Hong Kong Mathematics Olympiad (2004 – 2005)
Final Event 1 (Individual)

Unless otherwise stated, all answers should be expressed in numerals in their simplest form.
除非特別聲明，答案須用數字表達，並化至最簡。

1. 一個動物園內有 a 頭駱駝，單峯的比雙峯的多 10 頭。若牠們共有 55 個峯，求 a 的值。
There are a camels in a zoo.
The number of one-hump camels exceeds that of two-hump camels by 10.
If there have 55 humps altogether, find the value of a .

$a =$

2. 若 LCM$(a, b) = 280$ 及 HCF$(a, b) = 10$，求 b 的值。
If LCM$(a, b) = 280$ and HCF$(a, b) = 10$, find the value of b .

$b =$

3. 設 C 是一正整數且小於 $\sqrt{b}$ 。若 b 除以 C，餘數是 2。除以$(C+2)$，餘數是 C，求 C 的值。
Let C be a positive integer less than $\sqrt{b}$. If b is divided by C, the remainder is 2; when divided by $C + 2$, the remainder is C, find the value of C .

$C =$

4. 一個正 $2C$ 邊形共有 d 條對角綫，求 d 的值。
A regular $2C$-sided polygon has d diagonals, find the value of d .

$d =$

FOR OFFICIAL USE

Score for accuracy		×	Mult. factor for speed		=	Team No.	
		+	Bonus score			Time	
			Total score			Min.	Sec.

Hong Kong Mathematics Olympiad (2004 – 2005)
Final Event 2 (Individual)

Unless otherwise stated, all answers should be expressed in numerals in their simplest form.
除非特別聲明，答案須用數字表達，並化至最簡。

1. 陳先生有 8 個兒子和 a 個女兒，他的每個兒子都有 8 個兒子和 a 個女兒。他的每個女兒都有 a 個兒子和 8 個女兒。已知陳先生的男孫比女孫多 1 個及 a 是個質數，求 a 的值。
Mr. Chan has 8 sons and a daughters. Each of his sons has 8 sons and a daughters. Each of his daughters has a sons and 8 daughters. It is known that the number of his grand sons is one more than the number of his grand daughters and a is a prime number, find the value of a.

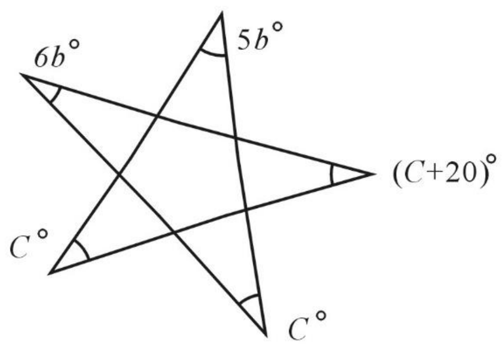
$a =$

2. 設 $\frac{a}{7}=\sqrt[3]{2+\sqrt{b}}+\sqrt[3]{2-\sqrt{b}}$，求 b 的值。
Let $\frac{a}{7}=\sqrt[3]{2+\sqrt{b}}+\sqrt[3]{2-\sqrt{b}}$. Find the value of b.

$b =$

3. 如圖一，求 C 的值。
In Figure 1, find the value of C.

$C =$



圖一 Figure 1

4. 已知 P_1、P_2、⋯、P_d 是 d 個連續質數。
若 $P_1+P_2+\cdots+P_{d-2}=P_{d-1}+P_d=C+1$，求 d 的值。
Given that $P_1, P_2, \cdots, P_d$ are d consecutive prime numbers.
If $P_1+P_2+\cdots+P_{d-2}=P_{d-1}+P_d=C+1$, find the value of d.

$d =$

FOR OFFICIAL USE

Score for accuracy		×	Mult. factor for speed		=		Team No.	
			+	Bonus score			Time		
				Total score			Min.	Sec.

Hong Kong Mathematics Olympiad (2004 – 2005)
Final Event 3 (Individual)

Unless otherwise stated, all answers should be expressed in numerals in their simplest form.
除非特別聲明，答案須用數字表達，並化至最簡。

1. 已知 a 是方程 $2^{x+1}=8^{\frac{1}{x}-\frac{1}{3}}$ 的正實數解，求 a 的值。

Given that a is a positive real root of the equation $2^{x+1}=8^{\frac{1}{x}-\frac{1}{3}}$. Find the value of a.

$a =$

2. 在周界為 a 米的長方形中，最大面積的一個長方形的面積是 b 平方米，求 b 的值。

The largest area of the rectangle with perimeter a meter is b square meter, find the value of b.

$b =$

3. 若 $c=[1234^3-1232\times(1234^2+2472)]\times b$，求 c 的值。

If $c=[1234^3-1232\times(1234^2+2472)]\times b$, find the value of c.

$c =$

4. 若 $\frac{1}{(c+1)(c+2)}+\frac{1}{(c+2)(c+3)}+\cdots+\frac{1}{(c+d)(c+d+1)}=\frac{8}{15}$，求 d 的值。

If $\frac{1}{(c+1)(c+2)}+\frac{1}{(c+2)(c+3)}+\cdots+\frac{1}{(c+d)(c+d+1)}=\frac{8}{15}$, find the value of d.

$d =$

FOR OFFICIAL USE

Score for accuracy ☐ × Mult. factor for speed ☐ = ☐   Team No. ☐

+ Bonus score ☐   Time ☐ ☐

Total score ☐   Min. Sec.

Hong Kong Mathematics Olympiad (2004 – 2005)
Final Event 4 (Individual)

Unless otherwise stated, all answers should be expressed in numerals in their simplest form.
除非特別聲明，答案須用數字表達，並化至最簡。

1. 若 $A^2 + B^2 + C^2 = AB + BC + CA = 3$ 及 $a = A^2$，求 a 的值。
If $A^2 + B^2 + C^2 = AB + BC + CA = 3$ and $a = A^2$, find the value of a.

$a =$

2. 已知 n 及 b 是整數，並滿足方程 $29n + 42b = a$，若 $5 < b < 10$，求 b 的值。
Given that n and b are integers satisfying the equation $29n + 42b = a$. If $5 < b < 10$, find the value b.

$b =$

3. 若 $\dfrac{\sqrt{3}-\sqrt{5}+\sqrt{7}}{\sqrt{3}+\sqrt{5}+\sqrt{7}} = \dfrac{c\sqrt{21}-18\sqrt{15}-2\sqrt{35}+b}{59}$，求 c 的值。
If $\dfrac{\sqrt{3}-\sqrt{5}+\sqrt{7}}{\sqrt{3}+\sqrt{5}+\sqrt{7}} = \dfrac{c\sqrt{21}-18\sqrt{15}-2\sqrt{35}+b}{59}$, find the value of c.

$c =$

4. 若 c 有 d 個正因數，求 d 的值。
If c has d positive factors, find the value of d.

$d =$

FOR OFFICIAL USE

Score for accuracy		×	Mult. factor for speed		=		Team No.	
			+	Bonus score			Time		
			Total score				Min.	Sec.

Hong Kong Mathematics Olympiad (2004 – 2005)
Final Event 1 (Group)

Unless otherwise stated, all answers should be expressed in numerals in their simplest form.
除非特別聲明，答案須用數字表達，並化至最簡。

1. 若在 1 至 200 內能同時被 3 和 7 整除的數有 a 個，求 a 的值。
Suppose there are a numbers between 1 and 200 that can be divisible by 3 and 7, find the value of a.

$a =$

2. 設質數 p 和 q 是方程 $x^2 - 13x + R = 0$ 的兩個不同的根，其中 R 是實數。
若 $b = p^2 + q^2$，求 b 的值。
Let p and q be prime numbers that are the two distinct roots of the equation $x^2 - 13x + R = 0$, where R is a real number. If $b = p^2 + q^2$, find the value of b.

$b =$

3. 已知 $\tan\alpha = -\frac{1}{2}$。若 $c = \frac{2\cos\alpha - \sin\alpha}{\sin\alpha + \cos\alpha}$，求 c 的值。
Given that $\tan\alpha = -\frac{1}{2}$. If $c = \frac{2\cos\alpha - \sin\alpha}{\sin\alpha + \cos\alpha}$, find the value of c.

$c =$

4. 設 r 和 s 是方程 $2\left(x^2 + \frac{1}{x^2}\right) - 3\left(x + \frac{1}{x}\right) = 1$ 的兩個不同的實數根。
若 $d = r + s$，求 d 的值。
Let r and s be the two distinct real roots of the equation $2\left(x^2 + \frac{1}{x^2}\right) - 3\left(x + \frac{1}{x}\right) = 1$. If $d = r + s$, find the value of d.

$d =$

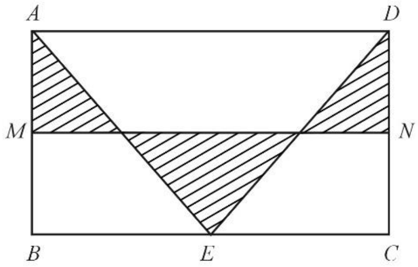
FOR OFFICIAL USE

Score for accuracy		×	Mult. factor for speed		=		Team No.	
			+	Bonus score			Time		
				Total score			Min.	Sec.

Hong Kong Mathematics Olympiad (2004 – 2005)
Final Event 2 (Group)

Unless otherwise stated, all answers should be expressed in numerals in their simplest form.
除非特別聲明，答案須用數字表達，並化至最簡。

1. 如圖一，在長方形 $ABCD$ 中，$AB = 6\text{ cm}$，$BC = 10\text{ cm}$。M 和 N 分別是 AB 和 DC 的中點。若陰影部分的面積是 $a\text{ cm}^2$，求 a 的值。
In Figure 1, $ABCD$ is a rectangle, $AB = 6\text{ cm}$ and $BC = 10\text{ cm}$. M and N are the midpoints of AB and DC respectively. If the area of the shaded region is $a\text{ cm}^2$, find the value of a.



圖一 Figure 1

$a =$

2. 設 $b = 89 + 899 + 8999 + 89999 + 899999$，求 b 的值。
Let $b = 89 + 899 + 8999 + 89999 + 899999$, find the value of b.

$b =$

3. 已知 $2x + 5y = 3$。若 $c = \sqrt{4^{x+\frac{1}{2}} \times 32^y}$，求 c 的值。
Given that $2x + 5y = 3$. If $c = \sqrt{4^{x+\frac{1}{2}} \times 32^y}$, find the value of c.

$c =$

4. 設 $d = \frac{1}{2} + \frac{2}{4} + \frac{3}{8} + \frac{4}{16} + \ldots + \frac{10}{2^{10}}$，求 d 的值。
Let $d = \frac{1}{2} + \frac{2}{4} + \frac{3}{8} + \frac{4}{16} + \ldots + \frac{10}{2^{10}}$, find the value of d.

$d =$

FOR OFFICIAL USE

Score for accuracy		×	Mult. factor for speed		=		Team No.		
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			Total score					Min.	Sec.

Hong Kong Mathematics Olympiad (2004 – 2005)
Final Event 3 (Group)

Unless otherwise stated, all answers should be expressed in numerals in their simplest form.
除非特別聲明，答案須用數字表達，並化至最簡。

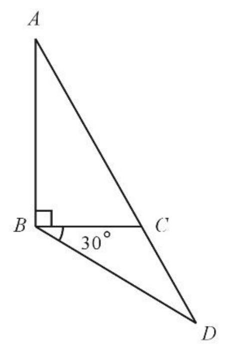
1. 設 $0° < \alpha < 45°$。若 $\sin\alpha\cos\alpha = \frac{3\sqrt{7}}{16}$ 及 $A = \sin\alpha$，求 A 的值。

   Let $0° < \alpha < 45°$. If $\sin\alpha\cos\alpha = \frac{3\sqrt{7}}{16}$ and $A = \sin\alpha$, find the value of A.

   $A =$

2. 如圖一，C 在 AD 上且 $AB = BD = 1$ cm，$\angle ABC = 90°$，$\angle CBD = 30°$。若 $CD = b$ cm，求 b 的值。
   In figure 1, C lies on AD, $AB = BD = 1$ cm, $\angle ABC = 90°$ and $\angle CBD = 30°$. If $CD = b$ cm, find the value of b.

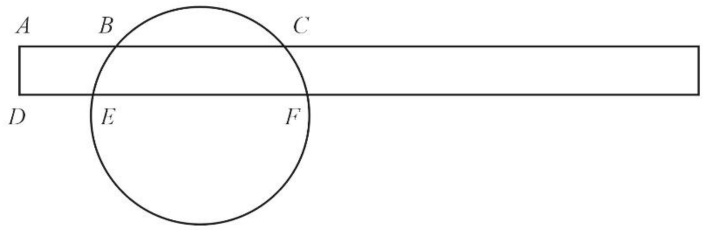
   $b =$



圖一 Figure 1

3. 如圖二，一長方形與圓相交於點 B、C、E 及 F。已知 $AB = 4$ cm，$BC = 5$ cm 及 $DE = 3$ cm。若 $EF = c$ cm，求 c 的值。
   In Figure 2, a rectangle intersects a circle at points B, C, E and F.
   Given that AB =4 cm, $BC = 5$ cm and $DE = 3$ cm. If $EF = c$ cm, find the value of c.

   $c =$



圖二 Figure 2

4. 假設 x 和 y 都是正數並且成反比。若 x 增加了 10%，則 y 減少了 d %，求 d 的值。
   Let x and y be two positive numbers that are inversely proportional to each other.
   If x is increased by 10 %, y will be decreased by d %, find the value of d.

   $d =$

FOR OFFICIAL USE

Score for accuracy		×	Mult. factor for speed		=		Team No.	
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Hong Kong Mathematics Olympiad (2004 – 2005)
Final Event 4 (Group)

Unless otherwise stated, all answers should be expressed in numerals in their simplest form.
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1. 若 $a=\log_{\frac{1}{2}}0.125$，求 a 的值。

   If $a=\log_{\frac{1}{2}}0.125$, find the value of a.

   $a=$

2. 若方程 $\left|x-|2x+1|\right|=3$ 有 b 個不同的解，求 b 的值。

   Suppose there are b distinct solutions of the equation $\left|x-|2x+1|\right|=3$, find the value of b.

   $b=$

3. 若 $c=2\sqrt{3}\times\sqrt[3]{1.5}\times\sqrt[6]{12}$，求 c 的值。

   If $c=2\sqrt{3}\times\sqrt[3]{1.5}\times\sqrt[6]{12}$, find the value of c.

   $c=$

4. 已知 $f_1=0$，$f_2=1$ 及對正整數 $n\ge 3$，$f_n=f_{n-1}+2f_{n-2}$。若 $d=f_{10}$，求 d 的值。

   Given that $f_1=0$, $f_2=1$ and for any positive integer $n\ge 3$, $f_n=f_{n-1}+2f_{n-2}$. If $d=f_{10}$, find the value of d.

   $d=$

FOR OFFICIAL USE

Score for accuracy		×	Mult. factor for speed		=		Team No.	
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