

## 二次方根的意義 Square root

英文版定義：

Definition: The square root of a positive number  $p$  is  $x$  when  $x^2 = p$ .

Note that every positive number has two square roots. For example,  $3^2 = 9$  and  $(-3)^2 = 9$ , so the two square roots of 9 are 3 and  $-3$ .

These are sometimes written together as  $\pm 3$ , and read as “plus or minus three.”

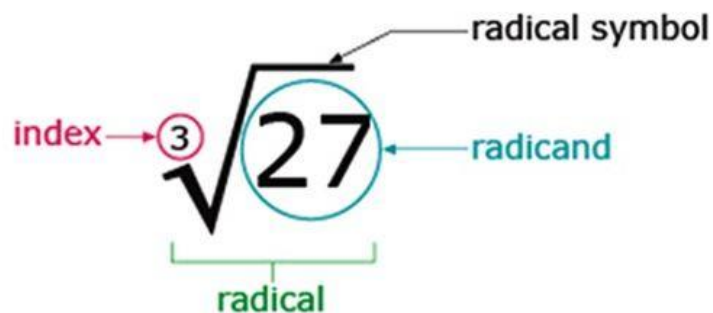
A perfect square is a whole number whose square roots are integers. For example, 16 is a perfect square since its square roots are the integers 4 and  $-4$ .

The square root of any number that isn't a perfect square is another example of an irrational number.

The symbol  $\sqrt{\quad}$  (radical symbol) is used to indicate the positive square root, or principal square root, of a number. So,  $\sqrt{16} = 4$ .

Reference: HMH into Math Advanced 2

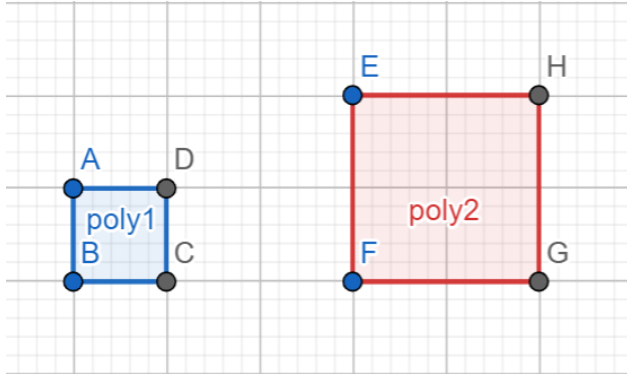
## Radical



Reference: <https://byjus.com/maths/radical/>

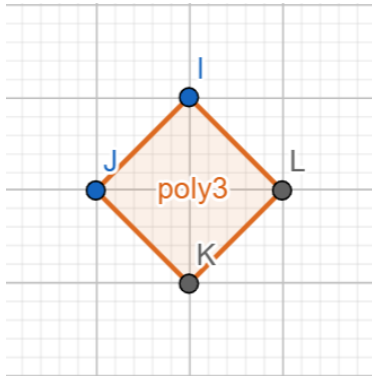
## 1 根號 Square root

邊長為 1 的正方形，其面積為 1；邊長為 2 的正方形，其面積為 4。



T：有沒有面積為 2 的正方形呢？可以試著畫畫看。

T：可以發現此正方形的面積為 2，那麼它的邊長是多少呢？



翻譯示例：

There is a square with side length 1, and its area is 1.

There is a square with side length 2, and its area is 4.

T : Is there a square with an area of 2?

(Students answer yes or no.)

T : You can try to draw a square with an area of 2.

By observing Polygon3, we can find a square has an area of 2.

What is the side length of this square?

課本內容：

假設面積為 2 的正方形，其邊長為  $m$ ，則  $m^2=2$ 。又  $1.4^2=1.96$ ， $1.5^2=2.25$ ，所以  $1.4 < m < 1.5$ ，也就是說， $m$  無法用一位小數表示。

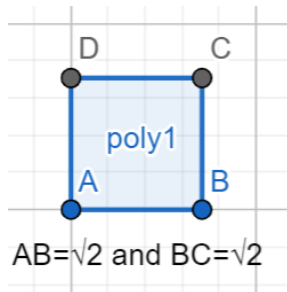
Assuming the square with an area of 2 has a side length of  $m$ , then  $m^2=2$ .

Since  $1.4^2=1.96$  and  $1.5^2=2.25$ , we can conclude that  $1.4 < m < 1.5$ .

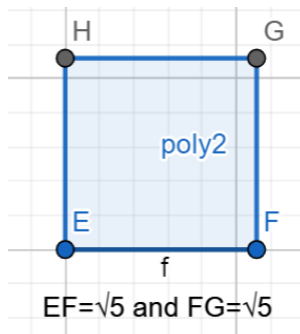
In other words, the side length  $m$  cannot be represented by a single decimal digit.

課本內容：

同樣的道理， $1.41^2=1.9881$ ， $1.42^2=2.0164$ ，所以  $1.41 < m < 1.42$ ，也就是說，這個數不只有兩位小數。事實上， $m$  無法用任何小數或分數表示，因此， $m$  的值我們以一個新的符號  $\sqrt{2}$ （讀作**根號二**）來代表此數，亦即面積為 2 的正方形，它的邊長記為  $\sqrt{2}$ ；



而面積為 5 的正方形，它的邊長記為  $\sqrt{5}$ 。



以此類推，面積為  $a$  的正方形，它的邊長記為  $\sqrt{a}$ 。反之，若  $a > 0$ ，正方形的邊長為  $\sqrt{a}$ ，則正方形的面積為  $(\sqrt{a})^2 = a$ 。

翻譯示例：

By the same reasoning,  $1.41^2=1.9881$  and  $1.42^2=2.0164$ .

Therefore,  $1.41 < m < 1.42$ , indicating that this number has more than two decimal places.

In fact,  $m$  cannot be represented by any decimal or fractional value.

Hence, we use a new symbol (read as "square root of 2") to represent this number.

Thus, for a square with an area of 2, its side length is denoted as  $\sqrt{2}$ .

Similarly, for a square with an area of 5, its side length is denoted as  $\sqrt{5}$ .

Following this pattern, for a square with an area of  $a$ , its side length is denoted as  $\sqrt{a}$ .

Conversely, if  $a > 0$  and the side length of a square is  $\sqrt{a}$ , then the area of the

square is given by  $(\sqrt{a})^2 = a$ .

### 【 $\sqrt{a}$ 的意義】

1. 面積為  $a$  的正方形，其邊長記為  $\sqrt{a}$ 。
2. 若  $a > 0$ ，則  $(\sqrt{a})^2 = a$ 。
3. 若  $a$ 、 $b$  為正數，且  $a > b$ ，則  $\sqrt{a} > \sqrt{b}$

翻譯示例：

1. The area of the square is  $a$ , so the side length is  $\sqrt{a}$ .
2. If  $a > 0$ , then  $(\sqrt{a})^2 = a$ .
3. If  $a$  and  $b$  are positive and  $a > b$ , then  $\sqrt{a} > \sqrt{b}$ .

練習

Calculate the following numbers.

- (1)  $(\sqrt{10})^2$
- (2)  $(\sqrt{15})^2$
- (3)  $(\sqrt{\frac{10}{37}})^2$

### 【 $\sqrt{a^2}$ 的意義】

若  $a > 0$ ，則  $\sqrt{a^2} = a$ 。

翻譯示例：

If  $a > 0$ , then  $\sqrt{a^2} = a$ .

練習

Calculate the following numbers.

- (1)  $\sqrt{10^2}$
- (2)  $\sqrt{31^2}$
- (3)  $\sqrt{1.3^2}$
- (4)  $\sqrt{\frac{1}{4}}$

## 參考資料來源

1. 111 國中數學翰林版課本
2. Into Math Advanced2
3. <https://byjus.com/maths/radical/>

☆老師們可以自己從中選擇以做出適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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