individual – Event 1)

FOR OFFICIAL USE

Score for accuracy	<input type="text"/>	×	Mult. factor for speed	<input type="text"/>	=	<input type="text"/>	Team No.	<input type="text"/>
			+	Bonus score		<input type="text"/>	Time	<input type="text"/>
							Min.	Sec.
						<input type="text"/>		

Unless otherwise stated, all answers should be expressed in numerals in their simplest forms.

除非特别声明，答案须用数字表达，并化至最简。

1. Given that m and n are positive integers. If $m+n+mn=54$ and $A=m+n$, find the value of A .

已知 m 和 n 均为正整数。如果 $m+n+mn=54$ 及 $A=m+n$ ，求 A 的值。

$A =$

2. If $f(a)=a-2$, $F(a,b)=b^2+a+A$ and $B=F(4,f(5))$, find the value of B .

若 $f(a)=a-2$ ，且 $F(a,b)=b^2+a+A$ 及 $B=F(4,f(5))$ ，求 B 的值。

$B =$

3. The area of the rhombus on the xy -plane with vertices $(B+2, 0)$, $(-B-2, 0)$, $(0, 2)$ and $(0, -2)$ is C square units. Find the value of C .

在 xy -平面上由点 $(B+2, 0)$, $(-B-2, 0)$, $(0, 2)$ 及 $(0, -2)$ 所组成之菱形的面积为 C 平方单位，求 C 的值。

$C =$

4. If D is a positive integer such that $\left(\frac{C}{4}+227\right)^{\frac{1}{D}}=D$, find the value of D .

如果 D 是正整数且 $\left(\frac{C}{4}+227\right)^{\frac{1}{D}}=D$ ，求 D 的值。

$D =$

Hong Kong Mathematics Olympiad (2023/24)
Finals (Individual – Event 2)

FOR OFFICIAL USE

Score for accuracy	<input type="text"/>	×	Mult. factor for speed	<input type="text"/>	=	<input type="text"/>	Team No.	<input type="text"/>
			+	Bonus score		<input type="text"/>	Time	<input type="text"/>
							Min.	Sec.
						<input type="text"/>		

Unless otherwise stated, all answers should be expressed in numerals in their simplest forms.

除非特别声明，答案须用数字表达，并化至最简。

1. A is the units digit of $2022^{2023^{2024}}$. Find the value of A .

若 A 是 $2022^{2023^{2024}}$ 的个位数，求 A 的值。

$A =$

2. B is the minimum value of $(x+20)^2 + (y-24)^2$, where x and y are integers that satisfy the equation $19x+13y=A$. Find the value of B .

已知 $(x+20)^2 + (y-24)^2$ 的最小值是 B ，当中 x 和 y 是方程 $19x+13y=A$ 的整数解。求 B 的值。

$B =$

3. There are C marbles in a bag, which are either red or blue. If we add B red marbles to the bag, the ratio of red marbles to blue marbles becomes $3:2$. If we add B blue marbles to the bag, the ratio of red marbles to blue marbles becomes $2:3$. Find the value of C .

在袋中有若干颗红色和蓝色的弹珠，它们的总数量是 C 。如果加入 B 颗红色弹珠，红色和蓝色弹珠数量的比例则为 $3:2$ ；如果加入 B 颗蓝色弹珠，红色和蓝色弹珠数量的比例则为 $2:3$ 。求 C 的值。

$C =$

4. If $5(\sqrt{25+2\sqrt{D}} + \sqrt{25-2\sqrt{D}}) = C$, find the value of D .

若 $5(\sqrt{25+2\sqrt{D}} + \sqrt{25-2\sqrt{D}}) = C$ ，求 D 的值。

$D =$

Hong Kong Mathematics Olympiad (2023/24)
 Finals (Individual – Event 3)

FOR OFFICIAL USE

Score for accuracy	<input type="text"/>	×	Mult. factor for speed	<input type="text"/>	=	<input type="text"/>	Team No.	<input type="text"/>
			+	Bonus score		<input type="text"/>	Time	<input type="text"/>
							Min.	Sec.
						<input type="text"/>		

Unless otherwise stated, all answers should be expressed in numerals in their simplest forms.

除非特别声明，答案须用数字表达，并化至最简。

1. If x and y are two different positive integers such that $\frac{1}{x} + \frac{1}{y} = \frac{2}{5}$. Find the value of $A = x + y$.

若 x 和 y 为满足方程 $\frac{1}{x} + \frac{1}{y} = \frac{2}{5}$ 的不同正整数，求 $A = x + y$ 的值。

$A =$

2. If B is the number of positive integers N such that $2^N + (19 - A)$ is divisible by 7. Find the value of B .

若 B 是所有正整数 N 使得 7 整除 $2^N + (19 - A)$ 的数量。求 B 的值。

$B =$

3. Given that a and b are real numbers such that $a^2 - b^2 = 9$ and $ab = 3$. If $a + b = \sqrt{\sqrt{\alpha} + C - B}$ for positive integers α and C , find the value of C .

已知 a 和 b 为满足方程组 $a^2 - b^2 = 9$ 及 $ab = 3$ 的实数。若对于正整数 α 和 C , $a + b = \sqrt{\sqrt{\alpha} + C - B}$, 求 C 的值。

$C =$

4. If x is the real root of the equation $(\log_a x)^{\log_a x} = x$ where a is a constant and $a > 1$. Find the value of $D = \frac{C \log_a x}{3a}$.

若 x 为满足方程 $(\log_a x)^{\log_a x} = x$ 的实数，其中 a 是常数且 $a > 1$ 。求 $D = \frac{C \log_a x}{3a}$ 的值。

$D =$

Hong Kong Mathematics Olympiad (2023/24)
 Finals (Individual – Event 4)

FOR OFFICIAL USE

Score for accuracy	<input type="text"/>	×	Mult. factor for speed	<input type="text"/>	=	<input type="text"/>
			+	Bonus score		<input type="text"/>
			<hr/>			
			Total score			<input type="text"/>

Team No.	<input type="text"/>
Time	<input type="text"/>
	<input type="text"/>
Min.	Sec.

Unless otherwise stated, all answers should be expressed in numerals in their simplest forms.

除非特别声明，答案须用数字表达，并化至最简。

1. If $A > 1$ and $1 + \frac{1}{A} + \frac{1}{A^2} + \frac{1}{A^3} + \cdots = \frac{A}{3}$, find A .

如果 $A > 1$ 且 $1 + \frac{1}{A} + \frac{1}{A^2} + \frac{1}{A^3} + \cdots = \frac{A}{3}$ ，求 A 。

$A =$

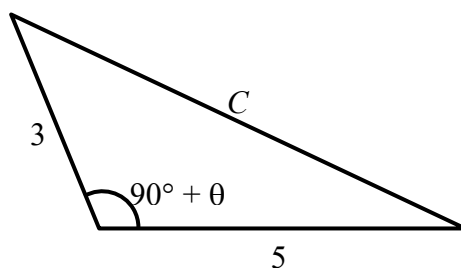
2. If $\frac{1}{A}$ is a root of the quadratic equation $x^2 - Bx + \frac{1}{6}B = 0$, find B .

如果 $\frac{1}{A}$ 是二次方程 $x^2 - Bx + \frac{1}{6}B = 0$ 的一个根，求 B 。

$B =$

3. Consider the triangle in the figure below. If $\tan \theta = B$, where $0^\circ < \theta < 90^\circ$, find C .

考虑下图中的三角形，如果 $\tan \theta = B$ ，其中 $0^\circ < \theta < 90^\circ$ ，求 C 。



$C =$

4. Let $d = C^2 - 20$. If D satisfies the equation $8^D = D^d$, find D .

设 $d = C^2 - 20$ ，如果 D 满足方程 $8^D = D^d$ ，求 D 。

$D =$