

通識博雅課程 -
數學的故事

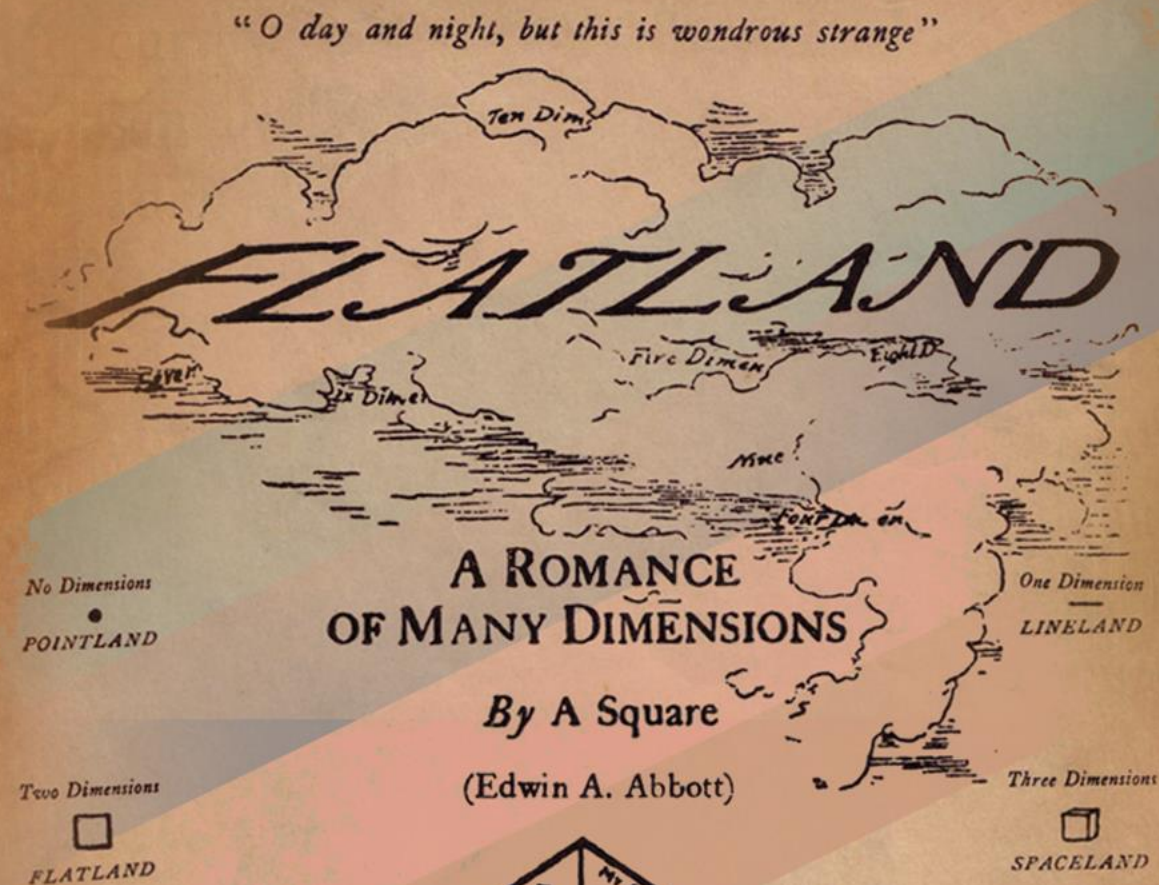
單元 11

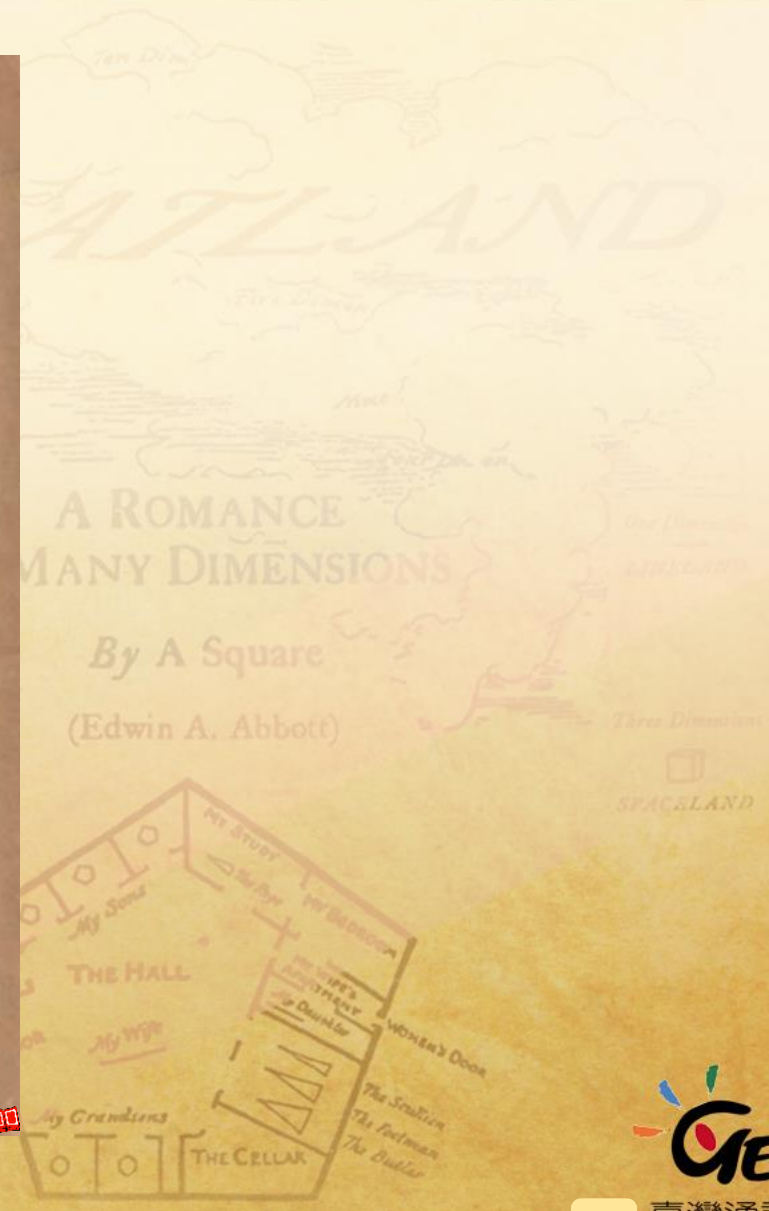
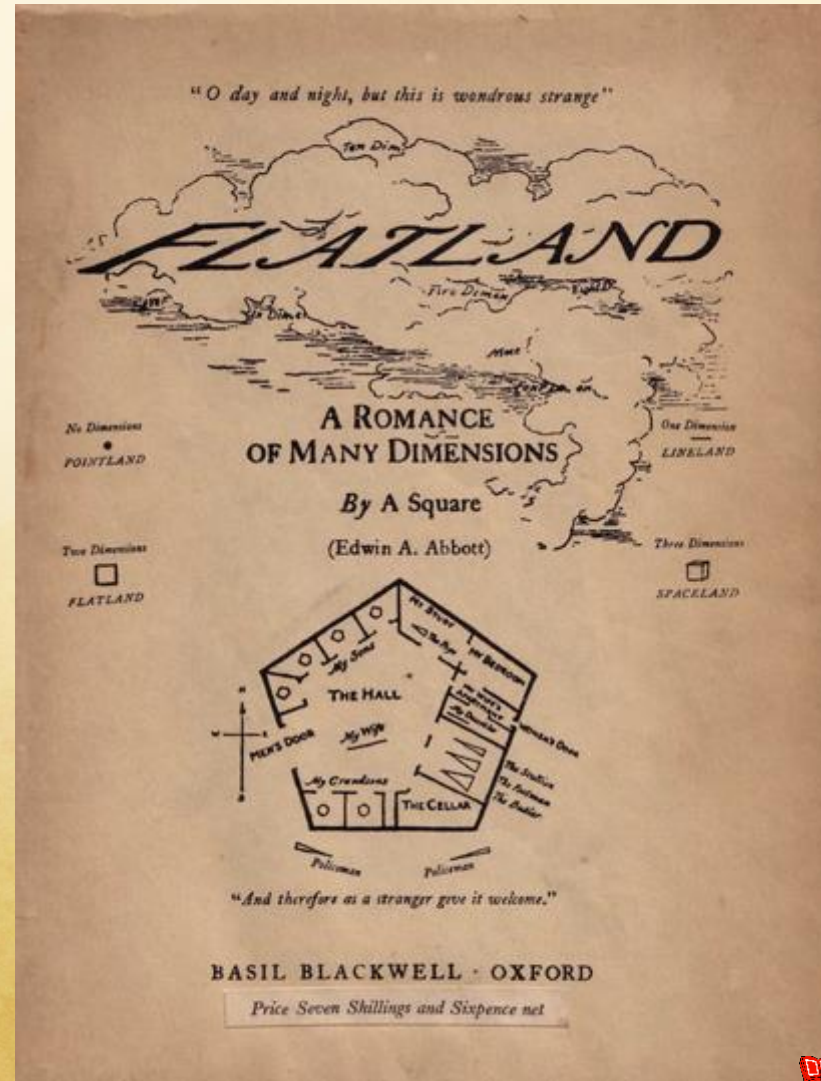
平面國

課程導讀1

p.001~p.042

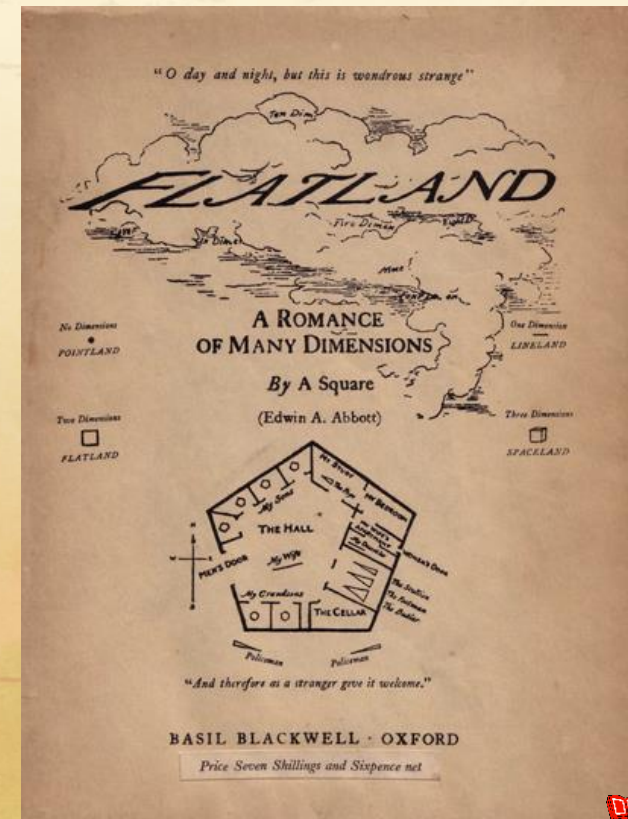
中國科技大學 徐惠莉





Flatland: A Romance of Many Dimensions

- 作者：埃德溫·A·艾勃特 著
(Edwin Abbott Abbott)
- 1884年
- 諷刺中篇小說



Flatland: A Romance of Many Dimensions

■ 科幻作家以撒·艾西莫夫 (Isaac Asimov) 序言：

《平面國》是「一個人所能找到對於維度概念的感受方法中最好的」

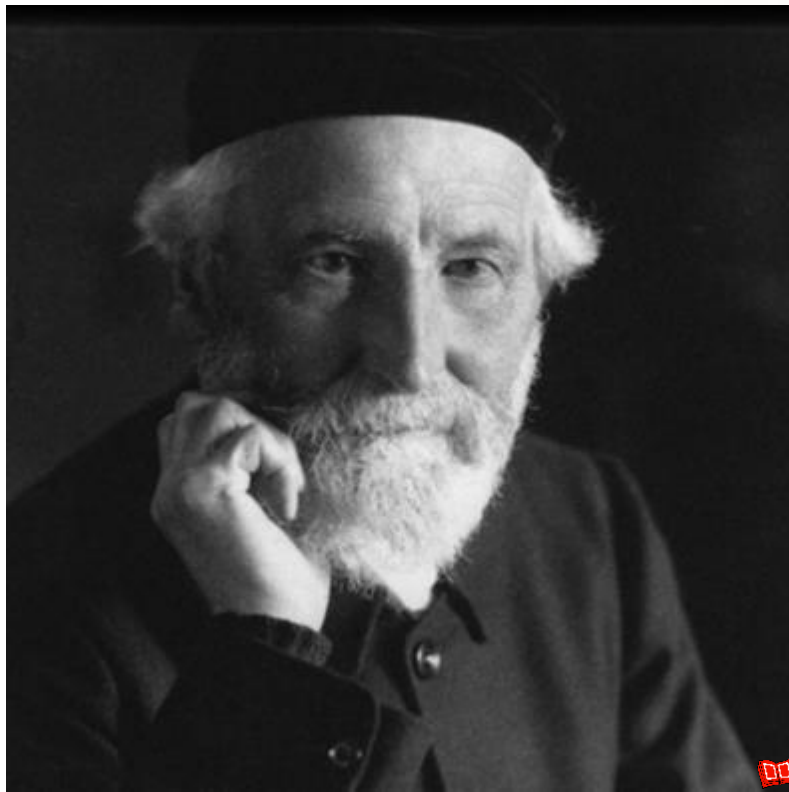


Isaac Asimov, 1920 - 1992

"O day and night, but this is wondrous strange"

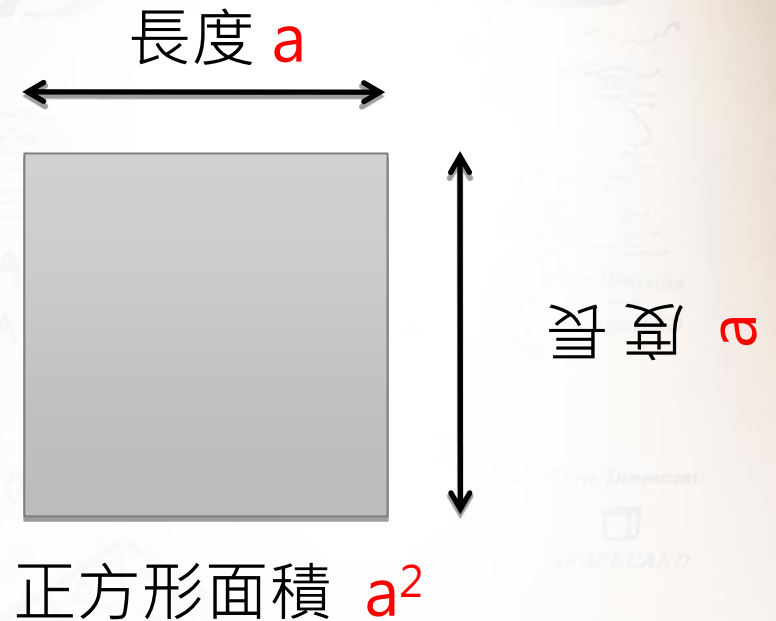
愛德溫·阿伯特·阿伯特

Edwin Abbott Abbott, 1838 – 1926



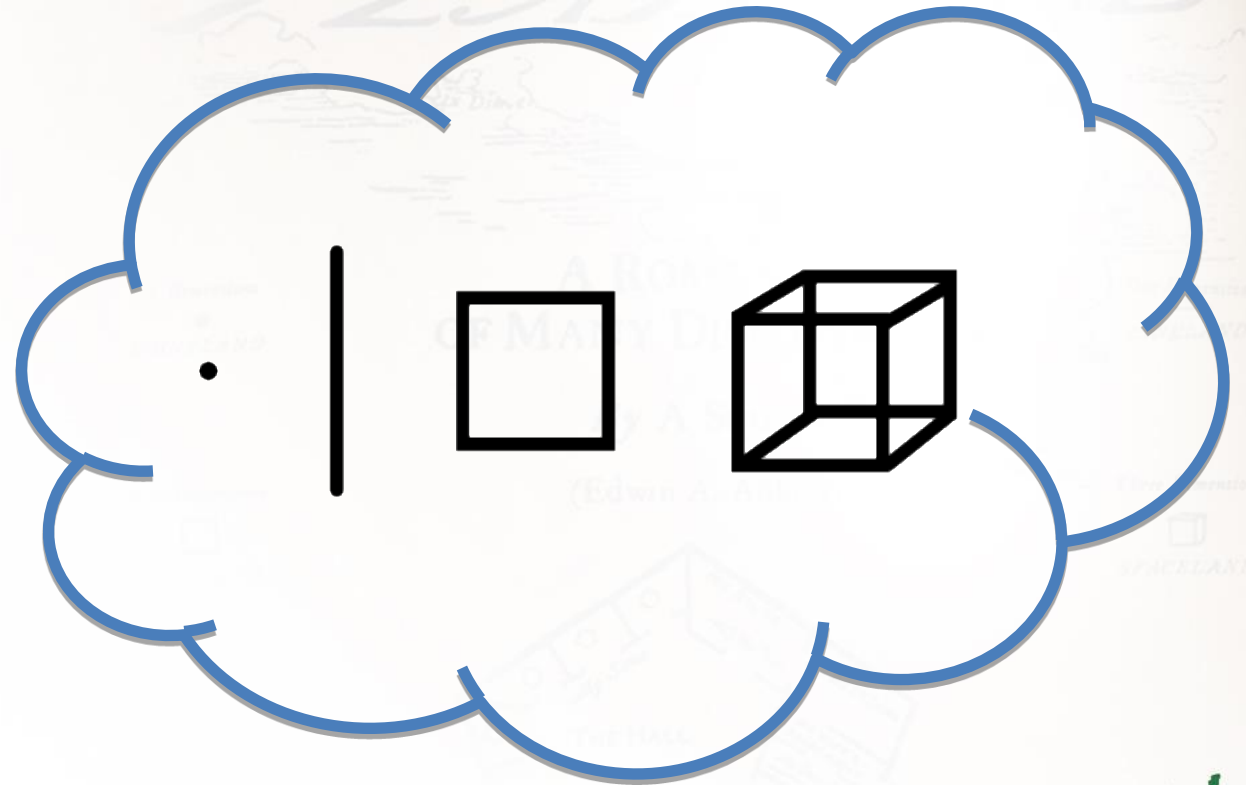
A Square

- 一個多維的傳奇的故事
- 正方形(A square)的自白
 - 雙關語
 - 平方(AA)_Edwin A bbott A bbott



維度 (dimension)

- 點的維度是 0 維
- 線的維度是 1 維(長度)
 - 前進、後退
- 面的維度是 2 維(面積)
 - 前、後、左、右
- 體的維度是 3 維(體積)
 - 前、後、左、右、上、下
- X X 的維度是 4 維 (? ?)



時間是第 4 維度

前、後、左、右、上、下

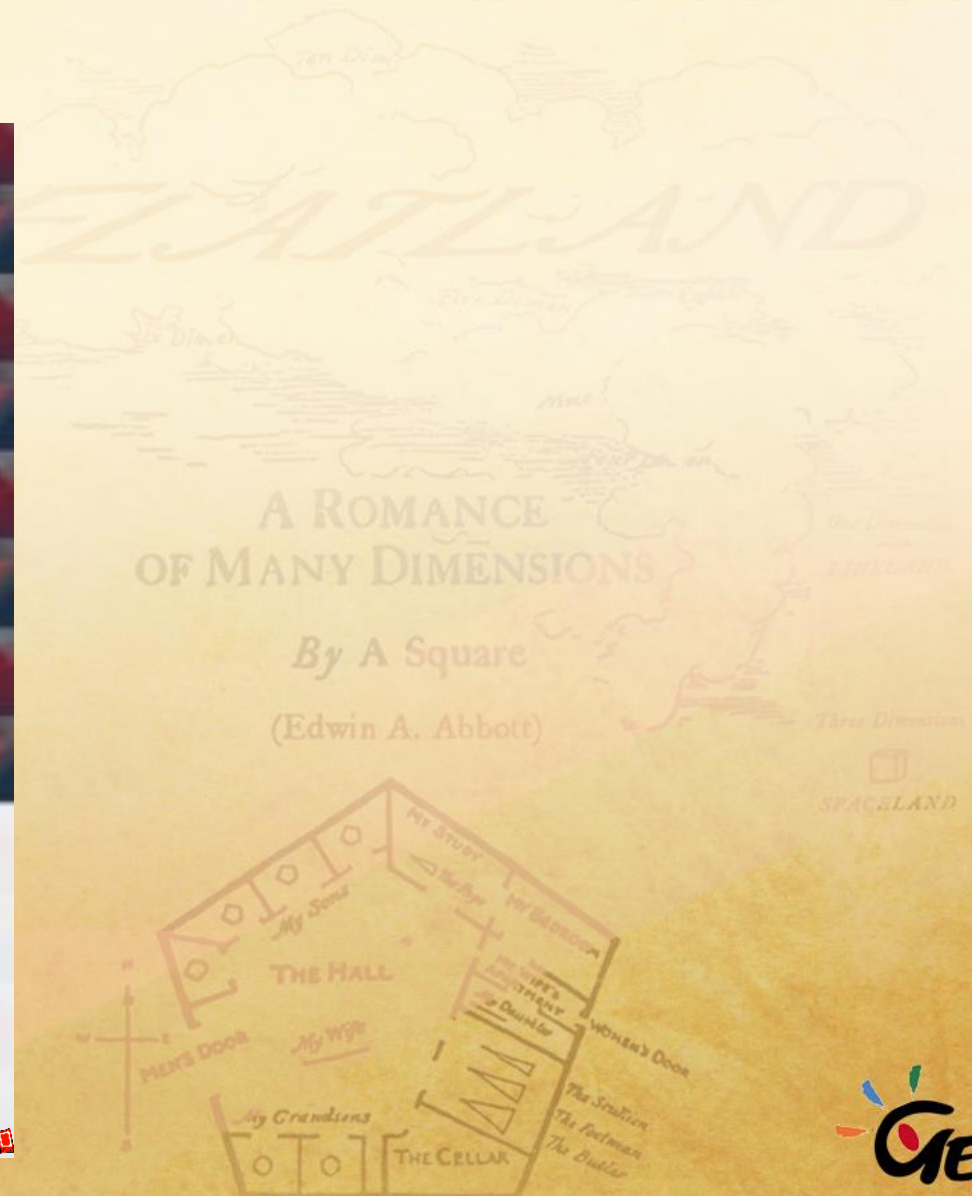
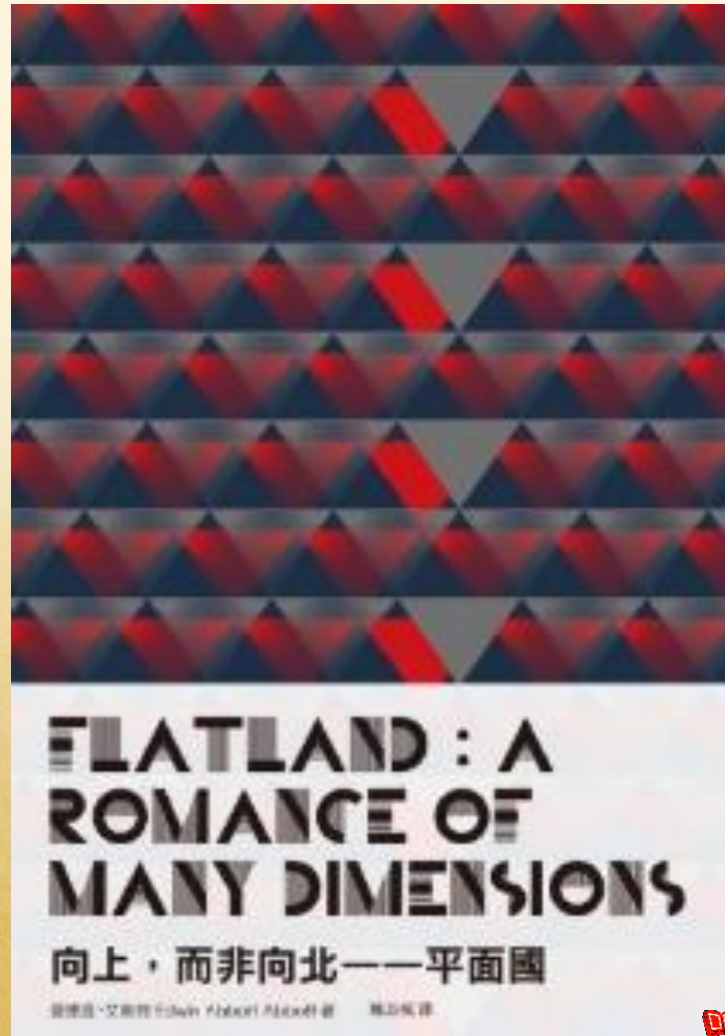
過去？未來？

平面國的翻譯者

■ 賴以威

- 師大電機系助理教授
- 「數感實驗室」創辦人
- 數學作家
- 2017未來大人物

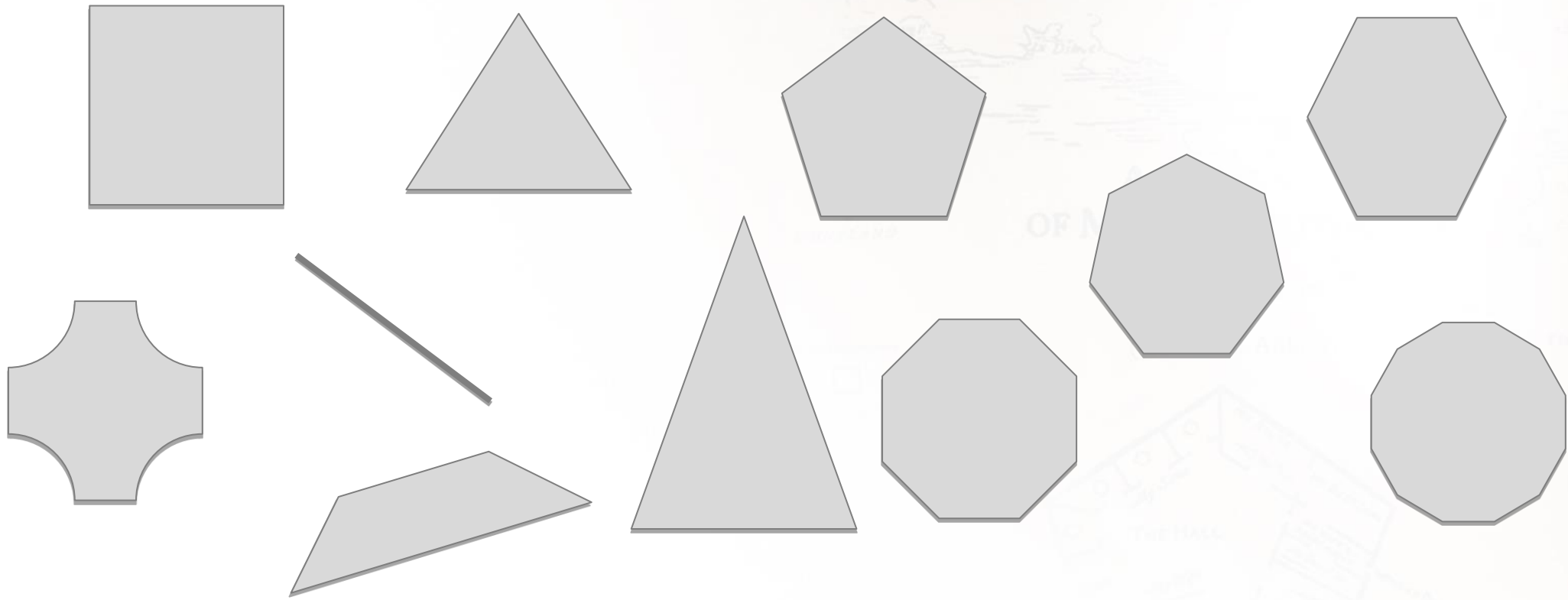




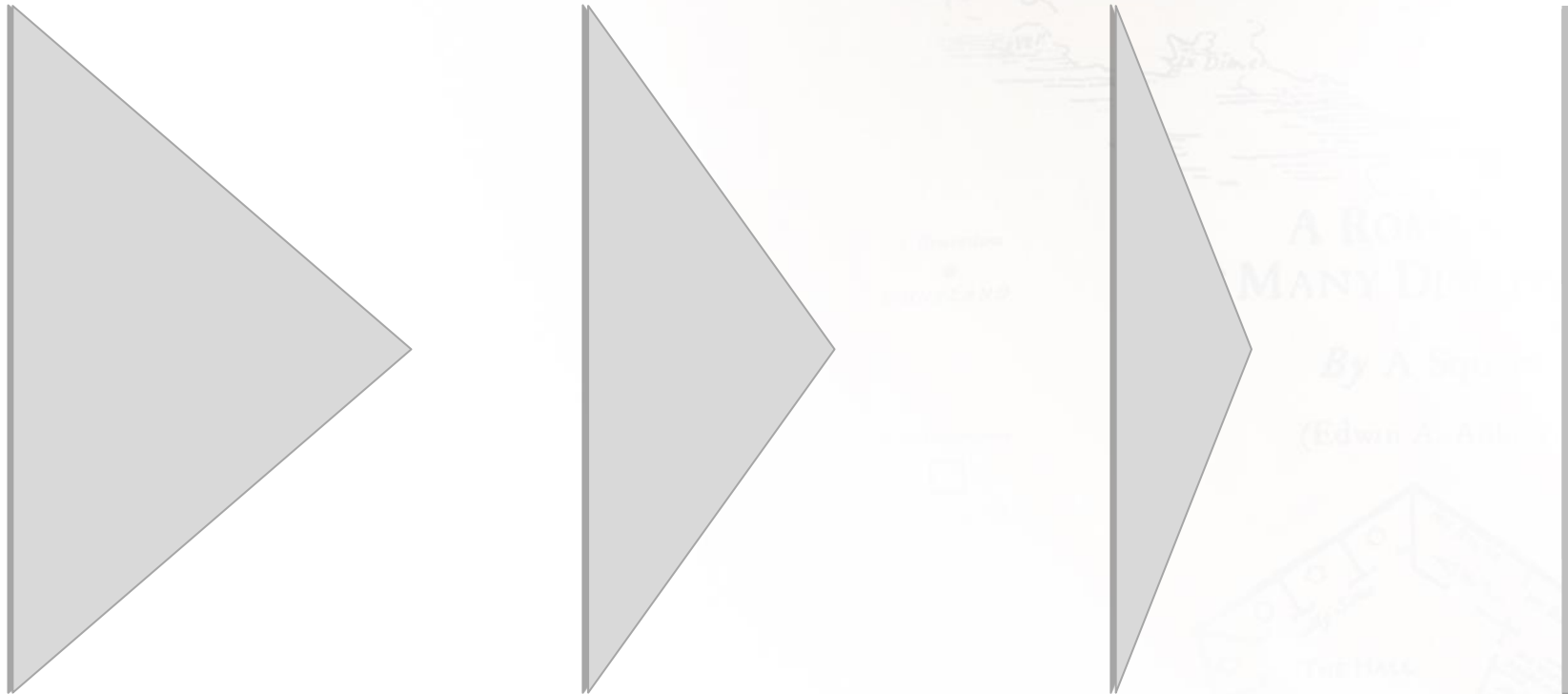
平面國 第一部

世界

平面國的「人」



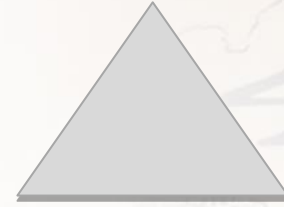
在平面國，所有的一切都看起來像線。



國民

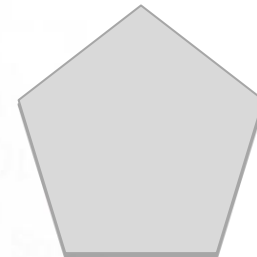
■ 中產階級

- 正三角形



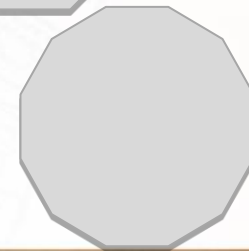
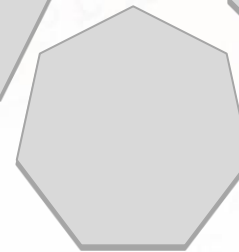
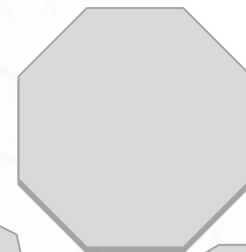
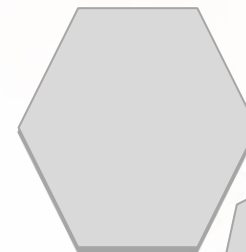
■ 專業人士、仕紳階級

- 正方形、正五邊形



■ 貴族

- 正n邊形 ($n > 5$, n 是整數)

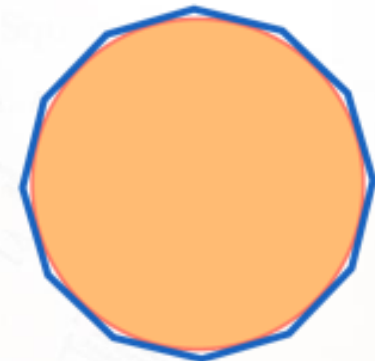
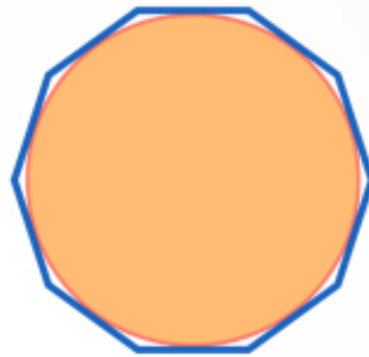
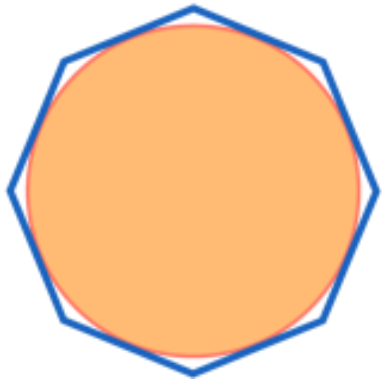
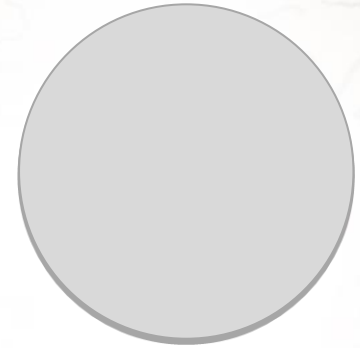


祭司是最高級階級

■ 祭司（領導者）

● 圓形

■ 或許他們只是正 n 邊形， n 趨近無窮大。



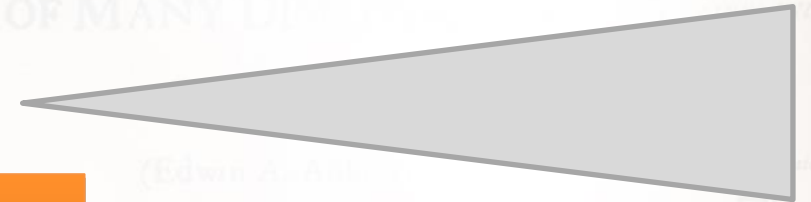
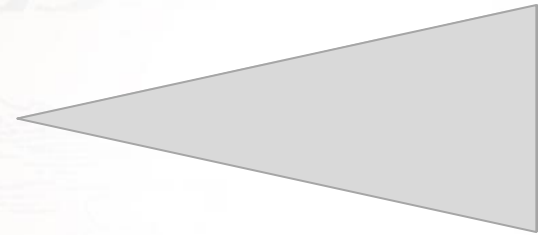
人民依照階級分成多種幾何圖形

■ 士兵、勞工階級

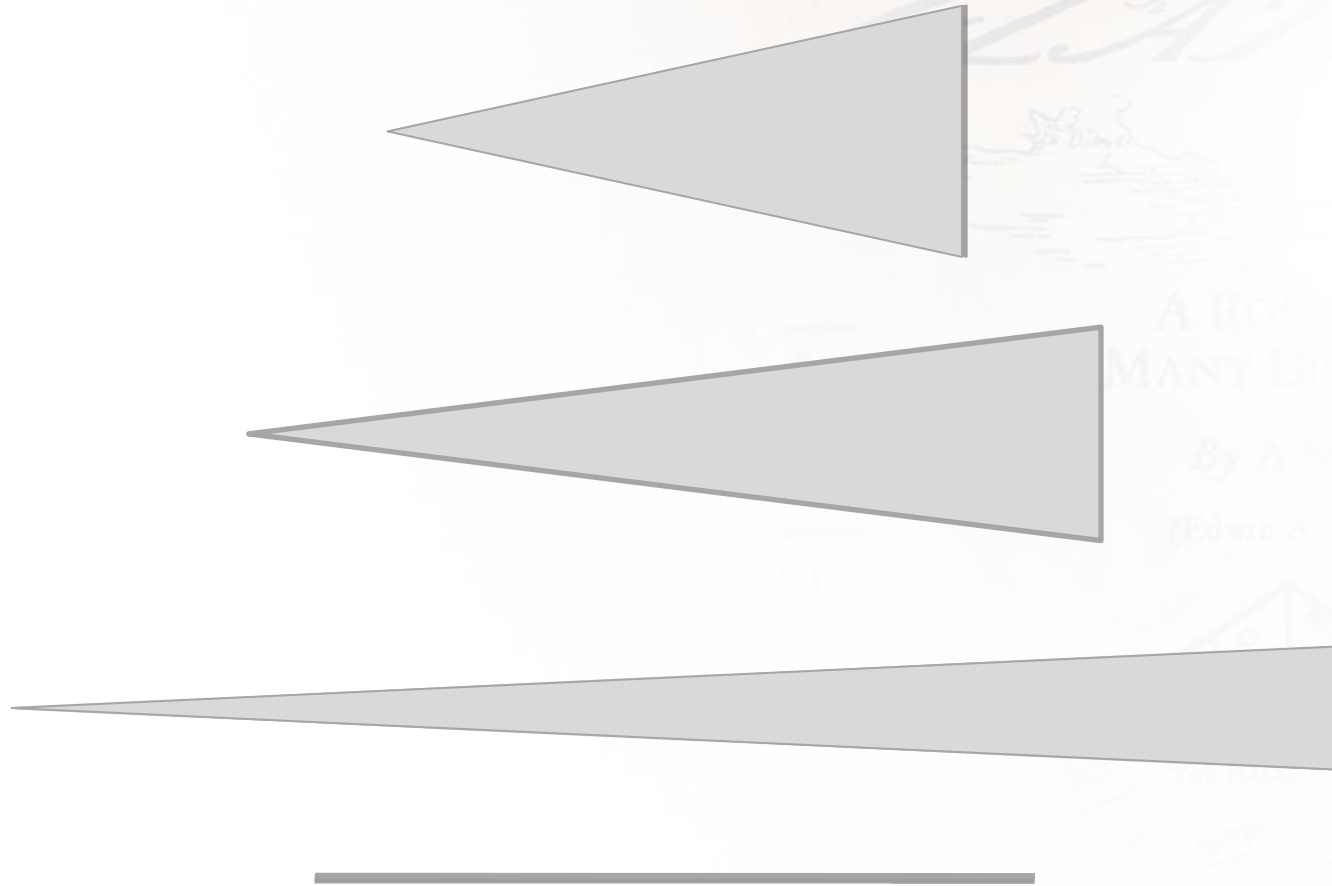
● 等腰三角形

■ 下等國民

頂角越小，會與哪一種人相似？



頂角越小，會與哪一種人相似？



等腰三角形會生出正三角形的孩子嗎？



階級升等

- 下層階級（士兵、勞工）
 - 每一代只能增加**角度**
- 中產階級以上
 - 每一代增加**一條邊**
- 越是上層階級，越是不孕

閱讀想一想

- 作者把下層階級的人，用每一代只能增加**角度**；而中產階級的人卻是每一代增加**一條邊**。你覺得作者為什麼要用這樣來區分呢？

平面國的女性

- 女性在行走時為何要晃動背部？
 - 正面？
 - 背面？
 - 側面？



平面國的女性 v.s. 19世紀英國的女性

19世紀的英國女性

■ 比奴隸好一點點

- 教育程度
- 謀生能力
- 結婚生子
- 無選舉權

■ 財產全歸丈夫所有

- 無離婚權

■ 勞工階級

- 8~12歲開始工作直到結婚(生子)

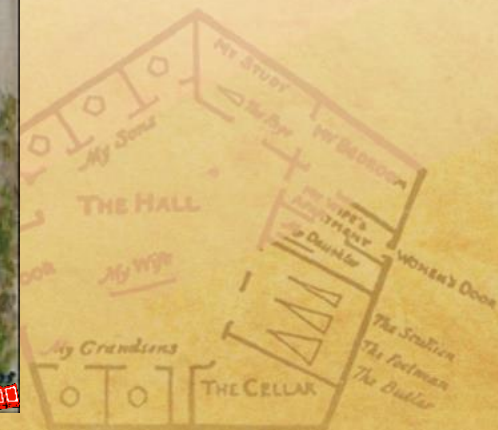


ATLAND

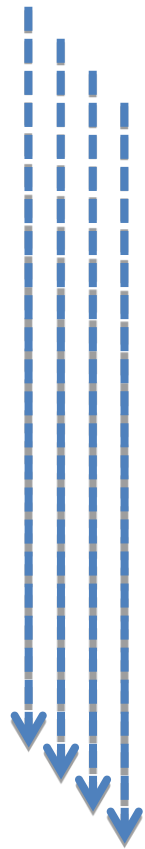
A ROMANCE
MANY DIMENSIONS

By A Square

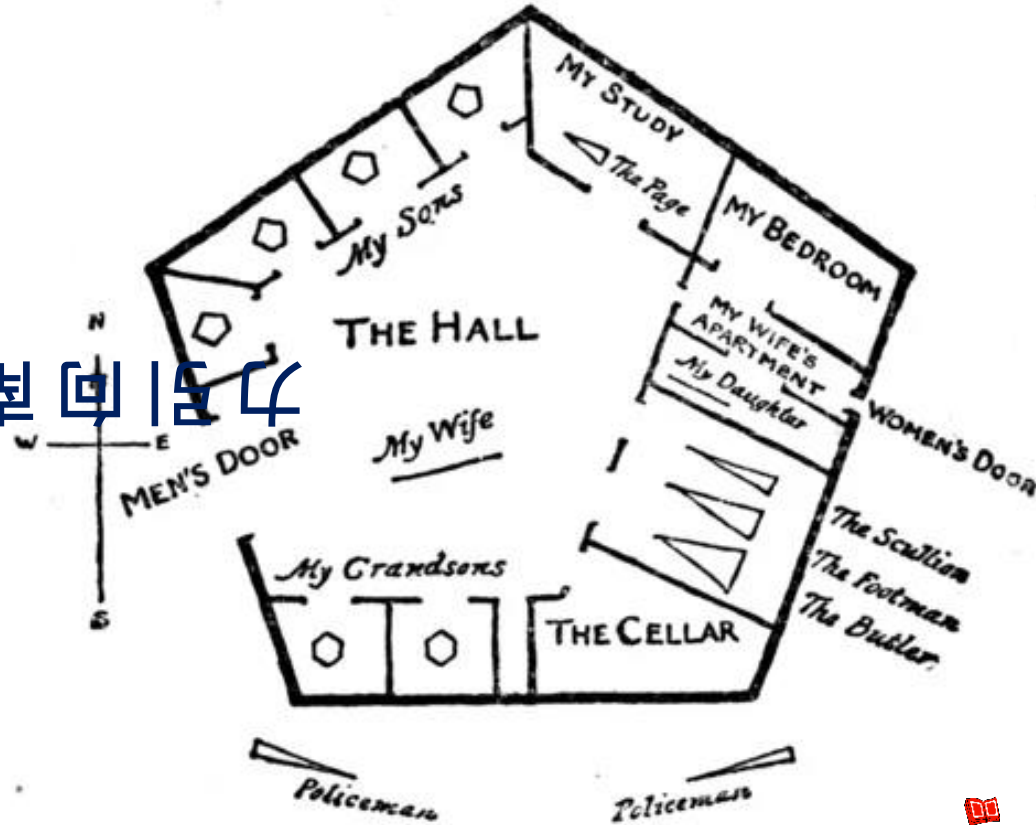
(Edwin A. Abbott)



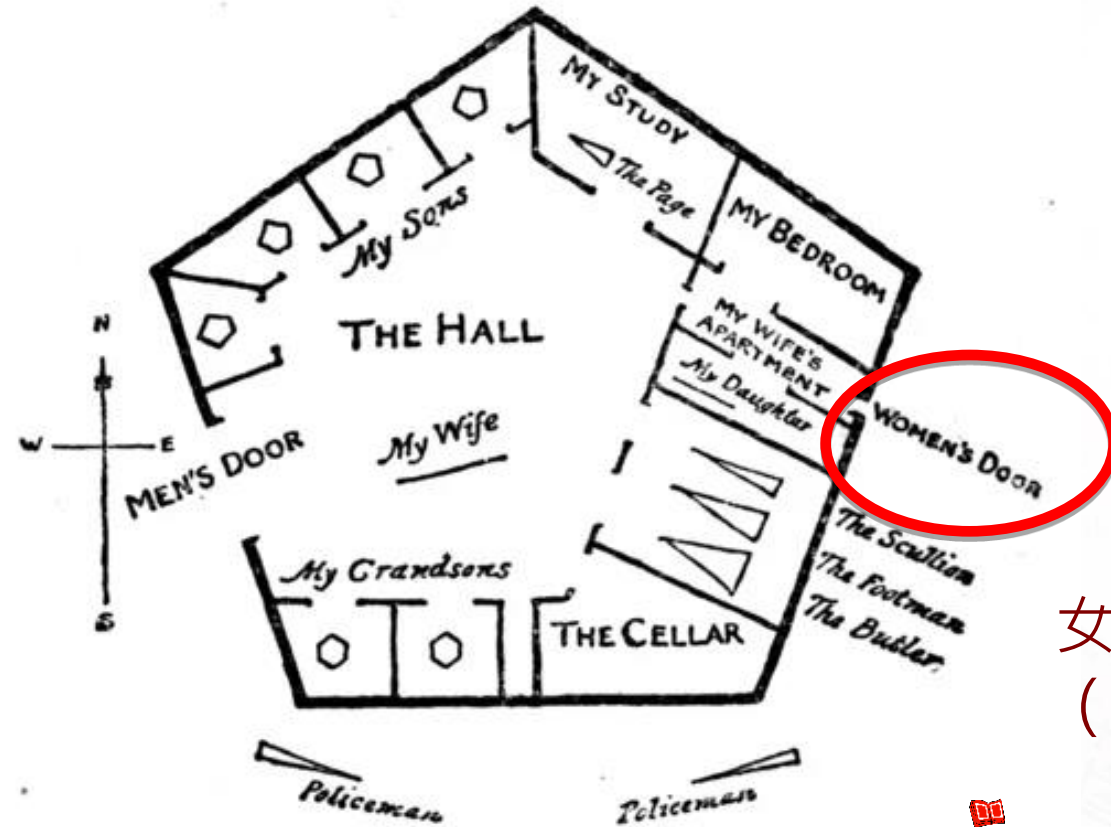
建築---正方形的家



率回信



建築---正方形的家



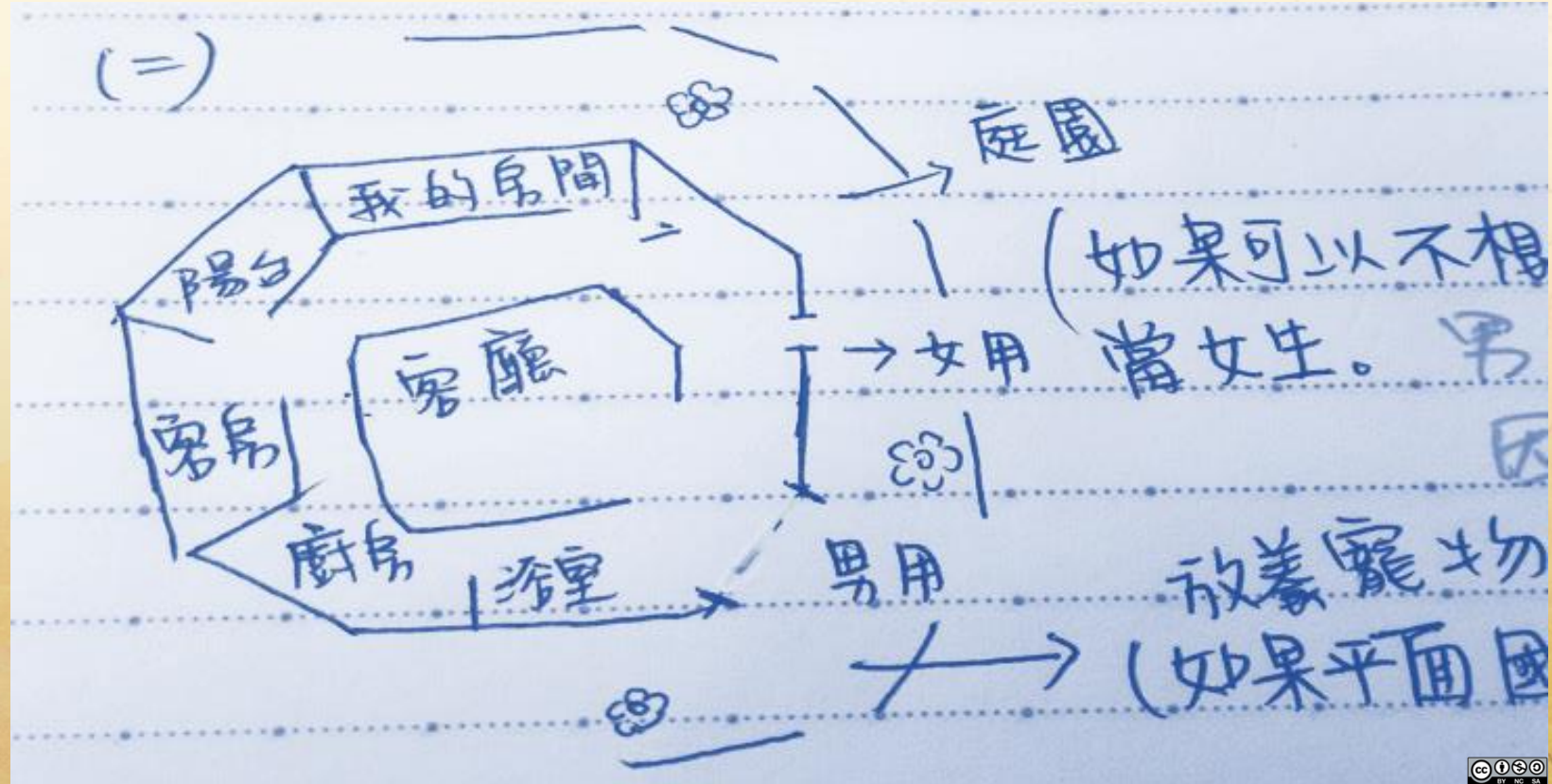
女性有專用的小門
(為什麼?)

閱讀想像

■ 如果你住在平面國，請為自己設計一棟房子？
畫出來並加以說明。

- 外形
- 內部格局
- 文字說明

範例



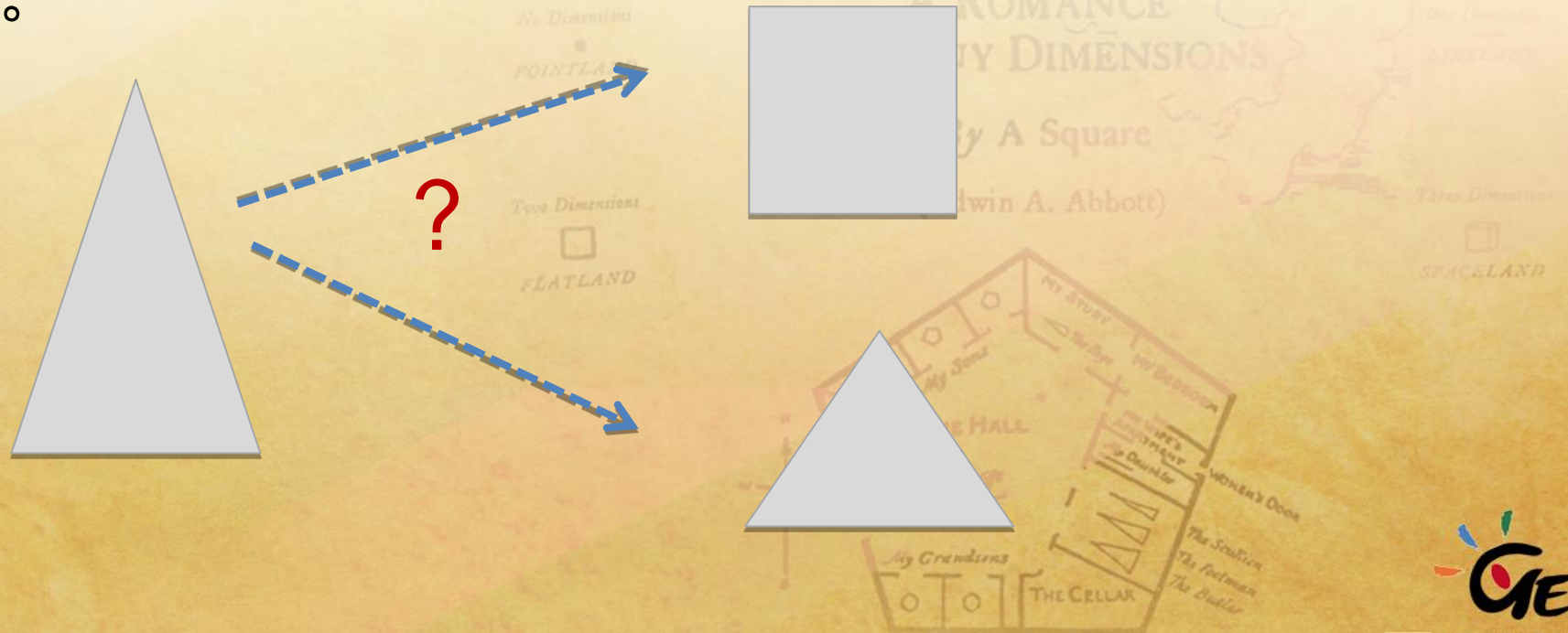
範例



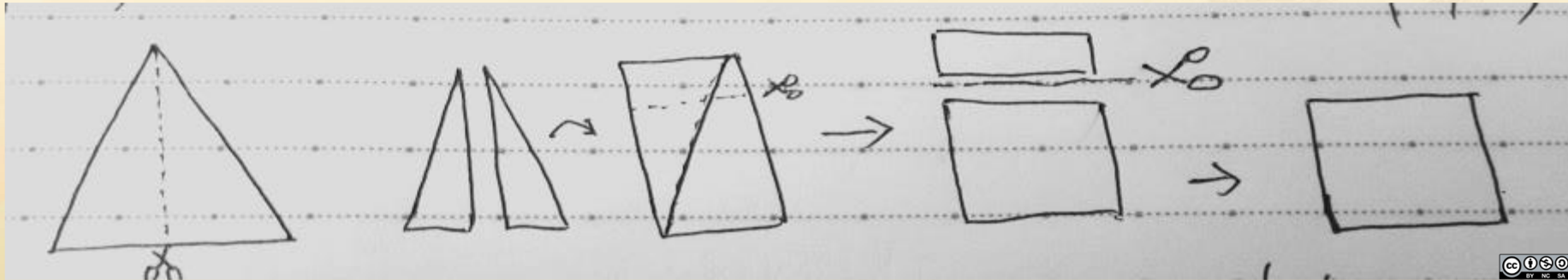
首先要替自己蓋起大間房子，必免轉身撞到人。畢竟是單身女子房，所以男性只能待在客廳、房間、廁所的門只僅可女性可通過的大小。

閱讀想像

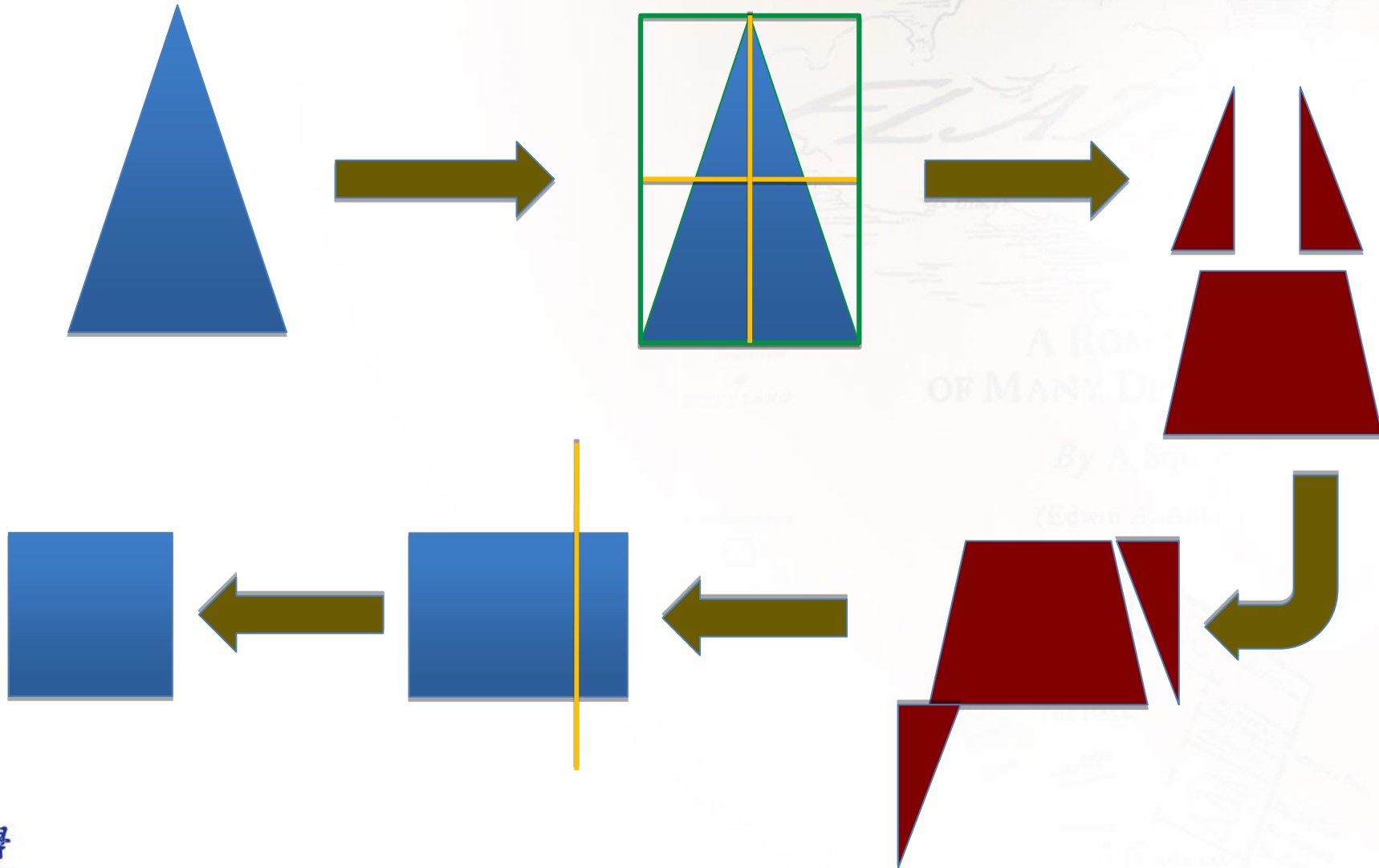
- 當個貴族才有希望？！想像一下，如何將下圖的士兵進行整形手術，使他成為中產階級或是專業人士？請說明整形的過程。



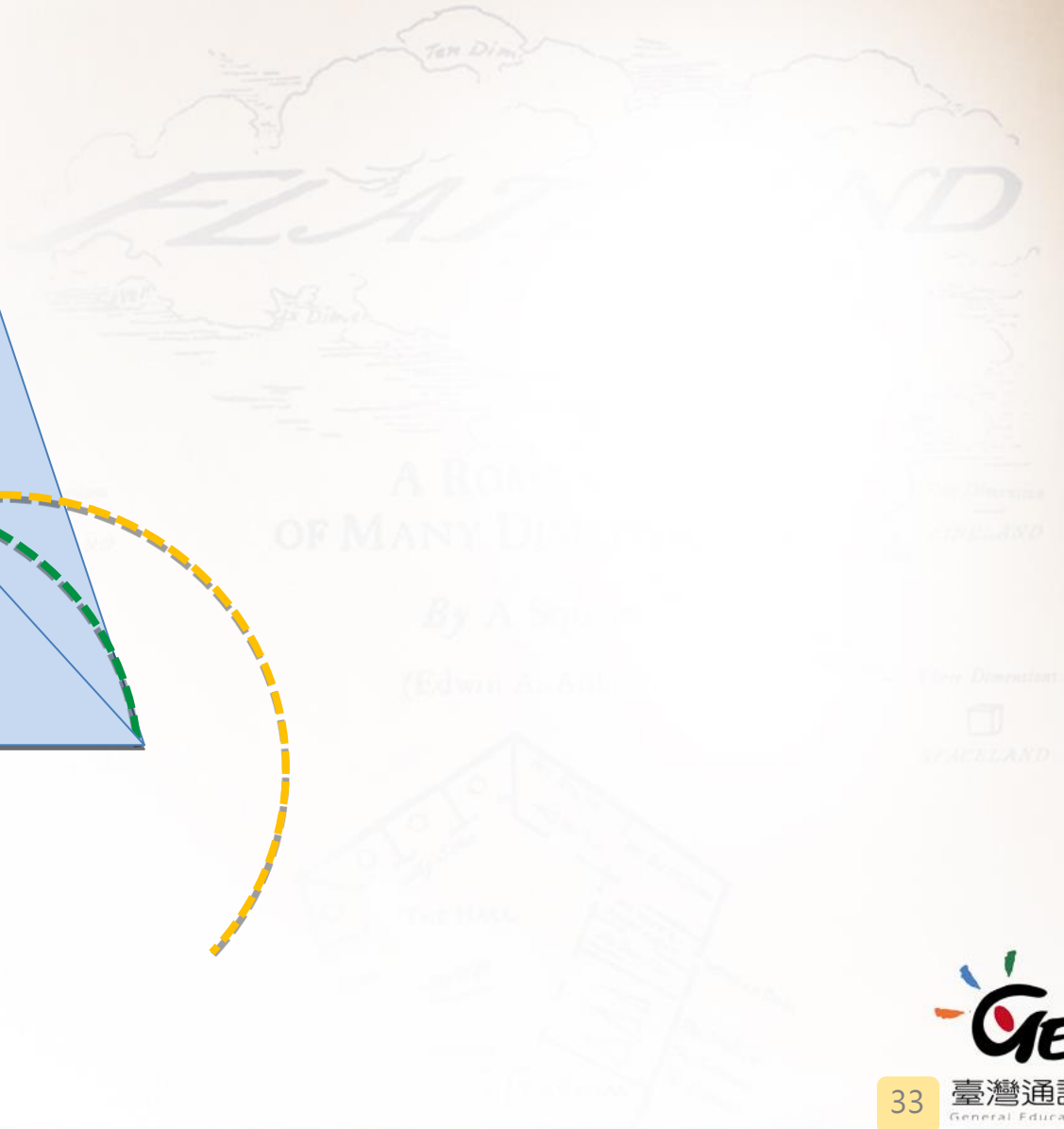
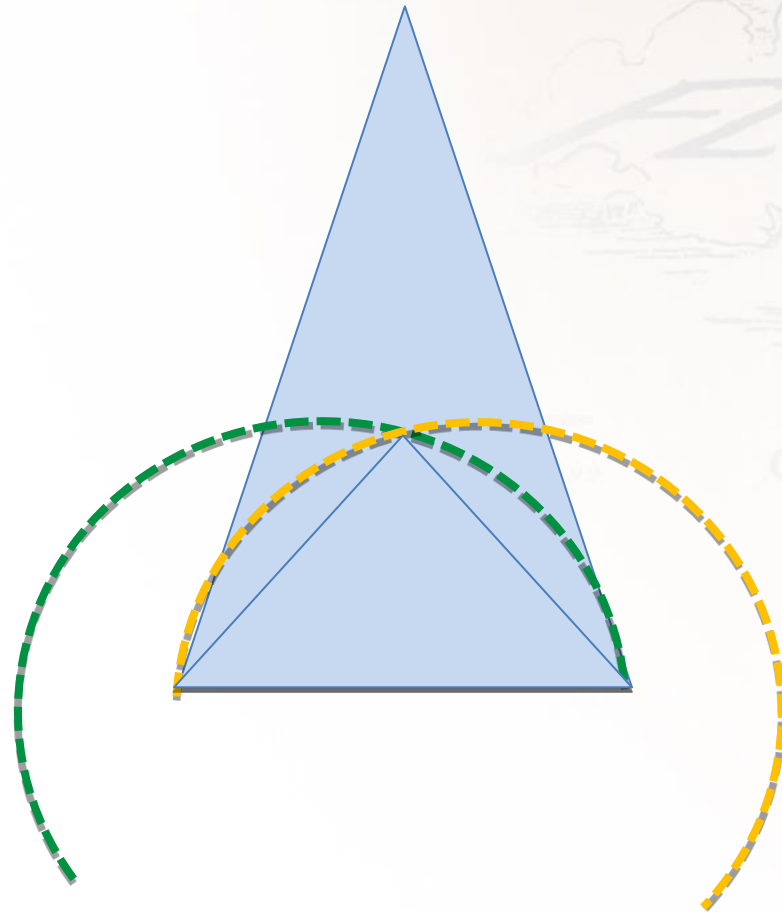
範例



"O day and night, but this is wondrous strange"



"O day and night, but this is wondrous strange"



參考資料

- 「平面國：向上，而非向北！」原文作者 Edwin Abbott Abbott，譯者 賴以威，魔酒出版。

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