2023/24 第十八屆香港小學數學創意解難比賽

24/2/2024（星期六）10:25-11:30

比賽時間：65 分鐘

參賽者須知：

1. **比賽時間：65 分鐘。**建議在甲部用 50 分鐘作答，在乙部用 15 分鐘作答。
2. 本問題卷共 8 頁、答題紙 6 頁及附件 2 頁，甲部有 12 題數學題，乙部有 1 題創意解難題。
3. 每位參賽學生獲派一份問題卷及一份答題紙。
4. 比賽期間隊員可以討論題目，並於答題紙寫上議定的答案。
   **** 只有寫於隊長的答題紙上的答案方可得到評分。**
5. 參賽隊伍需自備文具及計算機。為公平起見，比賽中只可使用非圖像計算機。本比賽中嚴禁使用電子字典、電腦、電話或其他有上網或通訊功能的工具。
6. 本試卷每頁的空白位置可作為草稿之用。每位參賽學生會獲派三張草稿紙，如有需要，可要求額外草稿紙。
7. 在筆試完結後，必須交回隊長的答題紙。

2023/24 The 18th Hong Kong Mathematics Creative Problem Solving Competition for Primary Schools

24/2/202 (Saturday) 10:25-11:30

Time allowed：65 minutes

Instructions for participants：

1. **Time allowed: 65 minutes.** It is advised to spend 50 minutes in Section A and 15 minutes in Section B.
2. The question paper consists of 8 pages, the answer sheet consists of 6 pages and the annex consists of 2 pages. There are 12 questions in Section A and 1 creative problem in Section B.
3. Each participant will get a set of question paper and a set of answer sheets.
4. Team members are allowed to discuss during the competition. The agreed answers should be written on the answer sheets.
   **** Only the answers in the captain's answer sheet will be marked.**
5. Participating teams should bring their own stationery and calculators. For the purpose of fairness, only non-graphic calculators are allowed. Electronic dictionaries, computers, mobile phones and other online or communication devices are prohibited.
6. The blank space on each page of this question paper can be used for rough work. Each participant will get three rough work sheets. Extra rough work sheets will be provided upon request.
7. The captain's answer sheets will be collected after the competition.

甲部（建議此部用 50 分鐘作答）

Section A (Suggested to use 50 minutes in this Section)

1. 以 2, 3, 2, 4 這四個數字及任何運算符號計算出以下數值，算式中必需使用每個數字一次，數字可以任何次序出現：

   Use the 4 digits 2, 3, 2, 4 and any math operations to compute the value(s), where each digit must be used and be used once only, and the numbers can be arranged in any order:

   $11 =$ _____

   $12 =$ _____

   $13 =$ _____

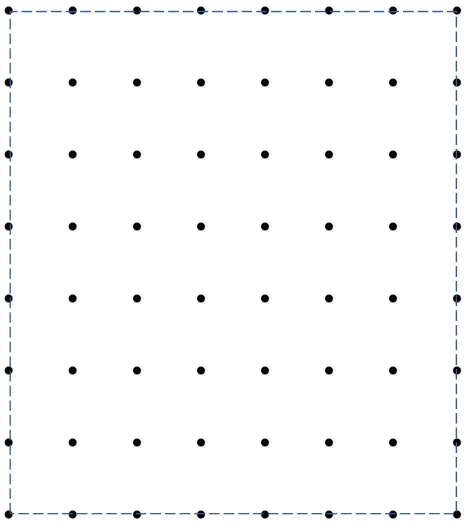
   $14 =$ _____

   $15 =$ _____

2. 下圖中直向及橫向每兩相鄰點的距離為 1 單位。試劃出三角形使其面積相等於虛線正方形的 (a) $\frac{1}{2}$；(b) $\frac{1}{3}$；(c) $\frac{1}{5}$。

   In the following figure, the vertical and horizontal distance between adjacent dots is 1 unit. Try to make triangles whose area equal to

   (a) $\frac{1}{2}$; (b) $\frac{1}{3}$; (c) $\frac{1}{5}$ of the square with dotted lines.



3. A、B、C、D、E 和 F ，6 人排成一條直線，已知：
6 people A, B, C, D, E and F are arranged in a straight line, it is given that:

F 不是排在最後，而且他和最後一人之間還有兩人；
E 不是排在最後；
在 A 的前面至少還有四人，但他不是排在最後；
D 不是排在最後，而他前面至少有兩人；
C 不是排在最前，也不是排在最後。
F is not in the last position, and there are two people between him and the last person;
E is not in the last position;
There are at least four people in front of A, and he is not in the last position;
D is not in the last position, and there are at least two people in front of him;
C is not in the first and the last position.

根據以上資料分析 6 人的排序。
Arrange the order of the 6 people according to the above information.

_____、_____、_____、_____、_____、_____
（最前） （最後）
(First position) (Last Position)

4. A 隊、B 隊、C 隊、D 隊和 E 隊五隊進行排球比賽，每兩隊球隊互賽一場進行循環賽。比賽結果如下：
Teams A, B, C, D and E are playing in a volleyball competition. Each team will play a match with every other team. The results are as follows:

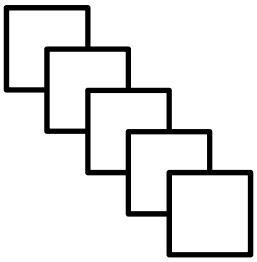
A 隊：2 勝 2 負
B 隊：0 勝 4 負
C 隊：1 勝 3 負
D 隊：4 勝 0 負
Team A: 2 Win 2 Lose
Team B: 0 Win 4 Lose
Team C: 1 Win 3 Lose
Team D: 4 Win 0 Lose

那麼 E 隊的成績如何？
Then what is the result of Team E?

勝 Win:_____; 負 Lose: _____

5. CPS 小學合唱團的所有團員正在進行分組練習。如果增加一組，每組有 7 人；如果減少一組，每組有 8 人。問 CPS 小學合唱團共有團員多少人？
The members of the school choir of CPS Primary School are practising in groups. If the number of groups is increased by one, then there will be exactly 7 members in each group. If the number of groups is decreased by one, then there will be exactly 8 members in each group. How many members are there in the school choir of CPS Primary School?

6. 有 5 張同樣大小的正方形門票如下圖重疊着，每張門票邊長為 5 厘米，重疊的部分是正方形，且邊長為門票的一半，求重疊後圖形的周界。
5 identical tickets in the shape of squares are overlapping as shown in the figure below. The length of each ticket is 5 cm. The overlapping part are identical squares whose lengths are half of that of the tickets. Find the perimeter of the shape after overlapping.



7. 有三名運動員，他們的年齡一個比一個大 2 歲，三人年齡相乘的積為 7920。他們三人中年齡最大的是多少歲？
There are three athletes, and each one is two years older than the previous one. The product of their ages is 7920. What is the age of the eldest athlete?

8. 三名足球員的球衣號碼均為質數，這三個質數的和是 62，這三個質數的相乘最大的積是多少？
The Jersey numbers of three football players are primes where the sum of the three primes is 62. What is the largest product when the three primes are multiplied together?

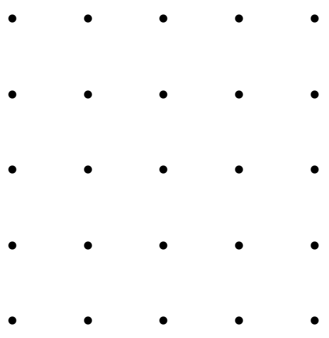
9. CPS 少年足球訓練班有 55 人，參加射球訓練的有 29 人，參加守門員訓練的有 28 人，有 12 人同時接受射球和守門員訓練。在 CPS 少年足球訓練班中既沒有參加了射球訓練也沒有參加守門員訓練的有多少人？
There are 55 players in the CPS Junior Football Training Course. 29 of them participate in shooting training, 28 of them participate in goalkeeping training and 12 of them participate in both training. How many students in the CPS Junior Football Training Course do not participate in shooting training nor goalkeeping training?

10. 甲隊和乙隊比賽，他們各有三個比賽隊員，能力分別為：上（1）、中（2）、下（3）。
Each of the team A and team B has three members in a competition. The abilities of the members are high (1), middle (2) and low (3) respectively.

甲隊：甲 1、甲 2 和甲 3
Team A: A1, A2 and A3
乙隊：乙 1、乙 2 和乙 3
Team B: B1, B2 and B3

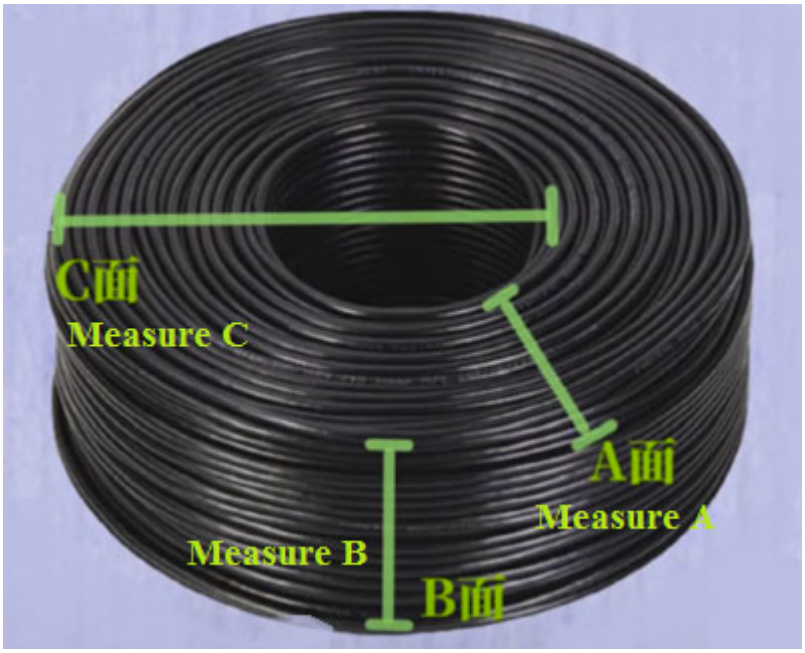
兩隊共比賽 3 場，每名隊員只可出賽一場，在三場比賽勝出兩場或以上的隊伍便能獲最後勝利。比賽時，能力上的必能勝過能力中和下，能力中的必能勝過能力下。而甲隊的三名隊員均不如乙隊同能力的隊員。
如果甲隊事先只打探出乙隊首場必出能力最高的隊員（乙 1），甲隊首場比賽應該派出哪種能力的隊員出賽才能有機會獲得最後勝利？求甲隊獲得最後勝利的機會是幾分之幾？
The two teams play three games in total. Each member can play only one game. The team winning two or more games will be the champion. During the games, the member with high ability must win the game from the opponent of middle or low ability, the member with middle ability must win the game from the opponent of low ability. Each member from Team A will lose to the member from Team B with the same ability level.
Assume that Team A knows that Team B will send the member of the high ability (B1) in the first game, which member should Team A send for the first game in order to have a chance of winning the champion? What is the probability of Team A to get the champion?

11.



上圖是一個 5 乘 5 的正方點陣，相鄰的每兩點的水平和垂直距離都等於 1 單位。若只能用紅筆由點連線至點，可以繪劃多少個面積大於 1 平方單位而小於 10 平方單位的紅色正方形？
The figure above is a 5 × 5 square grid, where the distances of every pair of horizontal and vertical pair of dots are equal to 1 unit. If you are allowed to draw red lines by joining dots, how many red squares of area larger than 1 square unit and smaller than 10 square units can be drawn?

12.



上圖顯示一紮電線，已知 C 面長度為 80 cm，A 面有電線根數 25 根而長度為 40 cm，B 面有電線根數 40 根。

The figure above shows a bundle of electric wires. It is given that the length of measure C is 80 cm. There are 25 pieces of electric wires in measure A and the length of measure A is 40 cm. There are 40 pieces of electric wires in measure B.

試寫出一算式，並估算以上電線的總長度。

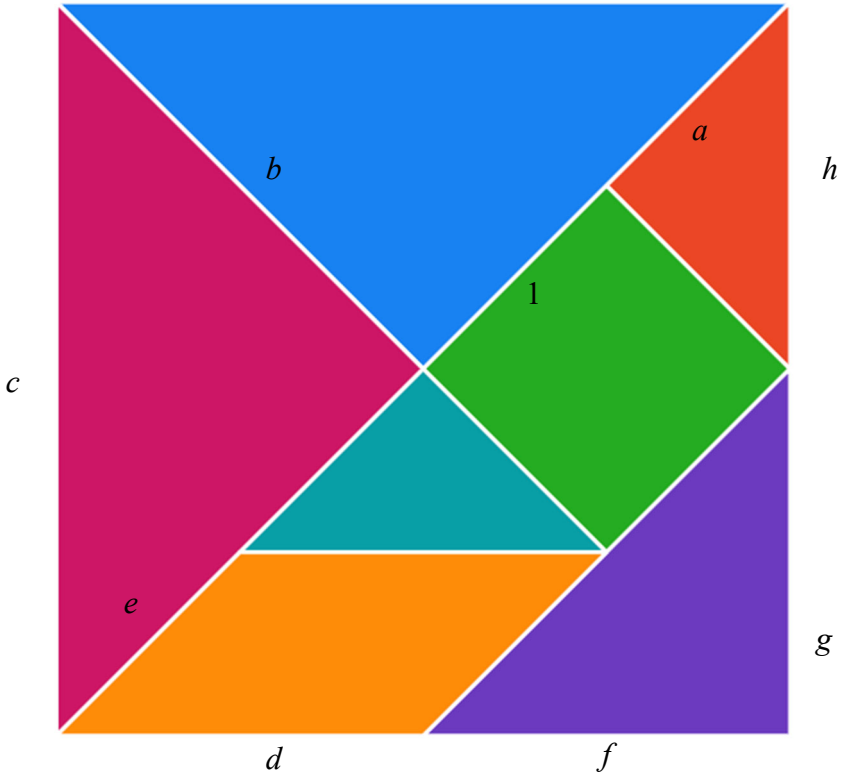
Write down an expression and estimate the total length of the above electric wires.

乙部（建議此部用 15 分鐘作答，如有需要，同學可先行閱讀附件一的閱讀材料。）

Section B (Suggested to use 15 minutes in this Section, students can read the reading materials provided in Annex 1 if necessary.)

1. 下圖顯示一個「七巧板」由七塊多邊形組成：

   A tangram puzzle consists of 7 pieces of polygons as shown:



(a) 多邊形當中有 2 個大三角形，1 個中等三角形，1 個平行四邊形，2 個小三角形及 1 個小正方形。假設小正方形的邊長為 1 單位。求圖中所有未知的邊長。

There are 2 big triangles, 1 middle size triangle, 1 parallelogram, 2 small triangles and 1 small square. Suppose the side of the small square has length of 1 unit. Find the lengths of all the unknown sides in the above figure.

(b) 除了上圖所示的大正方形外，我們可用七巧板拼出其他多邊形。在以下空格內畫出三個可以用七巧板的所有板塊拼出的凸多邊形。(你可把附件二中的七巧板剪開並試拼。)

註：凸多邊形為所有內角都小於180°的多邊形。

Besides the square shown in the above figure, the tangram pieces can be arranged to form other polygons. Use the grid below to draw any three convex polygons that can be formed by all the pieces of the tangram puzzle. (You may cut the tangrams in the Annex 2 for trials.)

Remark: Convex polygons are polygons with all interior angles less than 180°.

全卷完

End of Paper

2023/24 第十八屆香港小學數學創意解難比賽

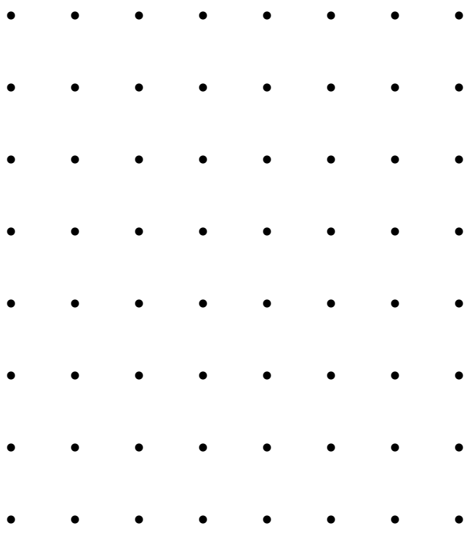
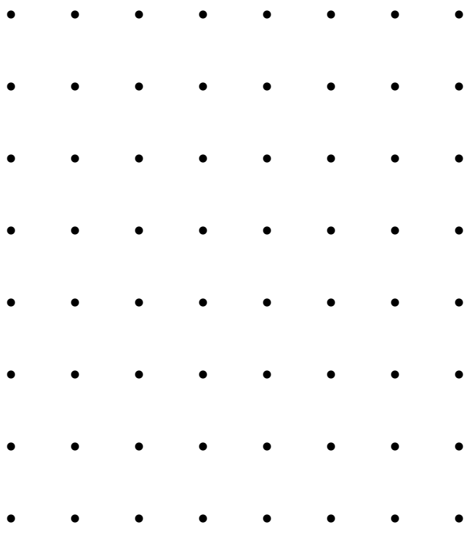
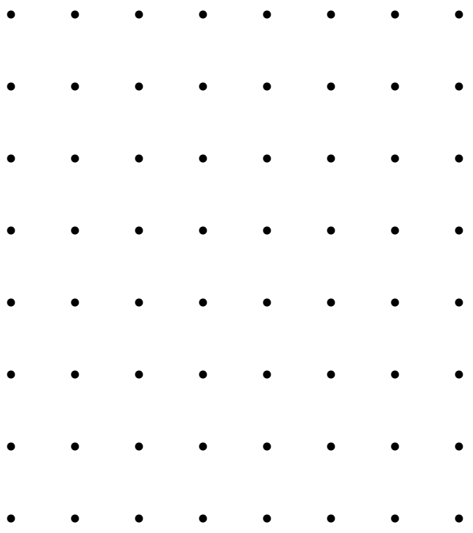
2023/24 The 18th Hong Kong Mathematics Creative Problem Solving Competition for Primary Schools

答題紙 Answer sheets

學校編號 School Code：P_____ 學校名稱 School Name：	得分 Score： /50

甲部 Section A

	答案 Answers	評分 Marks
1.	11 = _____ 12 = _____ 13 = _____ 14 = _____ 15 = _____	/5

2.	(a)  (b)  (c) 	/3

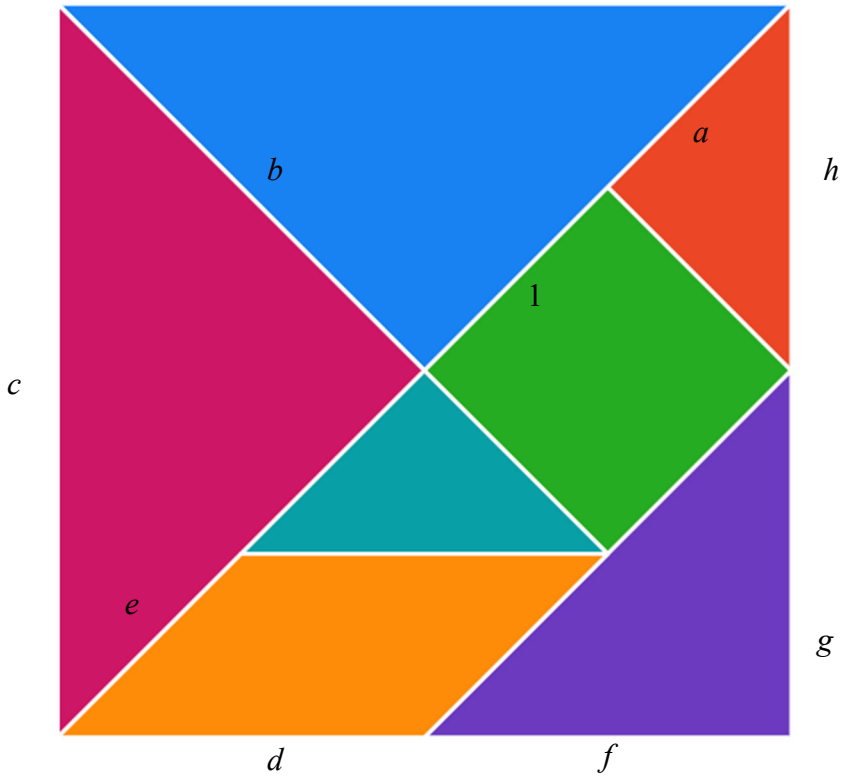
3.	_____、_____、_____、_____、_____、_____ （最前） （最後） (First position) (Last Position)	/3
4.	勝 Win:_____; 負 Lose: _____	/3
5.	問 CPS 小學合唱團共有團員多少人？ How many members are there in the school choir of CPS Primary School? 答 Answer：_____	/3
6.	求重疊後圖形的周界。 Find the perimeter of the shape after overlapping. 答 Answer：_____	/3
7.	他們三人中年齡最大的是多少歲？ What is the age of the eldest athlete? 答 Answer：_____	/3
8.	這三個質數的相乘最大的積是多少？ What is the largest product when the three primes are multiplied together? 答 Answer：_____	/3

9.	在 CPS 少年足球訓練班中既沒有參加了射球訓練也沒有參加守門員訓練的有多少人？ How many students in the CPS Junior Football Training Course do not participate in shooting training nor goalkeeping training? 答 Answer：_____	/3
10.	甲隊首場比賽應該派出哪種能力的隊員出賽才能有機會獲得最後勝利？ Which member should Team A send for the first game in order to have a chance of winning the champion? 答 Answer：_____ 求甲隊獲得最後勝利的機會是幾分之幾？ What is the probability of Team A to get the champion? 答 Answer：_____	/4
11.	請問你可以繪劃多少個面積大於 1 平方單位而小於 10 平方單位的紅色正方形？ How many red squares of area larger than 1 square unit and smaller than 10 square units can be drawn? 答 Answer：_____	/3
12.	試寫出一算式，並作以上電線總長度的估算。 Write down an expression and estimate the total length of the above electric wires. 答 Answer：_____ _____	/4

乙部 Section B

1. (a) 求圖中所有未知的邊長。(4 分)

Find the lengths of all the unknown sides in the above figure. (4 marks)



$a =$ _____

$b =$ _____

$c =$ _____

$d =$ _____

$e =$ _____

$f =$ _____

$g =$ _____

$h =$ _____

(b) 在以下空格內畫出三個可以七巧板拼出的凸多邊形。(6 分)

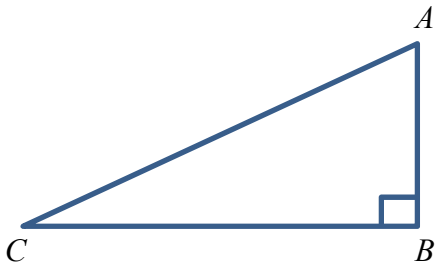
Use the grid below to draw any three convex polygons that can be formed by the tangram puzzle. (6 marks)

附件一 Annex 1

<u>畢氏定理 Pythagoras Theorem</u>

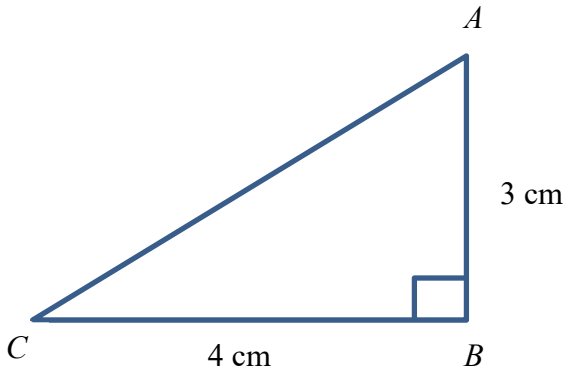
對於所有直角三角形 ABC，其中$\angle B = 90°$。我們便有$AC^2 = AB^2 + BC^2$。

For any right-angled triangle ABC, where $\angle B = 90°$. Then we have $AC^2 = AB^2 + BC^2$.



例一：

Example 1:



$AC^2 = AB^2 + BC^2$

$AC^2 = 3^2 + 4^2$

$AC^2 = 25$

要計算 AC 的數值，便要把數字取平方根，即：

To calculate the value of AC, we take square root on the number, i.e.:

$AC = \sqrt{25}$

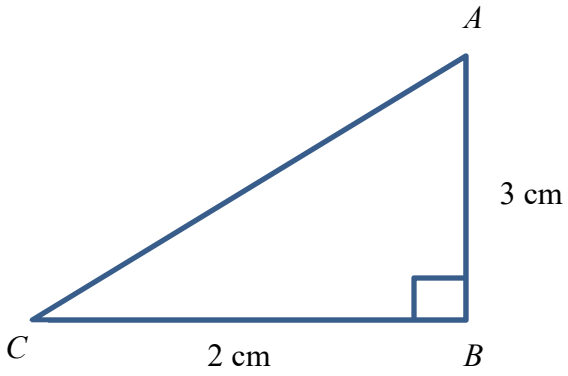
以計算機求出$\sqrt{25}$的值：

Use the calculator to find the value of $\sqrt{25}$:

$AC = 5$ cm

例一：

Example 1:



$AC^2 = AB^2 + BC^2$

$AC^2 = 3^2 + 2^2$

$AC^2 = 13$

要計算 AC 的數值，便要把數字取平方根，即：

To calculate the value of AC, we take square root on the number, i.e.:

$AC = \sqrt{13}$

以計算機求出$\sqrt{13}$的值，若計算機顯示值為無盡小數，便保留平方根號作答案，無需化簡：

Use the calculator to find the value of $\sqrt{13}$, if the calculator shows a non-terminating decimal, then leave the square root sign in the answer:

$AC = \sqrt{13}$ cm

附件二 Annex 2