Hong Kong Mathematics Olympiad (1991 – 1992)
Sample Event (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。

(i) 已知 $A = (b^m)^n + b^{m+n}$。當 $b = 4$，$m = n = 1$ 時，求 A 的值。
Given $A = (b^m)^n + b^{m+n}$. Find the value of A when $b = 4$, $m = n = 1$.

$A =$

(ii) 若 $2^A = B^{10}$ 且 $B > 0$，求 B 的值。
If $2^A = B^{10}$ and $B > 0$, find the value fo B.

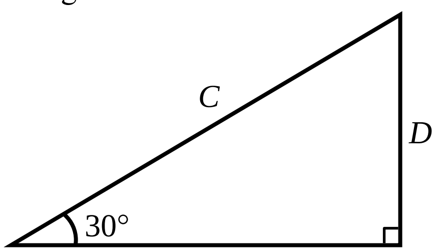
$B =$

(iii) 從下列方程求 C：$\sqrt{\dfrac{20B+45}{C}} = C$。
Solve for C in the following equation: $\sqrt{\dfrac{20B+45}{C}} = C$.

$C =$

(iv) 如圖所示，求 D 的值。
Find the value of D in the figure.

$D =$



FOR OFFICIAL USE

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

Hong Kong Mathematics Olympiad (1991 – 1992)
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。

(i) 若一凸 n 邊形之內角和為 1440°，求 n 的值。
If the sum of the interior angles of an n-sided polygon is 1440°, find the value of n.

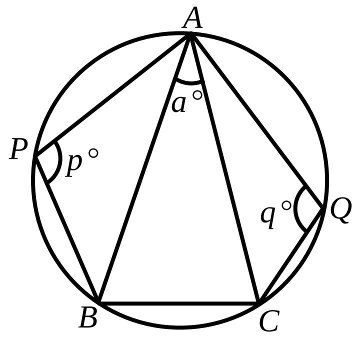
$n =$

(ii) 若 $x^2 - nx + a = 0$ 有兩等根，求 a 的值。
If $x^2 - nx + a = 0$ has 2 equal roots, find the value of a.

$a =$

(iii) 如圖所示，若 $z = p + q$，求 z 的值。
In the figure, if $z = p + q$, find the value of z.

$z =$



(iv) 若 $S = 1 + 2 - 3 - 4 + 5 + 6 - 7 - 8 + \ldots + z$，求 S 的值。
If $S = 1 + 2 - 3 - 4 + 5 + 6 - 7 - 8 + \ldots + z$, find the value of S.

$S =$

FOR OFFICIAL USE

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

Hong Kong Mathematics Olympiad (1991 – 1992)
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。

(i) 若 $ar = 24$ 及 $ar^4 = 3$，求 a 的值。
If $ar = 24$ and $ar^4 = 3$, find the value of a.

$a =$

(ii) 若 $\left(x+\frac{a}{4}\right)^2 = x^2 + \frac{a}{2}\cdot x + b$，求 b 的值。
If $\left(x+\frac{a}{4}\right)^2 = x^2 + \frac{a}{2}\cdot x + b$, find the value of b.

$b =$

(iii) 若 $c = \log_2 \frac{b}{9}$，求 c 的值。
If $c = \log_2 \frac{b}{9}$, find the value of c.

$c =$

(iv) If $d = 12^c - 142^2$, find the value of d.
若 $d = 12^c - 142^2$，求 d 的值。

$d =$

FOR OFFICIAL USE

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

Hong Kong Mathematics Olympiad (1991 – 1992)
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。

(i) 若 $a=\dfrac{\sin 15^\circ}{\cos 75^\circ}+\dfrac{1}{\sin^2 75^\circ}-\tan^2 15^\circ$，求 a 的值。

If $a=\dfrac{\sin 15^\circ}{\cos 75^\circ}+\dfrac{1}{\sin^2 75^\circ}-\tan^2 15^\circ$, find the value of a.

$a =$

(ii) 若直綫 $ax + 2y + 1 = 0$ 與 $3x + by + 5 = 0$ 互相垂直，求 b 的值。

If the lines $ax + 2y + 1 = 0$ and $3x + by + 5 = 0$ are perpendicular to each other, find the value of b.

$b =$

(iii) 三點 $(2, b)$、$(4, -b)$ 及 $(5, \frac{c}{2})$ 共綫，求 c 的值。

The three points $(2, b)$, $(4, -b)$ and $(5, \frac{c}{2})$ are collinear. Find the value of c.

$c =$

(iv) 若 $\dfrac{1}{x}:\dfrac{1}{y}:\dfrac{1}{z}=3:4:5$ 且 $\dfrac{1}{x+y}:\dfrac{1}{y+z}=9c:d$，求 d 的值。

If $\dfrac{1}{x}:\dfrac{1}{y}:\dfrac{1}{z}=3:4:5$ and $\dfrac{1}{x+y}:\dfrac{1}{y+z}=9c:d$, find the value of d.

$d =$

FOR OFFICIAL USE

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

\+ Bonus score [ ]   Time [ ] [ ]

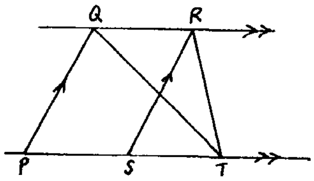
Total score [ ]   Min.   Sec.

Hong Kong Mathematics Olympiad (1991 – 1992)
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。

(i) 在圖中，$PQRS$ 之面積為 80 cm^2。若ΔQRT 之面積為 A cm^2，求 A 的值。
In the figure, the area of $PQRS$ is 80 cm^2. If the area of ΔQRT is A cm^2, find the value of A.

$A =$



(ii) 若 $B = \log_2\left(\frac{8A}{5}\right)$，求 B 的值。
If $B = \log_2\left(\frac{8A}{5}\right)$, find the value of B.

$B =$

(iii) 已知 $x + \frac{1}{x} = B$。若 $C = x^3 + \frac{1}{x^3}$，求 C 的值。
Given $x + \frac{1}{x} = B$. If $C = x^3 + \frac{1}{x^3}$, find the value of C.

$C =$

(iv) 設 $(p, q) = qD + p$。若$(C, 2) = 212$，求 D 的值。
Let $(p, q) = qD + p$. If $(C, 2) = 212$, 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 (1991 – 1992)
Final Event 5 (Individual)

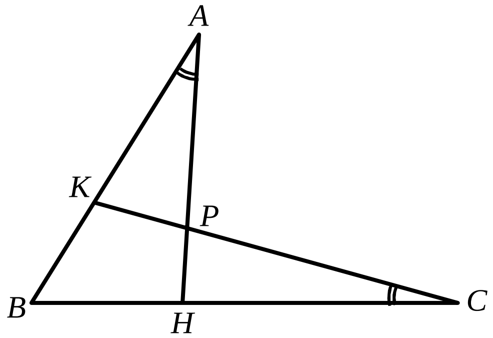
Unless otherwise stated, all answers should be expressed in numerals in their simplest form.
除非特別聲明，答案須用數字表達，並化至最簡。

(i) 設 p、q 為二次方程 $x^2 - 3x - 2 = 0$ 的兩根，且 $a = p^3 + q^3$，求 a 的值。
Let p, q be the roots of the quadratic equation $x^2 - 3x - 2 = 0$ and $a = p^3 + q^3$. Find the value of a.

$a =$

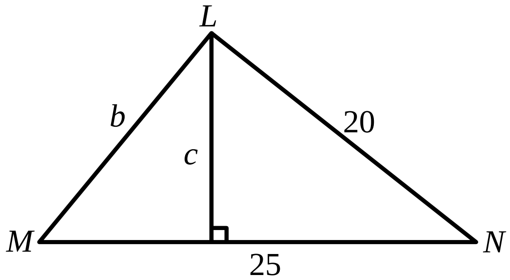
(ii) 若 $AH = a$，$CK = 36$，$BK = 12$，$BH = b$，求 b 的值。
If $AH = a$, $CK = 36$, $BK = 12$ and $BH = b$, find the value of b.

$b =$



(iii) 求 c 的值。
Find the value of c.

$c =$



(iv) 設 $\sqrt{2x+23}+\sqrt{2x-1}=c$ 及 $d=\sqrt{2x+23}-\sqrt{2x-1}$。求 d 的值。
Let $\sqrt{2x+23}+\sqrt{2x-1}=c$ and $d=\sqrt{2x+23}-\sqrt{2x-1}$. 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 (1991 – 1992)
Sample Event (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。

細看下列各組數字：
Consider the following groups of numbers:

(2)
(4, 6)
(8, 10, 12)
(14, 16, 18, 20)
(22, 24, 26, 28, 30)
……………………………

(i) 求第 50 組的最後一個數字。
Find the last number of the 50th group.

(ii) 求第 50 組的第一個數字。
Find the first number of the 50th group.

(iii) 若第 50 組的數字之和為 $50P$，求 P 的值。
Find the value of P if the sum of the numbers in the 50th group is $50P$.

$P =$

(iv) 若第 100 組的數字之和為 $100Q$，求 Q 的值。
Find the value of Q if the sum of the numbers in the 100th group is $100Q$.

$Q =$

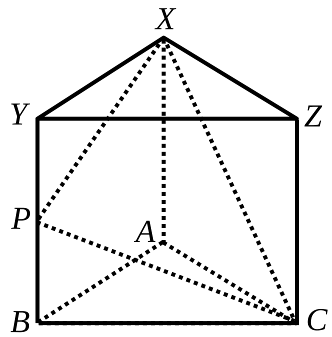
FOR OFFICIAL USE

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

Hong Kong Mathematics Olympiad (1991 – 1992)
Final Event 6 (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。

如圖所示，ΔABC 及 ΔXYZ 為等邊三角形，同時亦為一柱體的底和面。
P 為 BY 的中點，且 $BP = 3$ cm，$XY = 4$ cm。
As shown in the figure, ΔABC and ΔXYZ are equilateral triangles and are ends of a right prism. P is the mid-point of BY and $BP = 3$ cm, $XY = 4$ cm.



(i) If $a = \dfrac{CP}{PX}$, find the value of a.
若 $a = \dfrac{CP}{PX}$，求 a 的值。

$a =$

(ii) If $CX = \sqrt{b}$ cm, find the value of b.
若 $CX = \sqrt{b}$ cm，求 b 的值。

$b =$

(iii) If $\cos\angle PCX = \dfrac{\sqrt{c}}{5}$, find the value of c.
若 $\cos\angle PCX = \dfrac{\sqrt{c}}{5}$，求 c 的值。

$c =$

(iv) If $\sin\angle PCX = \dfrac{2\sqrt{d}}{5}$, find the value of d.
若 $\sin\angle PCX = \dfrac{2\sqrt{d}}{5}$，求 d 的值。

$d =$

FOR OFFICIAL USE

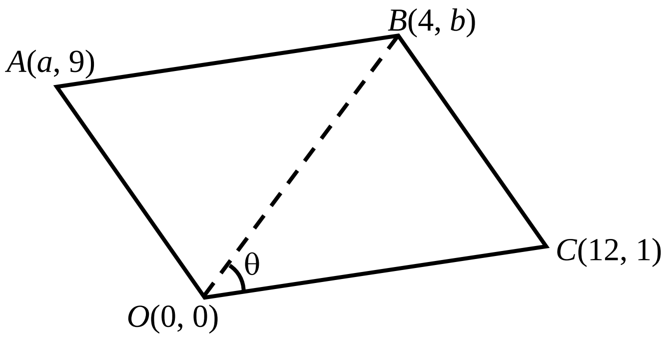
Score for accuracy [ ] × Mult. factor for speed [ ] = [ ]   Team No. [ ]

+ Bonus score [ ]   Time [ ] [ ]

Total score [ ]   Min.   Sec.

Final Event 7 (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。



已知 $OABC$ 為一平行四邊形。

Given that $OABC$ is a parallelogram.

(i) 求 a 的值。
Find the value of a.

$a =$

(ii) 求 b 的值。
Find the value of b.

$b =$

(iii) 求 $OABC$ 的面積。
Find the area of $OABC$.

Area =

(iv) 求 $\tan\theta$ 的值。
Find the value of $\tan\theta$.

$\tan\theta =$

FOR OFFICIAL USE

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

Hong Kong Mathematics Olympiad (1991 – 1992)
Final Event 8 (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。

(i) 一邊長 A cm 的等邊三角形之面積為 $\sqrt{3}\,\text{cm}^2$。求 A 的值。
The area of an equilateral triangle of side A cm is $\sqrt{3}\,\text{cm}^2$. Find the value of A.

$A =$

(ii) 若 $19 \times 243^{\frac{A}{5}} = b$，求 b 的值。
If $19 \times 243^{\frac{A}{5}} = b$, find the value of b.

$b =$

(iii) 方程 $x^3 - 173x^2 + 339x + 513 = 0$ 之根為 -1、b 及 c。求 c 的值。
The roots of the equation $x^3 - 173x^2 + 339x + 513 = 0$ are -1, b and c.
Find the value of c.

$c =$

(iv) 某三角錐體之底為一邊長 $2c$ cm 之等邊三角形。
若該三角錐體之高為 $\sqrt{27}$ cm，且其體積為 $d\,\text{cm}^3$，求 d 的值。
The base of a triangular pyramid is an equilateral triangle of side $2c$ cm.
If the height of the pyramid is $\sqrt{27}$ cm, and its volume is $d\,\text{cm}^3$,
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 (1991 – 1992)
Final Event 9 (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。

若一正六邊形 $ABCDEF$ 之面積為 $54\sqrt{3}$ cm^2，且 $AB = x$ cm，$AC = y\sqrt{3}$ cm，
If the area of a regular hexagon $ABCDEF$ is $54\sqrt{3}$ cm^2 and $AB = x$ cm, $AC = y\sqrt{3}$ cm,

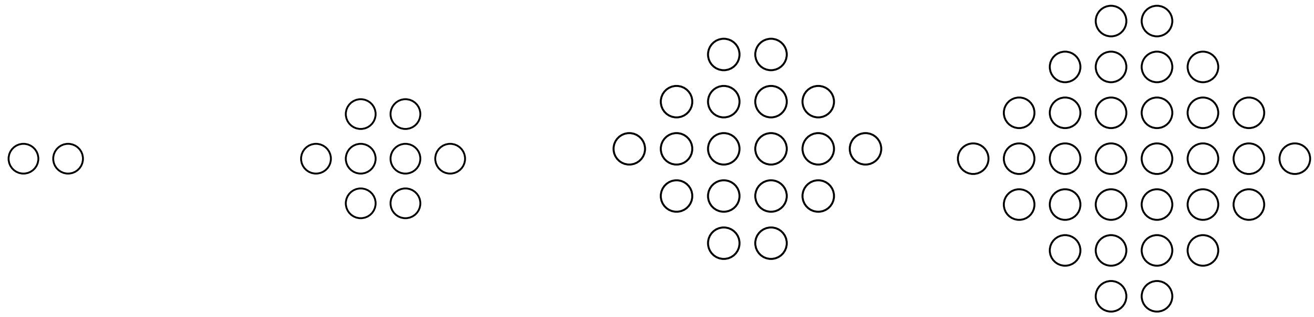
(i) 求 x 的值。
find the value of x.

$x =$

(ii) 求 y 的值。
find the value of y.

$y =$

細看以下之數形：
Consider the following number pattern:



$T_1 = 2$ $T_2 = 8$ $T_3 = 18$ $T_4 = 32$

(iii) 求 T_{10} 的值。
Find the value of T_{10}.

$T_{10} =$

(iv) 若 $T_n = 722$，求 n 的值。
If $T_n = 722$, find the value of n.

$n =$

FOR OFFICIAL USE

Score for accuracy × Mult. factor for speed =

\+ Bonus score

Total score

Team No.

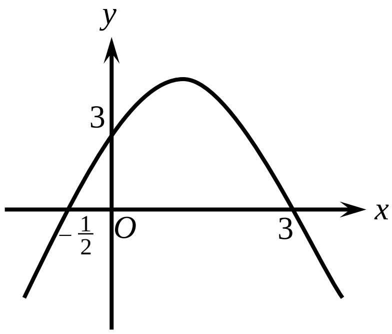
Time Min. Sec.

Hong Kong Mathematics Olympiad (1991 – 1992)
Final Event 10 (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。

下圖為 $y = ax^2 + bx + c$ 的圖形。

The following shows the graph of $y = ax^2 + bx + c$.



(i) 求 c 的值。
Find the value of c .

$c =$

(ii) 求 a 的值。
Find the value of a .

$a =$

(iii) 求 b 的值。
Find the value of b .

$b =$

(iv) 若 $y = x + d$ 為 $y = ax^2 + bx + c$ 的切線，求 d 的值。
If $y = x + d$ is tangent to $y = ax^2 + bx + c$, 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.