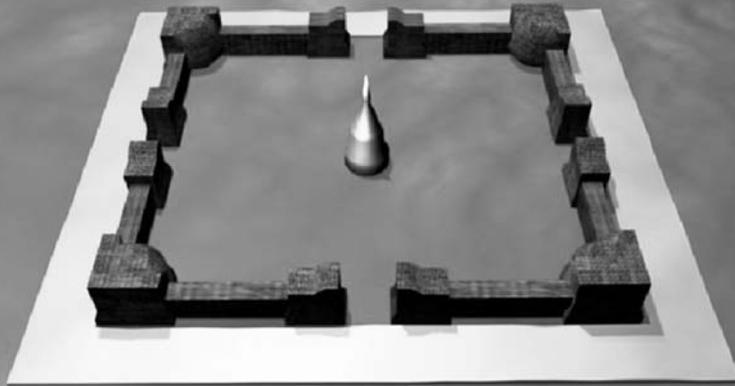


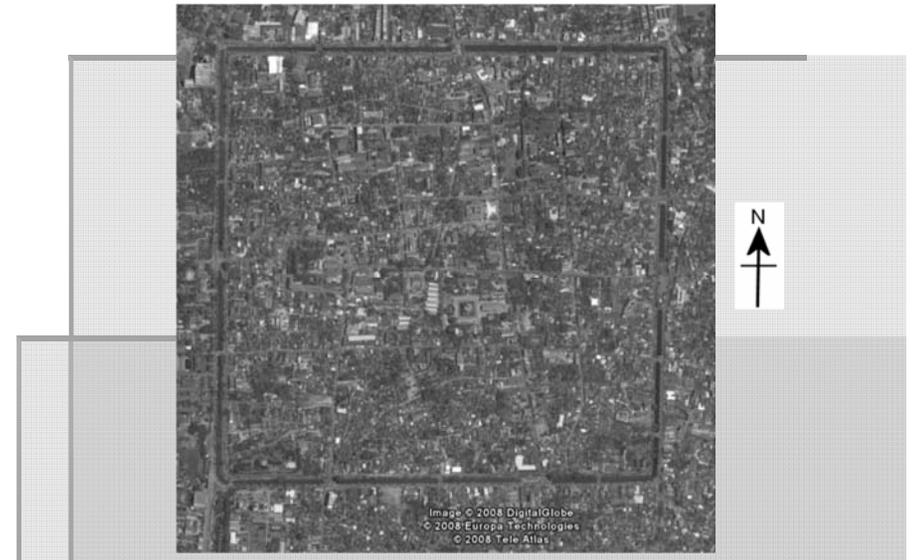
# Mathematics and Chiang Mai Wall Construction



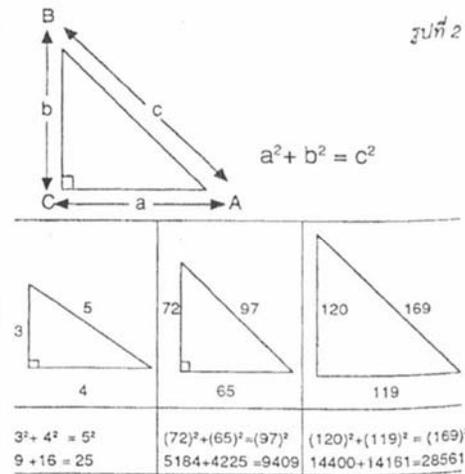
By Atichart Kettapun

Archeological Mathematics and Science Research Unit, Chiang Mai University

# Chiang Mai Wall via Satellite Image



# Making Right Angle by using Pythagoras Theorem



It was used by people in Babylon, Egypt, Greek and Roman.

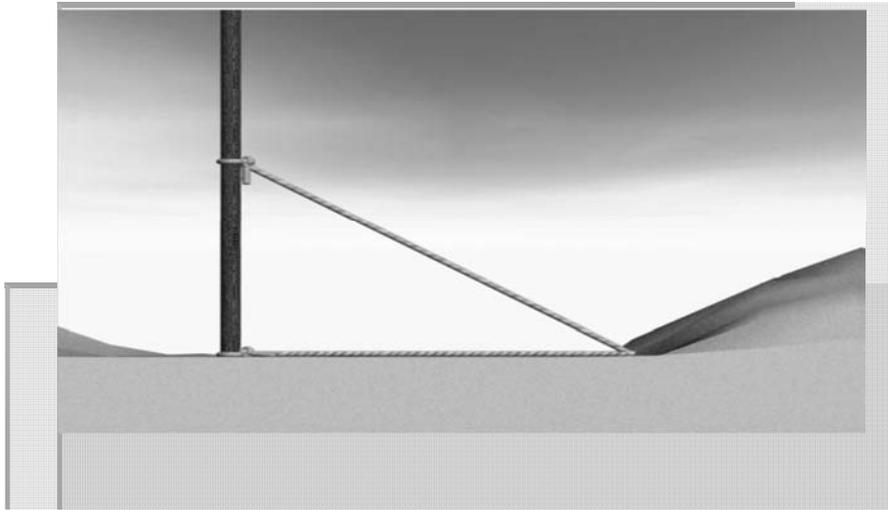
# The Babylonian tablet Plimpton 322



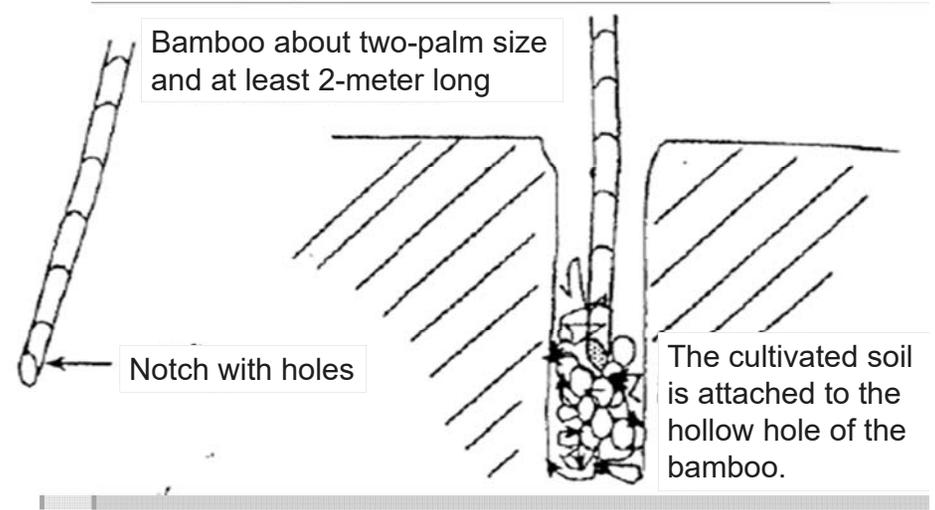
This mathematical tablet was recovered from an unknown place in the Iraq desert. It can be determined, apparently from its style, that it was written originally sometime around 1800 BCE. It is now located at Columbia University.



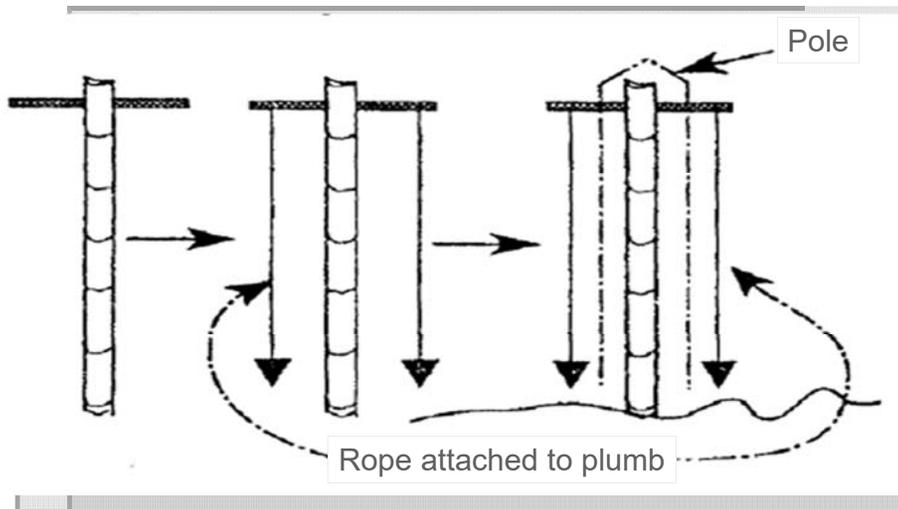
# Adjusting the Level (Cont.)



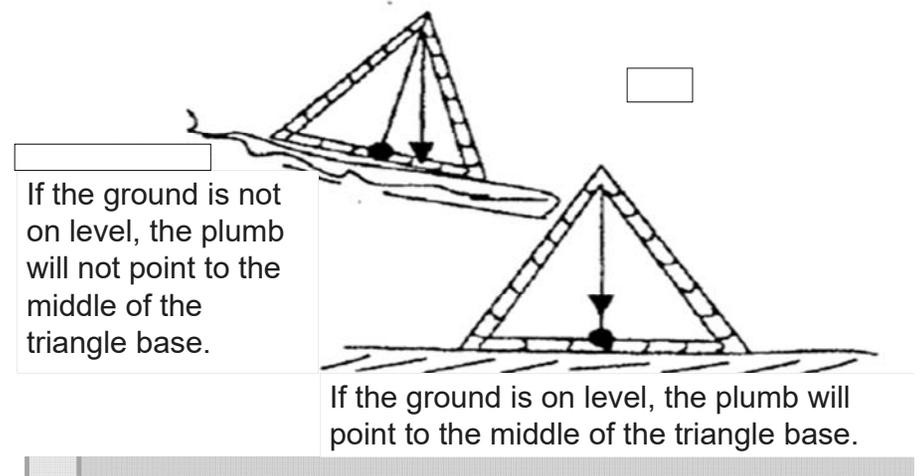
Adjusting the poles to the vertical and leveling the ground by the ancient people in Suvarnabhumi (cont.)



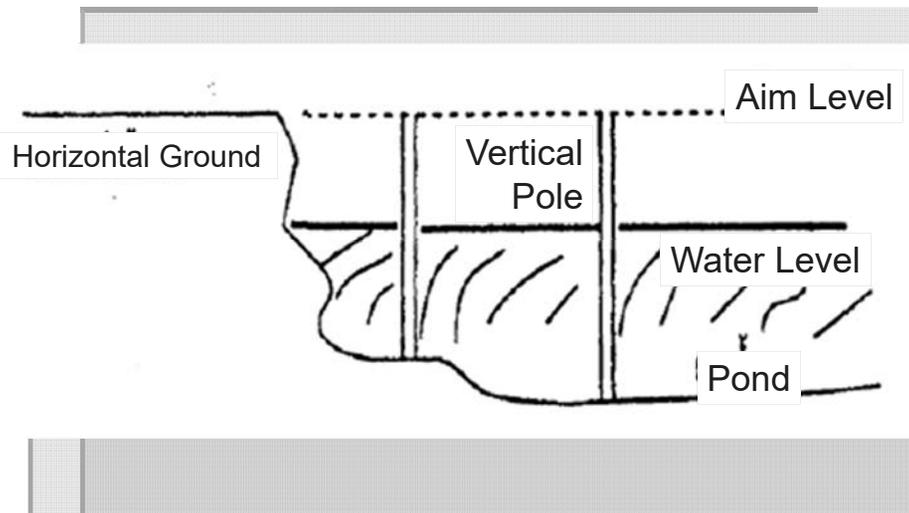
Adjusting the poles to the vertical and leveling the ground by the ancient people in Suvarnabhumi. (cont.)



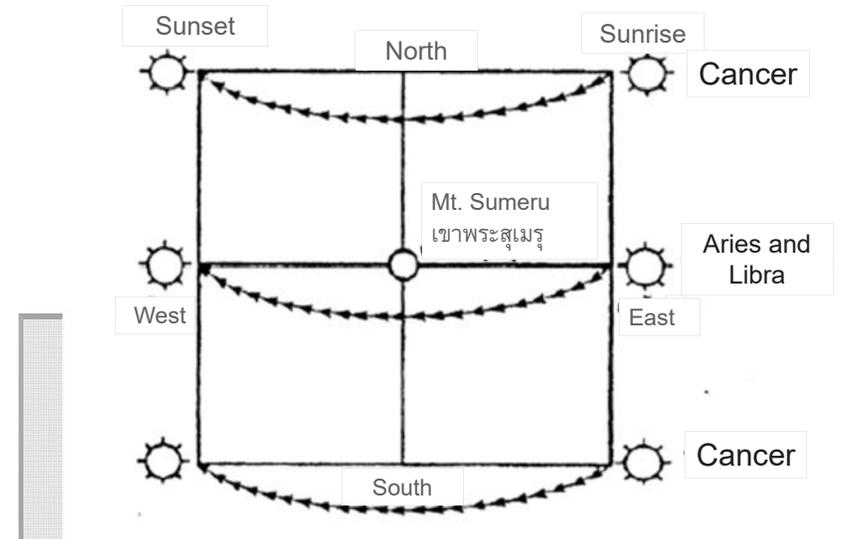
Adjusting the poles to the vertical and leveling the ground by the ancient people in Suvarnabhumi (cont.)



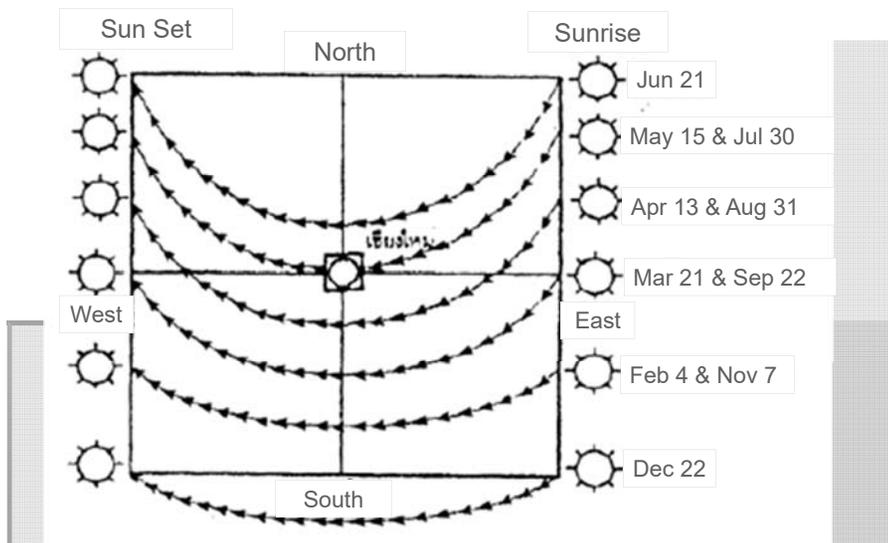
Adjusting the poles to the vertical and leveling the ground by the ancient people in Suvarnabhumi (cont.)



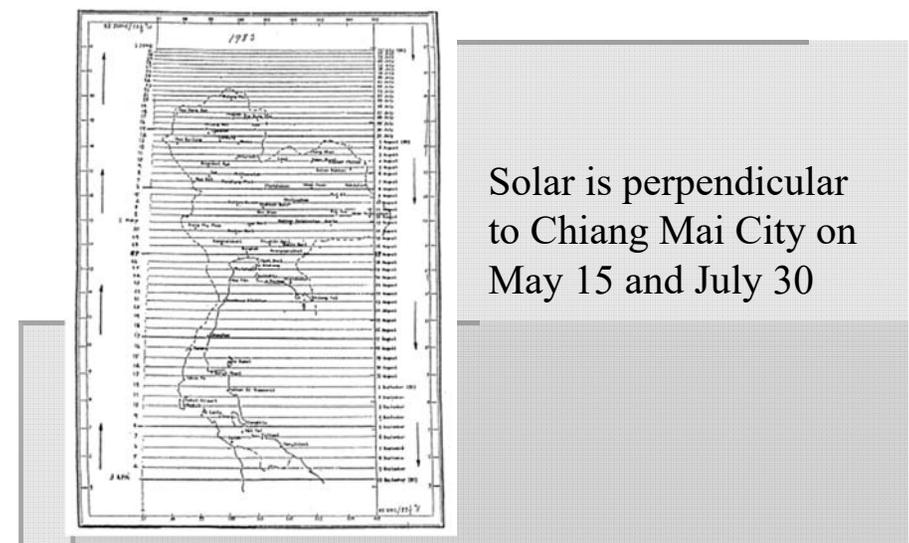
The world and the rise and fall of the sun, according to the belief of the Brahmins (พราหมณ์)



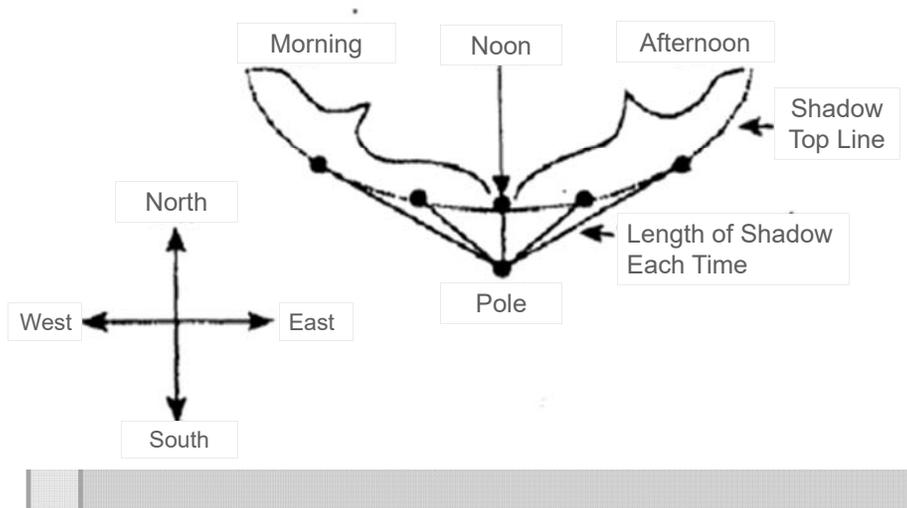
Sunshine in Chiang Mai City



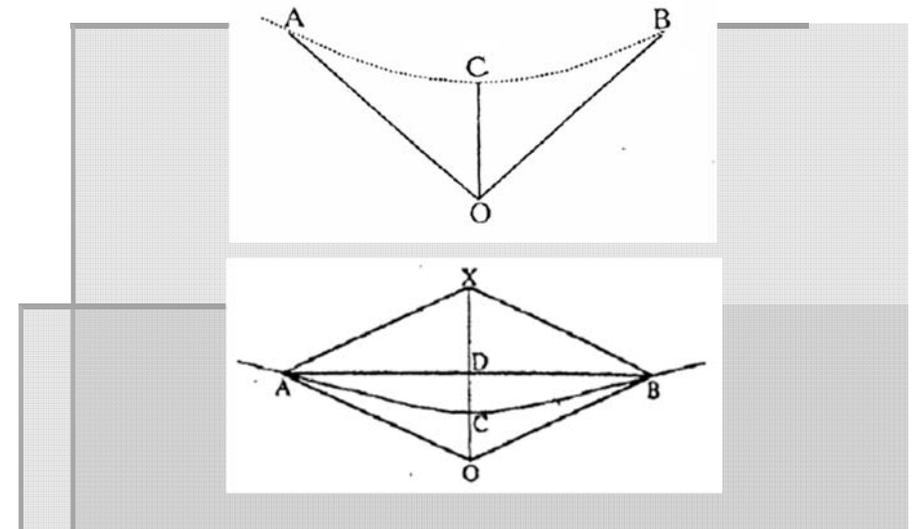
Sunshine in Chiang Mai City (cont.)



## Sunshine in Chiang Mai City (cont.)

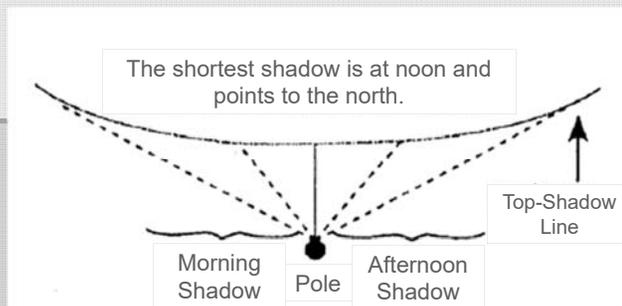


## Sunshine in Chiang Mai City (cont.)



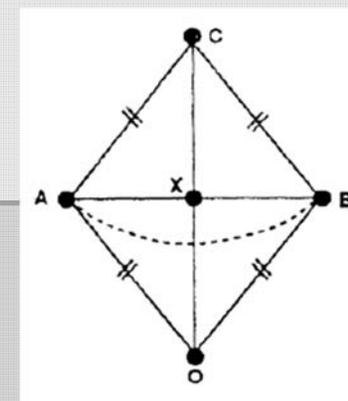
## Finding 4 directions in Chiang Mai Wall Construction

- **Step 1** : Adjust the area planned to be the center of the city. Take a long straight pole to the ground and make it vertical.
- **Step 2** : Draw line of the top shadow from the first step from the morning to the afternoon.



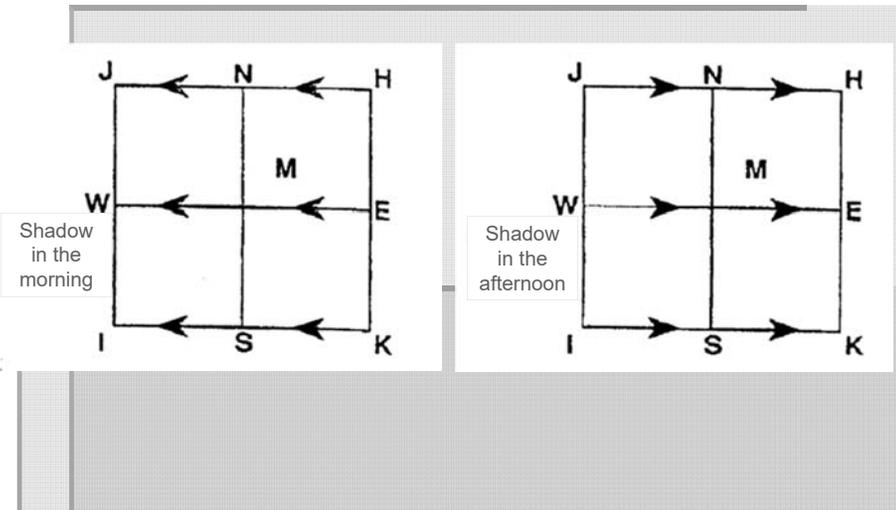
## Finding 4 directions in Chiang Mai Wall Construction (cont.)

- **Step 3** : Check for the shortest shadow.

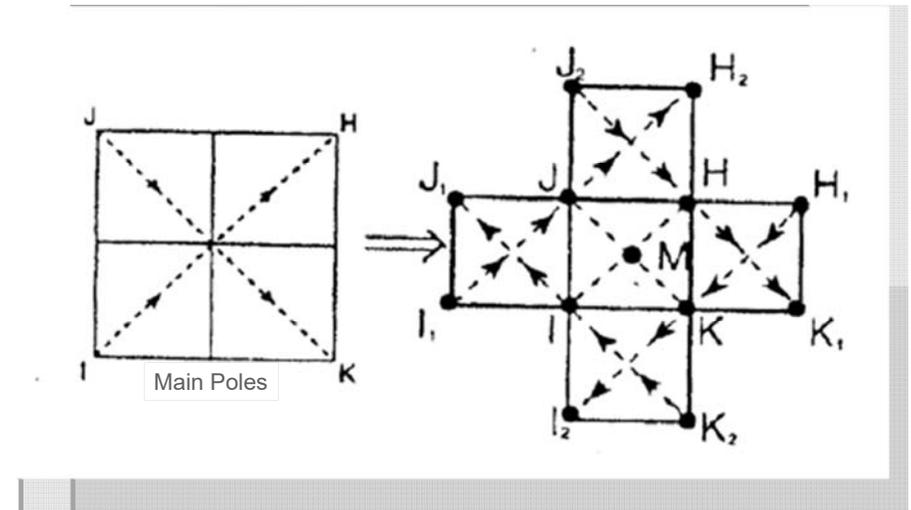




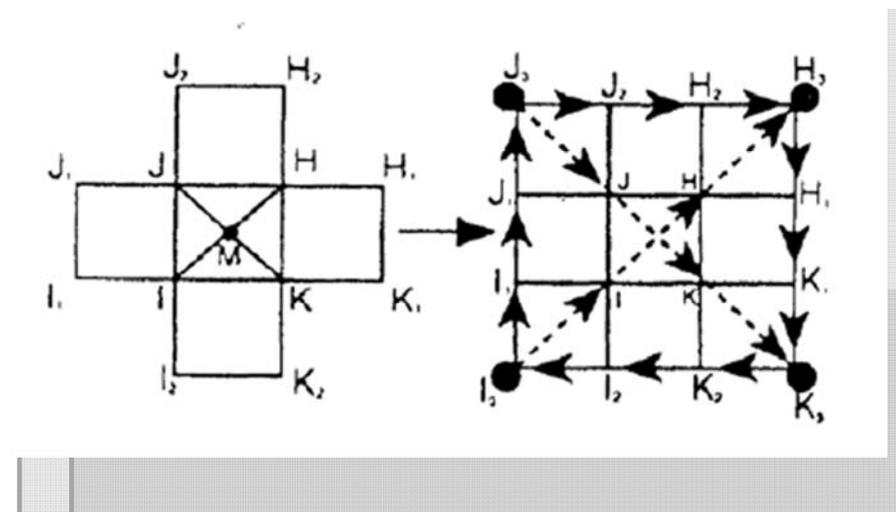
## Finding 4 directions in Chiang Mai Wall Construction (cont.)



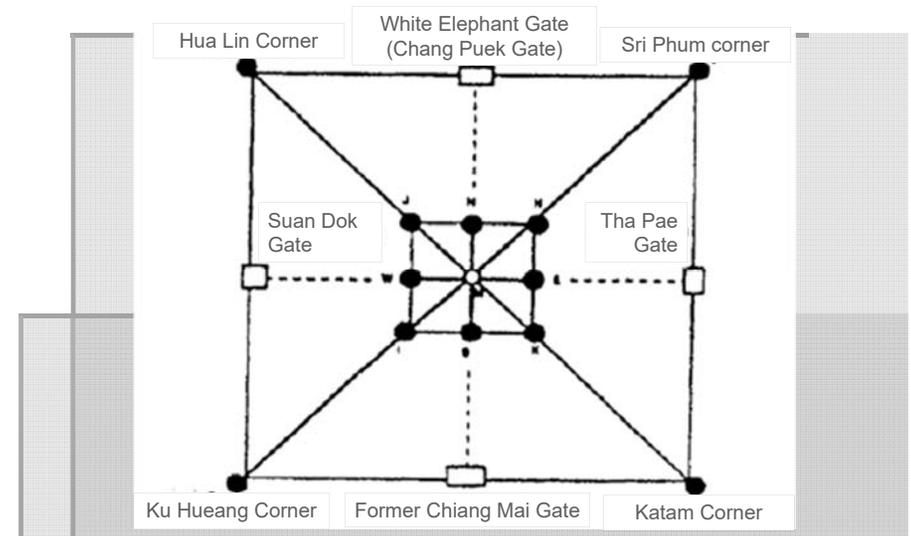
## Using the city pillar to find a city wall corners and gates



## Using the city pillar to find a city wall corners and gates (cont.)



## Using the city pillar to find a city wall corners and gates (cont.)



## Questions



1. Where is the Chiang Mai City Wall?
2. In the past, the East believed that the world was flat. What did they think that the world is floating above?
3. For the East's belief in the past, what was at the center of the universe?
4. What belief created a moat around the Chiang Mai City Wall?
5. What is the day that the sun rises at the exact east?

## Questions (Cont.)

6. What is the day that the sun rises to the south the most?
7. To start building the Chiang Mai city wall, what did they need to do first?
8. What did Lanna people use to adjust the level of the floor?
9. What did Lanna people use to set the pole perpendicular to the ground?
10. What did Western countries use to create the right angle of large buildings in the past?

## Questions (Cont.)

11. What did the East use to create the right angle of large buildings in the past?
12. In the documentary, what is the error percentage of a right angle for large buildings of Western countries in the past?
13. In the documentary, what is the error percentage of a right angle for large buildings in Angkor Wat, Cambodia, in the past?

## Answers



1. Chiang Mai
2. The Earth is above the water and the water is above the wind.
3. Mount Sumeru.
4. The belief is that the earth is floating on the water.
5. Mar 21 and Sep 22.
6. Dec 22.
7. Make the level of the ground to be flat and horizontal.
8. Gable (၂၅) with isosceles triangle shape.

## Answers (cont.)



9. Plumbs. (ลูกตั้ง)
10. The Pythagoras theorem.
11. Sunrise and Shadow.
12. 7-15%.
13. Within 3%.

## References

- บทความเรื่อง เสาหลักเมืองเชียงใหม่แทนทฤษฎีพีทาโกรัสได้อย่างไร โดย รศ.สมัย ยอดอินทร์ ในหนังสือ “สู่ 30 ปี วิทยาศาสตร์ที่ยั่งยืน” คณะวิทยาศาสตร์ มหาวิทยาลัยเชียงใหม่ (An article by Associate Professor Sami Yodindra)
- <http://www.math.ubc.ca/~cass/courses/m446-03/pl322/pl322.html>