

畢氏定理應用

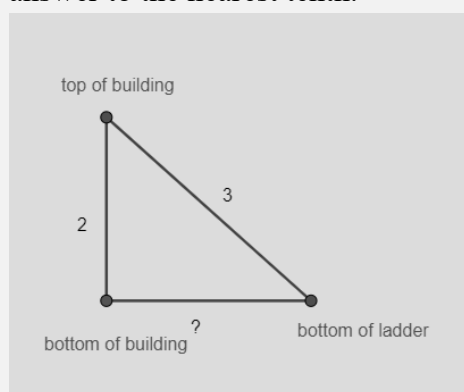
Applications of the Pythagorean Theorem

雙語使用參考範例：

例題 1: (找合理數據)

如果你將一把 3.5 公尺的梯子頂端靠在一個 2 公尺高的建築物頂部，則梯子的底部將距離此建築物底部多少公尺？四捨五入到小數點後第一位。

How far will the bottom of the ladder be from the bottom of the building if you place a 3.5-meter ladder against the top of A 2-meter tall building? Round the answer to the nearest tenth.



解：

要解這個例題，我們可以使用畢氏定理。

複習：在一個直角三角形中，斜邊的長度（在這種情況下是梯子）的平方等於其他兩邊的長度的平方之和（建築物的高度和梯子底部距離建築物底部的距離）。

To solve this example, we can use the Pythagorean theorem.

Review:

In a right-angled triangle, the square of the length of the hypotenuse (the ladder in this case) is equal to the sum of the squares of the lengths of the other two sides (the height of the building and the distance from the bottom of the ladder to the bottom of the building).

因此在這個情況

$$c^2 = a^2 + b^2$$

c 是梯子的長度（3.5 公尺），

a 是建築物的高度（2 公尺），

b 是梯子底部到建築物底部的距離。

So, in this case:

$$c^2 = a^2 + b^2$$

c is the length of the ladder (3 meters),

a is the height of the building (2 meters),

b is the distance from the bottom of the ladder to the bottom of the building.

現在讓我們先把數字代入

Now, plug in the values:

$$3.5^2 = 2^2 + b^2$$

$$12.25 = 4 + b^2$$

$$b^2 = 8.25$$

$$b = \pm\sqrt{8.25} \approx \pm 2.9$$

負數不合理(因為長度都是正的)

Negative number answers are unreasonable. (Because as length must be positive)

因此，梯子的底部將距離建築物底部約2.9公尺。

So, the bottom of the ladder will be approximately 2.9 meters from the bottom of the building.

雙語使用參考範例：

例題 2:

一開始你先向西走 500 公尺，然後右轉，再向北走 800 公尺。這時，你距離出發點的直線距離是多少？四捨五入到小數點後第一位。

You start walking 500m west, turn right, and walk north for another 800m (800m north). At the end of walking, what is your straight-line distance from your starting point? Round the answer to the nearest tenth.

解:

$$c^2 = a^2 + b^2$$

c 是題目要求的直線距離，

a 是你向西走的距離 (500m)，

b 是你向北走的距離 (800m)。

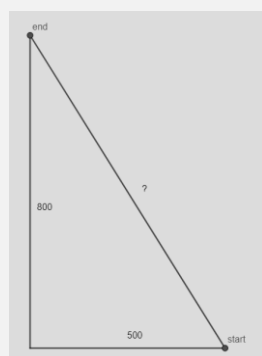
So, in this case:

$$c^2 = a^2 + b^2$$

c is the required distance straight-line distance from the starting point,

a is the distance you drove west (500m),

b is the distance you drove north (800m).



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Now, plug in the values:

$$c^2 = 500^2 + 800^2$$

$$c^2 = 250000 + 640000$$

$$c^2 = 890000$$

$$c = \pm\sqrt{890000} = \pm 100\sqrt{89} \approx \pm 943.4$$

負數不合理(因為距離都是正的)

Negative number answers are unreasonable. (Because distance must be positive)

因此，最後，你距離出發點的直線距離為943.4公尺。

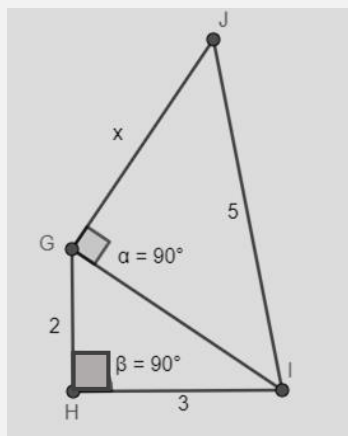
So, at the end of your walk, your straight-line distance from the starting point is 943.4m.

雙語使用參考範例：

例題 3:

如下圖， GHI 和 GJI 均為直角三角形，其中 $\overline{HI} \perp \overline{GH}$ ， $\overline{GI} \perp \overline{GJ}$ ，且 $\overline{HI} = 3$ ， $\overline{GH} = 2$ ， $\overline{JI} = 5$ ，則 $\overline{GJ} = ?$

In the figure below, both GHI and GJI are right triangles, where $\overline{HI} \perp \overline{GH}$, $\overline{GI} \perp \overline{GJ}$, and $\overline{HI} = 3$, $\overline{GH} = 2$, $\overline{JI} = 5$, then $\overline{GJ} = ?$



找底部的三角形的斜邊長(\overline{GI})

Find the hypotenuse of the triangle on the bottom. (\overline{GI})

$$2^2 + 3^2 = \overline{GI}^2$$

$$\overline{GI}^2 = 4 + 9$$

$$\overline{GI}^2 = 13$$

$$\overline{GI} = \pm\sqrt{13}$$

負數不合理(因為長度都是正的)

Negative number answers are unreasonable. (Because length must be positive)

$$\overline{GI} = \sqrt{13}$$

找出上面的三角形的未知長度的邊(\overline{GJ})(x)

Find the missing leg of the triangle on the top. (\overline{GJ})

$$\overline{GJ}^2 + (\sqrt{13})^2 = 5^2$$

$$\overline{GJ}^2 = 25 - 13$$

$$\overline{GJ}^2 = 12$$

$$\overline{GJ} = \pm\sqrt{12}$$

負數不合理(因為長度都是正的)

Negative number answers are unreasonable. (Because length must be positive)

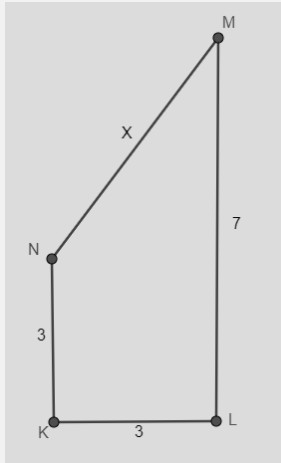
$$\overline{GJ} = \sqrt{12} = 2\sqrt{3}$$

雙語使用參考範例：

例題 4:

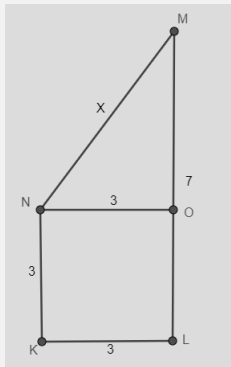
已知 $KLMN$ 為一梯形，其中 $\overline{KL} \perp \overline{ML}$ ， $\overline{KL} \perp \overline{KN}$ ，且 $\overline{KL} = \overline{NK} = 3$ ， $\overline{ML} = 7$ ，則 $\overline{MN} = ?$

In the trapezoid $KLMN$, where $\overline{KL} \perp \overline{ML}$, $\overline{KL} \perp \overline{KN}$, and $\overline{KL} = \overline{NK} = 3$, $\overline{ML} = 7$, then $\overline{MN} = ?$



畫一條線可以找到一個直角三角形和一個正方形。正方形對面的邊和底邊會一樣長，所以 $\overline{NO} = 3$ 。

Draw a line to create a right triangle and a square and note that opposite sides of the square are the same length, so $\overline{NO} = 3$.



$$x^2 = 3^2 + (7 - 3)^2$$

$$x^2 = 9 + 16$$

$$x^2 = 25$$

$$x = \pm 5$$

負數不合理(因為長度都是正的)

Negative number answers are unreasonable. (Because as length must be positive)

$$x = 5$$

參考資料來源

1. 111 國中數學翰林版課本

2. Into Math Advanced2

☆老師們可以自己從中選擇以做出适合自己學生程度的學習單或是在課堂中適時補充這些英文。

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