Hong Kong Mathematics Olympiad (1981 – 1982)

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) 求 a 的值，若 $a = 5 + 8 + 11 + \ldots + 38$。
Find the value of a if $a = 5 + 8 + 11 + \ldots + 38$.

$a =$

(ii) 設 $b = a$ 的所有位值之和，求 b 的值。
Let b = the sum of the digits of the number a. Find the value of b .

$b =$

(iii) 若 $c = b^2$，求 c 的值。
If $c = b^2$, find the value of c .

$c =$

(iv) 已知 $3d = c$，求 d 的值。
Given that $3d = c$, find the value of d .

$d =$

FOR OFFICIAL USE

Score for accuracy [ ] × Mult. factor for speed [ ] = [ ]

+ Bonus score [ ]

Total score [ ]

Team No. [ ]

Time [ ] [ ]

Min. Sec.

Hong Kong Mathematics Olympiad (1981 – 1982)

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) 從一副撲克牌中抽出兩張，而不放回原位。若抽得兩張都是紅心的機會率為 $\frac{1}{a}$，求 a 的值。
Two cards are drawn at random from a pack and not replaced.
If the probability that both cards are hearts is $\frac{1}{a}$, find the value of a.

$a =$

(ii) 在 17 人之中揀選 a 人，共有 b 種方法，求 b 的值。
If there are b ways of choosing 15 people from 'a' people, find the value of b.

$b =$

(iii) 一共有 $\frac{b}{2a}$ 幅不同顏色的旗，每次升起最少一幅。
如果不考慮顏色的次序，求一共有多少種不同的訊號 c？
If c signals can be made with $\frac{b}{2a}$ flags of different colours by raising at least one of the flags, without considering the arrangement of colours, find the value of c.

$c =$

(iv) 一個袋有 c 個球，其中 3 個是紅色。從中抽取一個，
問抽到紅球的概率為何？
There are c balls in a bag, of which 3 are red .
What is the probability of drawing a red ball ?

Probability =

FOR OFFICIAL USE

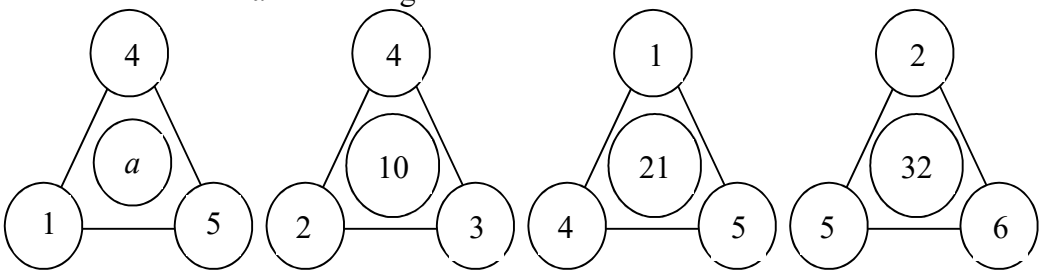
Score for accuracy		×	Mult. factor for speed		=		Team No.		
				+ Bonus score			Time		
				Total score				Min.	Sec.

Hong Kong Mathematics Olympiad (1981 – 1982)

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) 下圖中，求 a 的值。
Find the value of a in the figure.



$a =$

(ii) 求 b 的值，若 $\dfrac{\sin(4b)^\circ}{\cos(4b)^\circ} = \sqrt{\sqrt{a}}$ $(0 < 4b < 90)$。

Find the value of b if $\dfrac{\sin(4b)^\circ}{\cos(4b)^\circ} = \sqrt{\sqrt{a}}$ $(0 < 4b < 90)$.

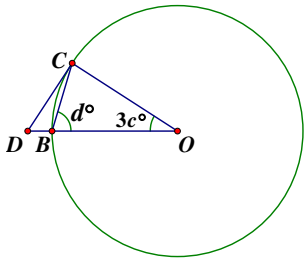
$b =$

(iii) 在以下數列中求 c 的值。

Find the value of c from the sequence: $\dfrac{3}{12}, \dfrac{7}{34}, \dfrac{c}{56}, \dfrac{b}{78}$.

$c =$

(iv) 圖中，O 為圓心，B 和 C 為圓周上的點，使得 $\angle BOC = 3c°$, $\angle OBC = d°$。求 d 的值。
In the figure, O is the centre, B and C are points on the circumference. $\angle BOC = 3c°$, $\angle OBC = d°$.
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 (1981 – 1982)

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) 若 $x=\dfrac{\log a^3}{\log a^2}$，其中 $a>0$ 及 $a\neq 1$，求 x 的值。

Find the value of x if $x=\dfrac{\log a^3}{\log a^2}$ where $a>0$ and $a\neq 1$.

$x=$

(ii) 若 $y-1=\log x+\log 2-\log 3$，求 y 的值。

If $y-1=\log x+\log 2-\log 3$, find the value of y.

$y=$

(iii) 若 $\log_2 Z^y=3$ 則 Z 的值為何？

What is the value of Z if $\log_2 Z^y=3$?

$Z=$

(iv) 求 $\log_z y$ 的值。

Find the value of $\log_z y$.

$\log_z y=$

FOR OFFICIAL USE

Score for accuracy [ ] × Mult. factor for speed [ ] = [ ]

\+ Bonus score [ ]

Total score [ ]

Team No. [ ]

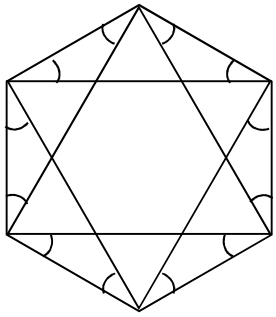
Time [ ] Min. [ ] Sec.

Hong Kong Mathematics Olympiad (1981 – 1982)

Final Event 5 (Individual)

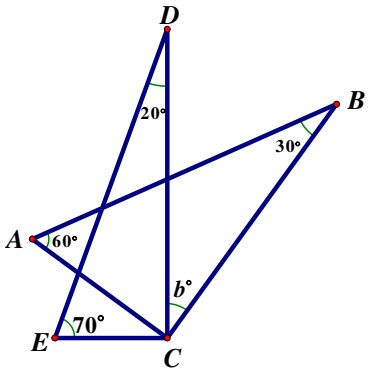
Unless otherwise stated, all answers should be expressed in numerals in their simplest form.
除非特別聲明，答案須用數字表達，並化至最簡。

(i) 如圖，所有有記號的角的總和是 $a°$，求 a 的值。
Let the sum of the marked angles be $a°$.
Find the value of a.



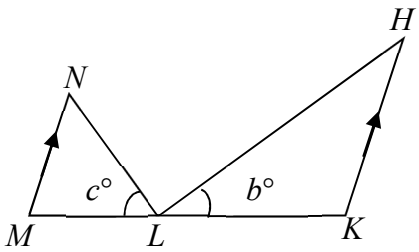
$a =$

(ii) 若 $\angle ACE = \left(\frac{a}{10}\right)^\circ$。求 b 的值。
$\angle ACE = \left(\frac{a}{10}\right)^\circ$. Find the value of b.



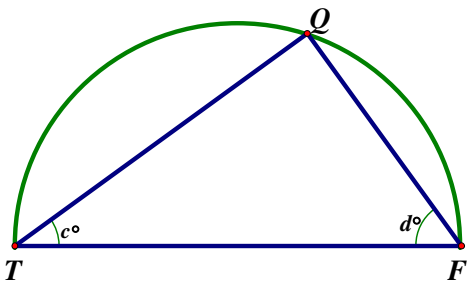
$b =$

(iii) 若 $HK = KL$，$LM = MN$，$HK // MN$，
求 c 的值。
If $HK = KL$, $LM = MN$, $HK // MN$,
find the value of c.



$c =$

(iv) TQF 為一半圓形，求 d 的值。
TQF is a semi-circle. 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 (1981 – 1982)

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。

Let $\log 2 = a$ 設 $\log 2 = a$
$\log 3 = b$ $\log 3 = b$
$\log 5 = c$ $\log 5 = c$

(i) 以 a、b 及 c 表示 $\log 6$。
Express $\log 6$ in terms of a, b and c.

$\log 6 =$

(ii) 計算 $3.5a + 3.5c$。
Evaluate $3.5a + 3.5c$.

$3.5a+3.5c =$

(iii) 以 a、b 及 c 表示 $\dfrac{\log 30}{\log 15}$。
Express $\dfrac{\log 30}{\log 15}$ in terms of a, b and c.

$\dfrac{\log 30}{\log 15} =$

(iv) 以 a、b 及 c 表示 $(\log 15)^2 - \log 15$。
Express $(\log 15)^2 - \log 15$ in terms of a, b and c.

$(\log 15)^2 - \log 15 =$

FOR OFFICIAL USE

Score for accuracy [ ] × Mult. factor for speed [ ] = [ ]

+ Bonus score [ ]

Total score [ ]

Team No. [ ]

Time [ ] [ ]

Min. Sec.

Hong Kong Mathematics Olympiad (1981 – 1982)

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。

(i) 右圖顯示一圓錐體及一半球體。$OB = 12$ cm，$r = 10$ cm，以 π 表示該立體的表面面積。
Figure 1 shows a cone and a hemisphere.
$OB = 12$ cm, $r = 10$ cm. Express the surface area of the solid in terms of π.

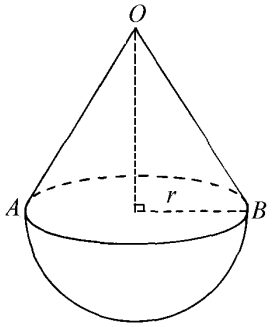


Figure 1

surface area =

(ii) 以 π 表示上圖立體的體積。
What is the volume of the hemisphere shown in figure 1?
Give your answer in terms of π.

volume =

(iii) 圖二顯示一圓錐體放置在一個半徑相等(r)、高度相同(h)的圓柱體內，以 r 及 h 表示兩者之間的空間的體積。
In figure 2, a right circular cone stands inside a right cylinder of same base radius r and height h. Express the volume of the space between them in terms of r and h.

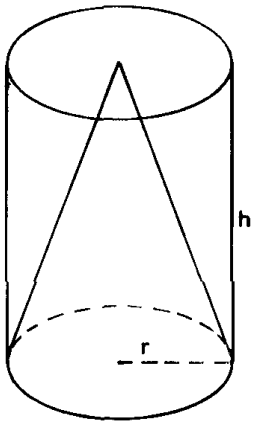


Figure 2

Volume =

(iv) 求圓柱體與圓錐體體積之比。
Find the ratio of the volume of the cylinder to that of the cone.

ratio =

FOR OFFICIAL USE

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

Hong Kong Mathematics Olympiad (1981 – 1982)

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。

依下圖
Given that:

1	2	3
4	5	6
7	8	9

1 stands for *A*　1 表示 *A*
2 stands for *B*　2 表示 *B*
……
25 stands for *Y*　25 表示 *Y*
26 stands for *Z*　26 表示 *Z*

(i) 以下符號 ㄩ ㄥ ㄋ ㄇ ㄖ 表示甚麼數字？
What number does the code ㄩ ㄥ ㄋ ㄇ ㄖ stand for?

ㄩ ㄥ ㄋ ㄇ ㄖ =

(ii) **以** Δ 表示 零。計算以下公式並以符號表示答案。
Put Δ stands for zero. Calculate the following and give the answer in code.
(ㄩΔ)(ㄋ Δ) + ㄦㄏ – ㄥΔ

answer =

(iii) "3 8 18 9 19 20 13 1 19" 表示一個英文字。它是甚麼？
"3 8 18 9 19 20 13 1 19" stands for a word. What is it?

word =

(iv) 將以下密碼翻譯成英文字。一共有兩個英文字。
Decode the following message:
(ㄦΔ ㄦㄖ ㄏ ㄦㄋ) (ㄩㄦ ㄦㄏ)
There are two words in the message.

message =

FOR OFFICIAL USE

Score for accuracy [ ] × Mult. factor for speed [ ] = [ ]

Team No. [ ]

+ Bonus score [ ]

Time [ ] [ ]

Total score [ ]

Min. Sec.

Hong Kong Mathematics Olympiad (1981 – 1982)

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。

(i) 在以下數列中求 A 的值。
Find the value of A from the sequence:
0, 3, 8, A, 24, 35, ⋯

$A =$

(ii) 方程 $x^2 - 15x + B = 0$ 的根為 7 及 C。求 B 和 C 的值。
The roots of the equation $x^2 - Ax + B = 0$ are 7 and C.
Find the values of B and C.

$B =$

$C =$

(iii) 若 $\log_7 B = \log_7 C + 7^X$， 求 X 的值。
If $\log_7 B = \log_7 C + 7^X$; find the value of X.

$X =$

FOR OFFICIAL USE

Score for accuracy [ ] × Mult. factor for speed [ ] = [ ]

\+ Bonus score [ ]

Total score [ ]

Team No. [ ]

Time [ ] [ ]

Min. Sec.

Hong Kong Mathematics Olympiad (1981 – 1982)

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。

(i) 若 $N = 2^{12} \times 5^8$，N 是一個多少位的數字？
How many digits are there in the number N if $N = 2^{12} \times 5^8$?

Number of digits

(ii) $(2^{48} - 1)$ 可被兩個介乎於 60 至 70 之間的整數整除，求該兩數。
If $(2^{48} - 1)$ is divisible by two whole numbers between 60 and 70, find them.

smaller number =

larger number =

(iii) 以下兩個數，哪一個較大？$2^{\frac{1}{2}} \times 9^{\frac{1}{9}}$，$3^{\frac{1}{3}} \times 8^{\frac{1}{8}}$。
Given $2^{\frac{1}{2}} \times 9^{\frac{1}{9}}$, $3^{\frac{1}{3}} \times 8^{\frac{1}{8}}$. What is the greatest number?

greatest number =

FOR OFFICIAL USE

Score for accuracy [ ] × Mult. factor for speed [ ] = [ ]

\+ Bonus score [ ]

Total score [ ]

Team No. [ ]

Time [ ] [ ]

Min. Sec.