

Chapter 3

Mathematics in daily life

Part 2

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<http://pirun.ku.ac.th/~fengwks/mathcomp>

Ch.3.2

⇒ 3.4 Convolution

⇒ 3.5 Chart and Graph

3.4 Convolution

If one event was occurred because of doing some activities, operation of doing two things together/joint along time series this event call “convolution”.

Convolution is a mathematical operation of 2 functions , producing a third function that is typically viewed as a modified version of one of the original functions, giving the area overlap between the two functions as a function of the amount that one of the original functions is translated [1]

Source [1]: <http://en.wikipedia.org/wiki/Convolution>



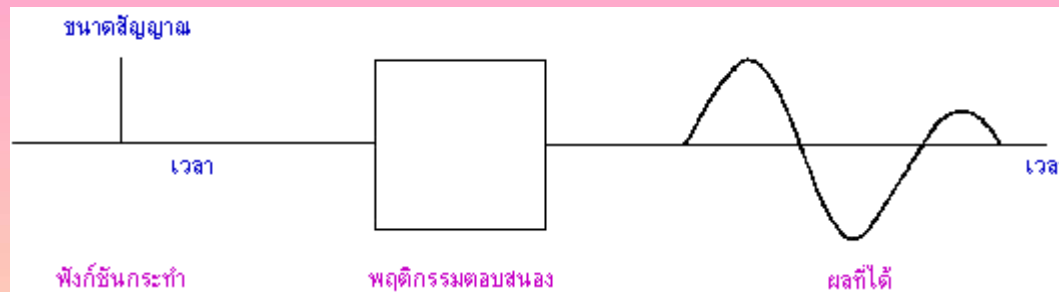


Figure 1. Wave vibration from smashing soil that distribute along time series.

Example:

Smashing the soil at time- t , the soil will receive the energy from this action it causes wave vibration.

Convolution and related operations are found in many applications of many field such as science, engineering, economics and mathematics.

Example 1

To promote the new theory of agricultural plantation, the Agricultural Co-Operatives (BAAC) announce to agriculture who live in Damnoen Saduak district, Ratchaburi, Thailand, for doing soft loan. The period of load is 7 weeks for 1 Rai per one family.

The agriculture were separated into 3 groups

Group #1 total 3 families

Group #2 total 4 families

Group #3 total 5 families

***Each group are about to start working one week away.**

How much does it cost of the plan of BAAC for soft-loan preparation for each weeks ? How much of time consume for this project.

Week No.	Expense Items	Cost (Baht)
1	Seed and plant-labors	1,000
2	Repairing seed	500
3 – 6	Fertilizer and insect-chemical	
	(will increasing cost 200 baht per week)	2,000
7	Harvest labors	500

Please answer those question below

1. What is the input function ?.....
2. What is the Response function?.....
3. How much does the period of this sequence event?

SOLVE

week	1	2	3	4	5	6	7											
0	0	1	0.5	2	2.2	2.4	2.6	0.5	0	0 (*10 ³ Baht)								
5	4	3	$(5*0) + (4*0) + (3*1) = 3$ thousand baht															
	5	4	3	$(5*0) + (4*1) + (3*0.5) = 5.5$ thousand baht														
		5	4	3 = 13 * 10 ³ baht													
			5	4	3 = 17.1 * 10 ³ baht												
				5	4	3 = 26 * 10 ³ baht											
					5	4	3 = 28.4 * 10 ³ baht										
						5	4	3 = 23.9 * 10 ³ baht									
							5	4	3 = 15 * 10 ³ aht								
								5	4	3 = 2.5*10 ³ baht							

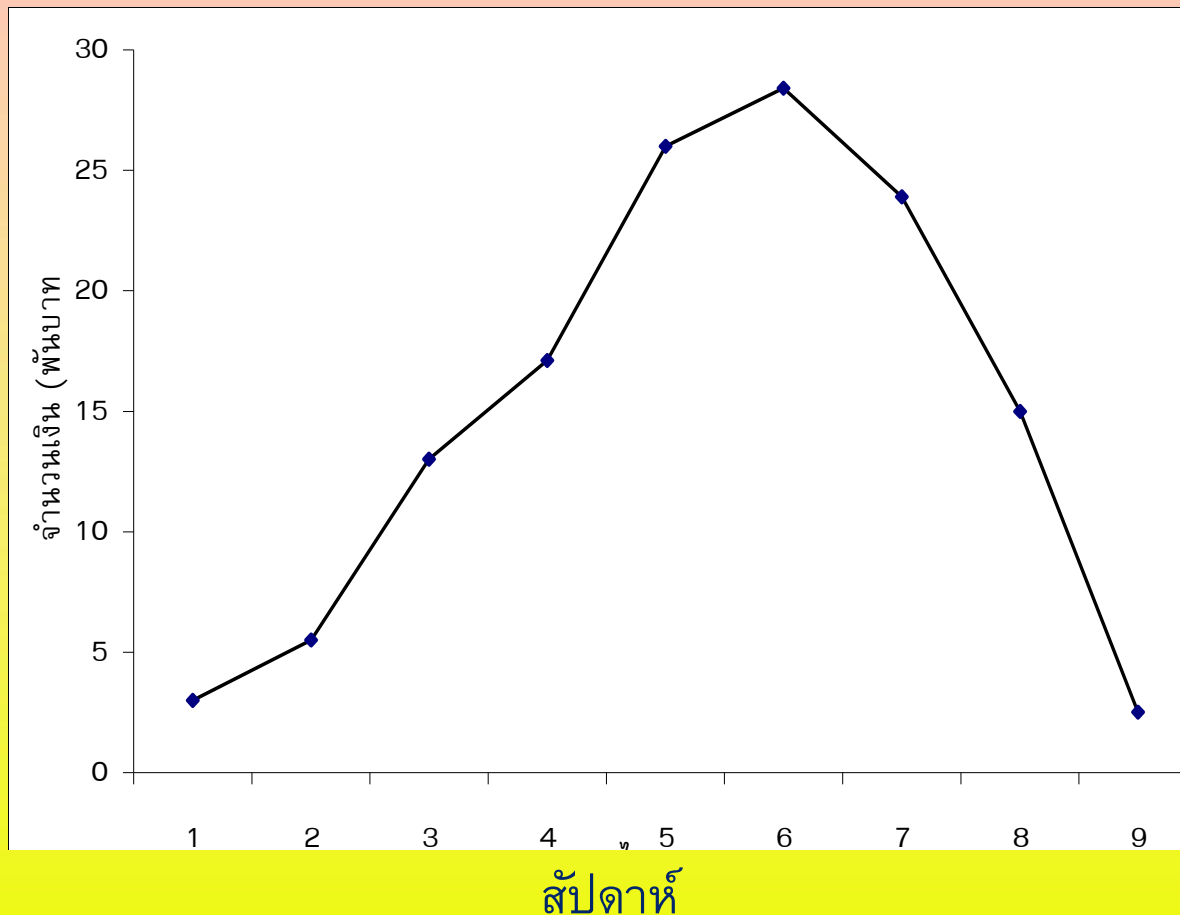
Total 9 weeks Bank for Agriculture and Agricultural Co-Operatives (BAAC) will use the budget 134,400 Baht

Convolution

Input function => Budget expense every weeks

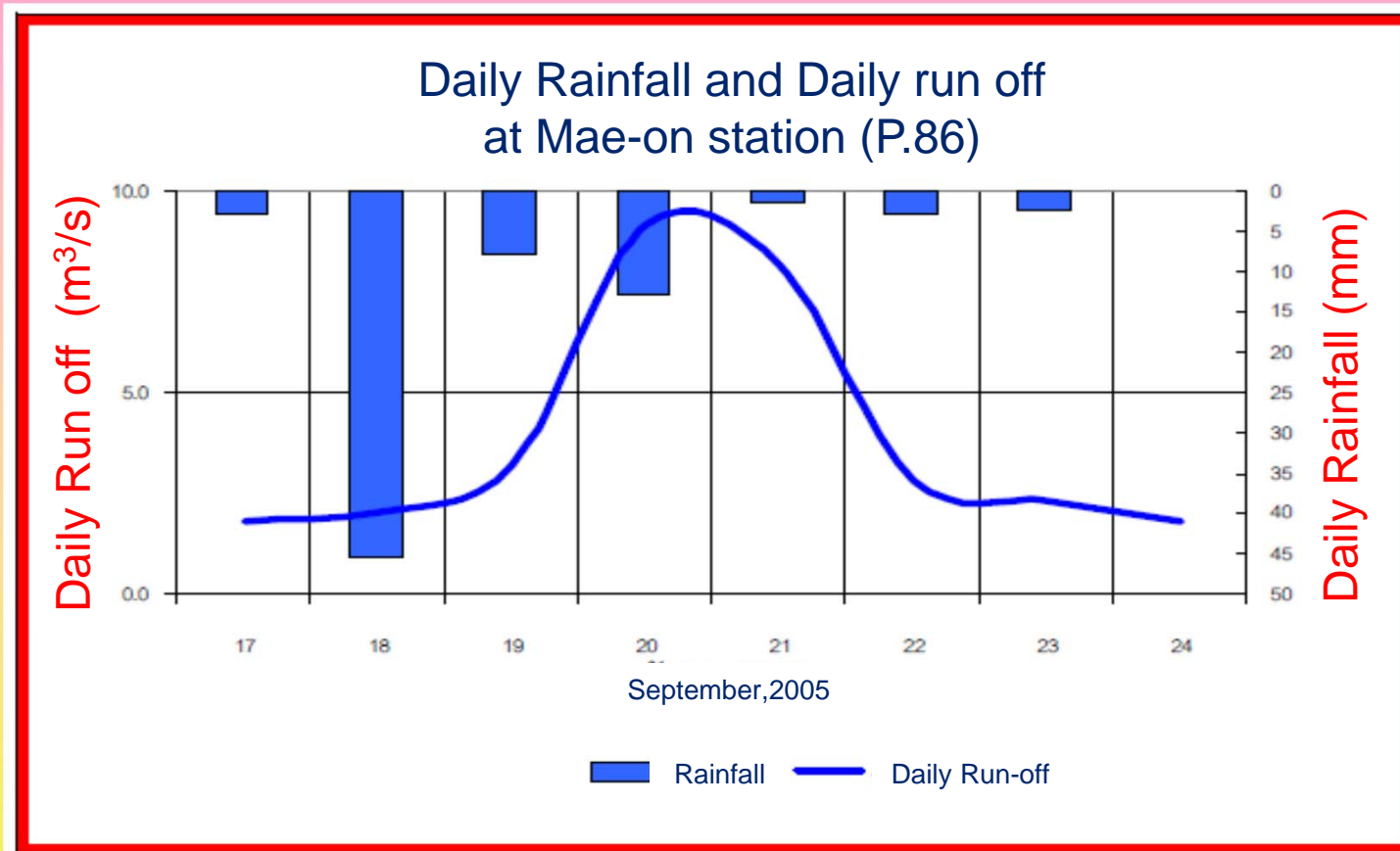
Behavior/ response => BAAC loan

Output/response function => Total BAAC budget of each weeks.



Maximum budget use at week#6 and the last week use minimum budget (week#9)

Practice



Input function =>

Respond =>

Output or response function =>

Daily Rainfall

River basin/ unit daily runoff

Daily runoff

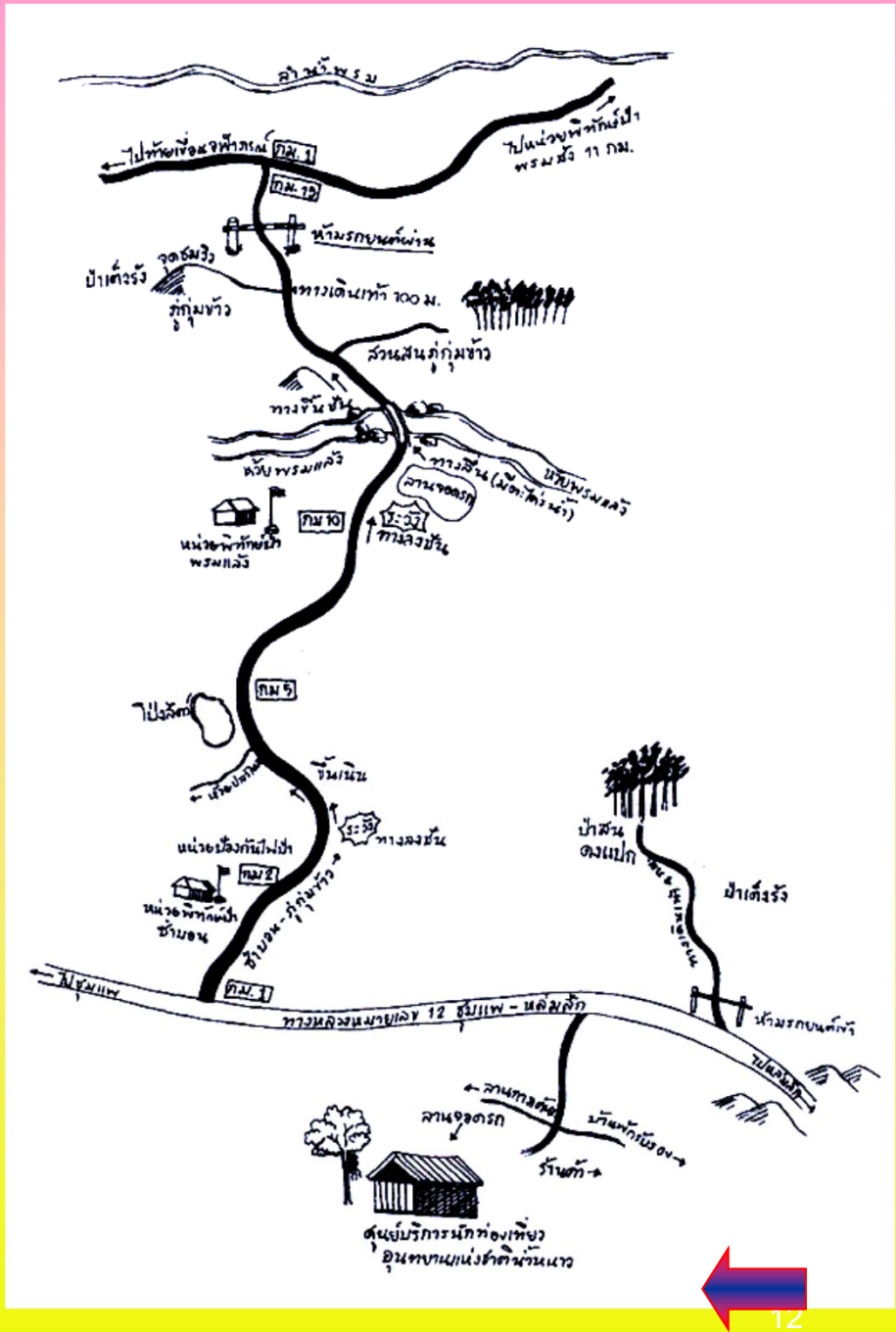
Maximum flood occur on September 20 ,2005

3.7 Chart and graph

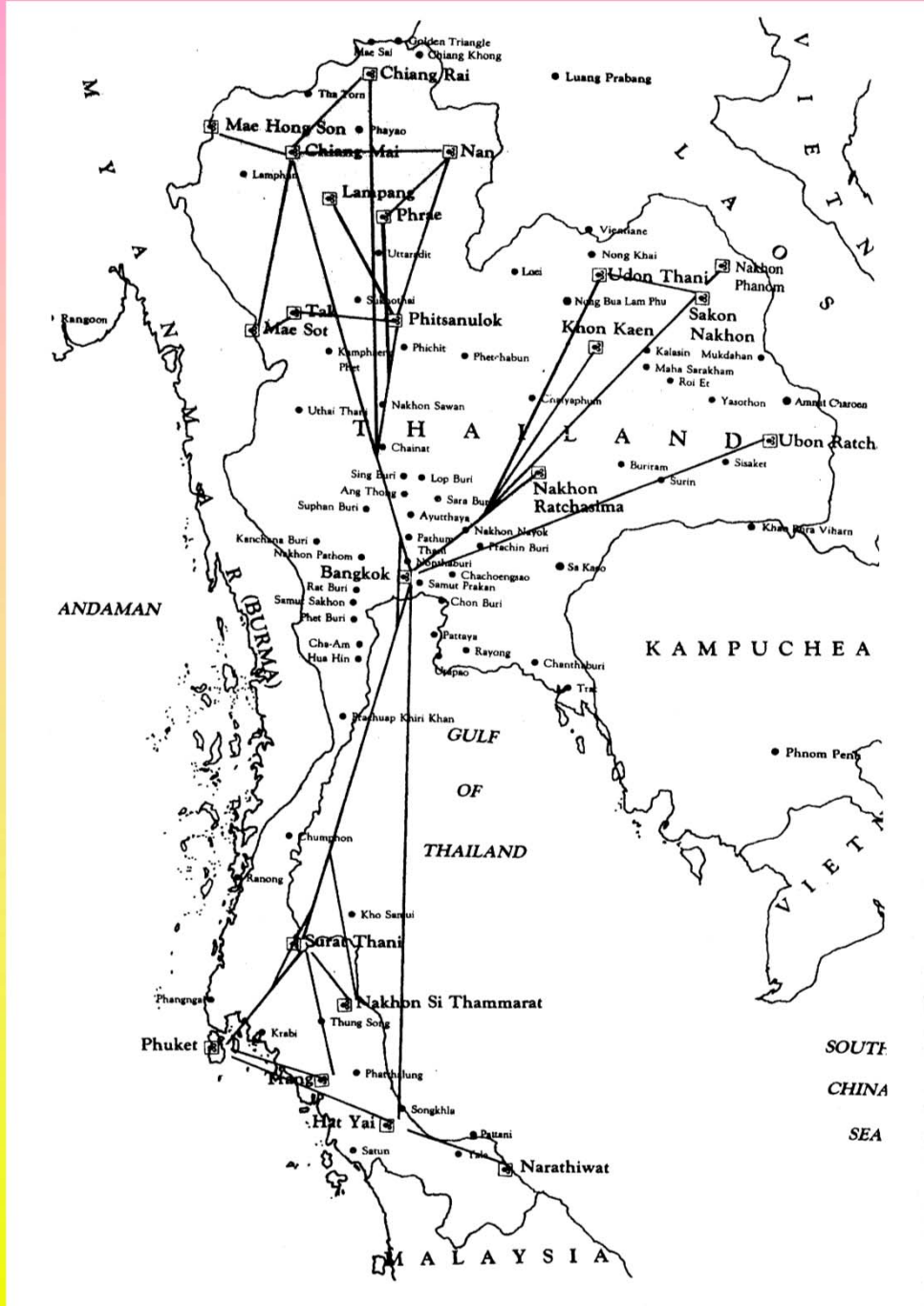
Map represents the real world using feature/objects (known distance and direction), eg. GIS

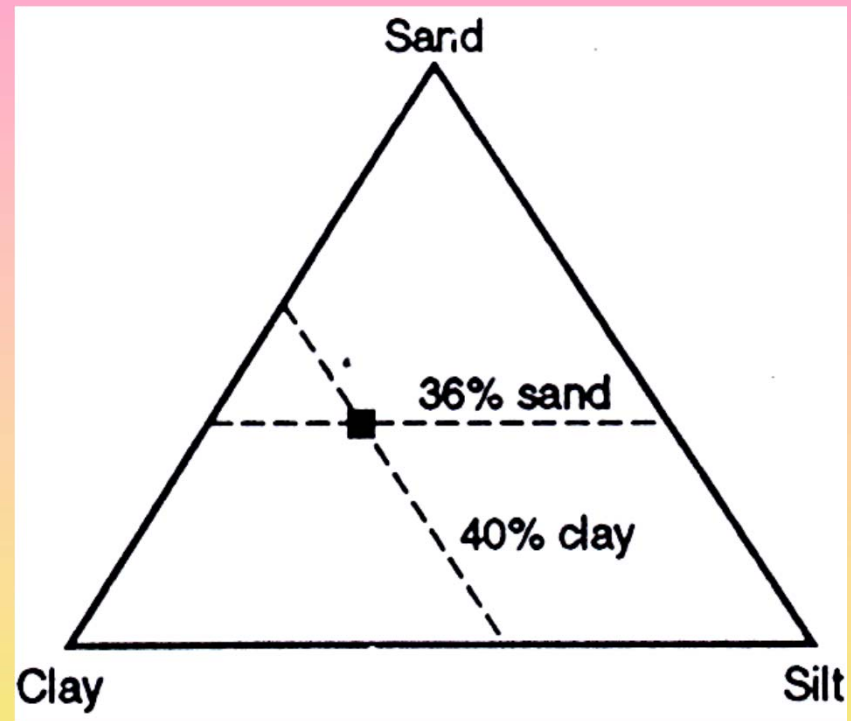
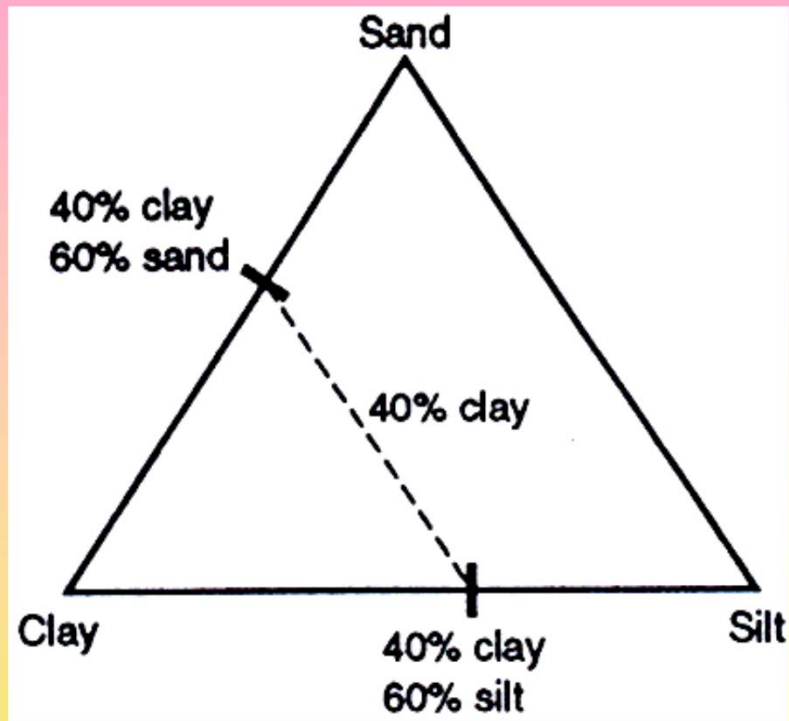
Feature

- Point =>small and importance things
- Line =>road , highway, river etc.
- polygon =>boundary area.



Domestic Airline Network map



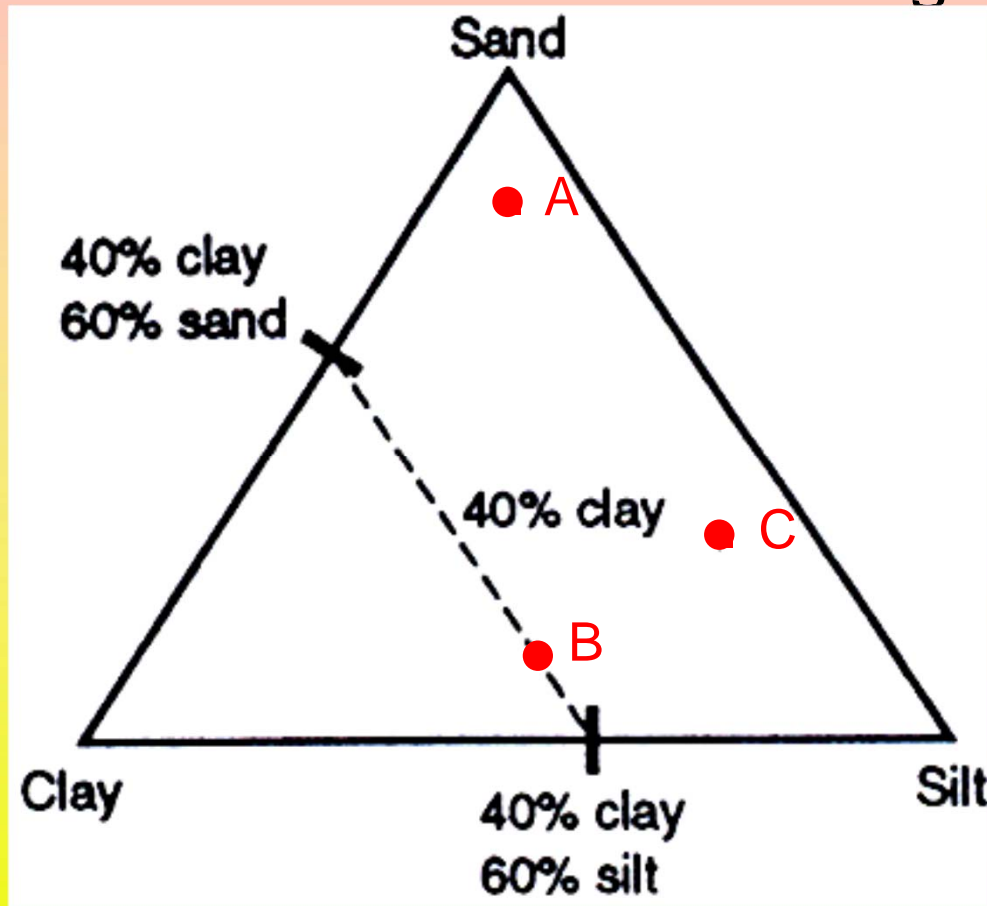


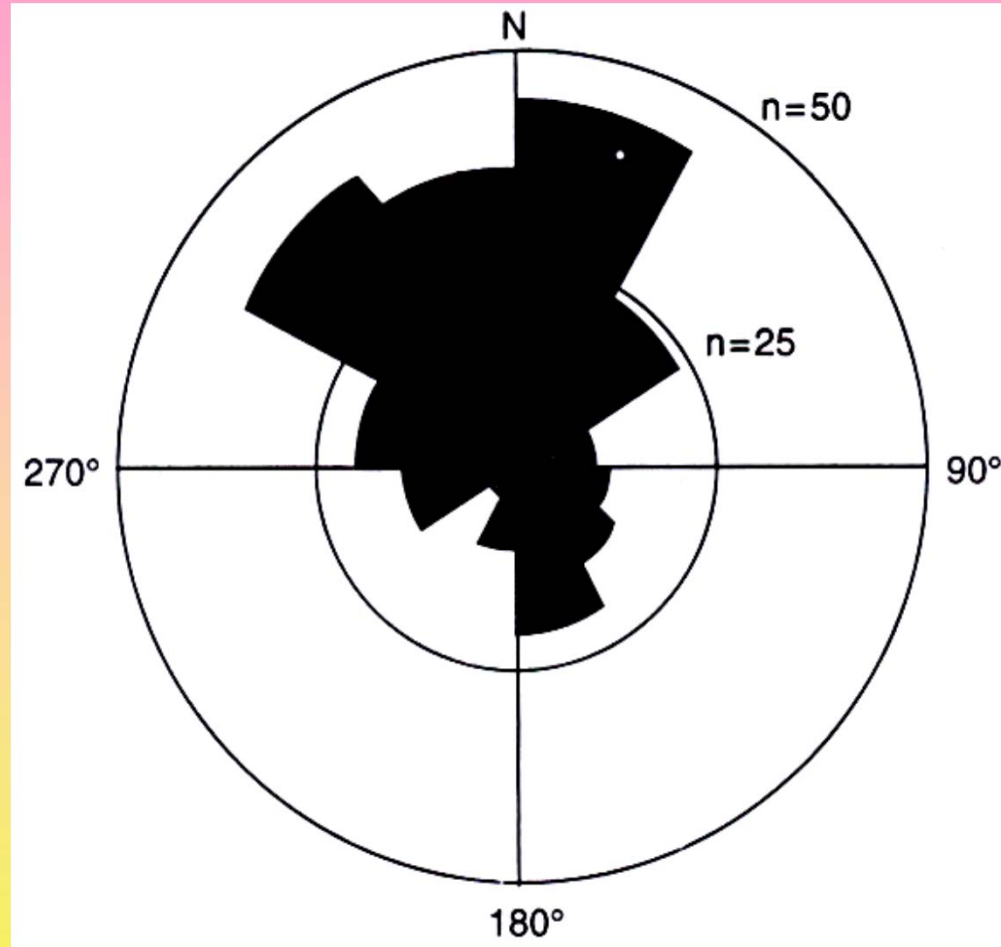
Soil texture triangle, classified by sand ,silt and clay

- From this figure shows the 36% of sand , 40% of clay and 24% of silt.

Exercise

Please calculate the value of point A , B and C those are as shown in the figure below





Rose diagram shows the frequency and direction of meteorites to the earth.

2 the frequency and direction of meteorites

Direction (from North to East)	Frequency
1-30	43
31-60	23
61-90	10
91-120	11
121-150	14
151-180	20
181-210	10
211-240	4
241-270	15
271-300	20
301-330	40
331-360	36

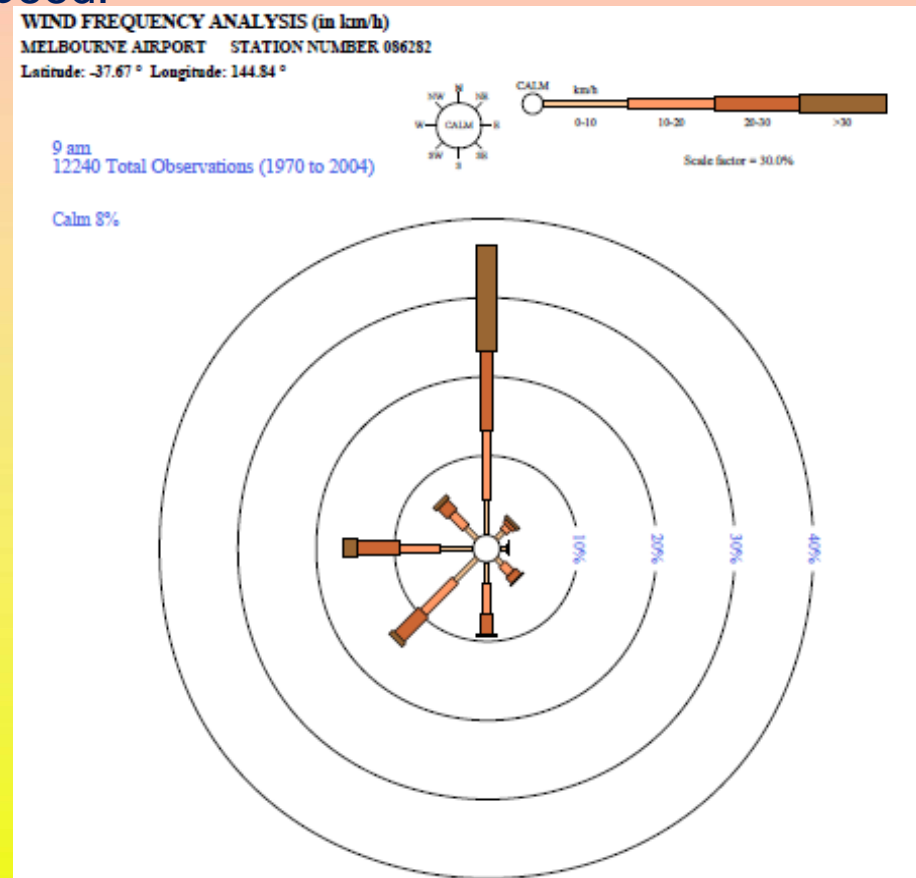
Source : Watham (1995)

Wind rose diagram

A diagram in which statistical information concerning direction and speed of the wind at a location may be summarized; a line segment is drawn in each of perhaps eight compass directions from a common origin; the length of a particular segment is proportional to the frequency with which winds blow from that direction; thicknesses of a segment indicate frequencies of occurrence of various classes of wind speed.

Interpreting the wind rose

- There are a number of different formats which can be used to display wind roses. These wind roses have been constructed in the following way:
- The percentage of calm conditions is represented by the size of the centre circle - the bigger the circle, the higher is the frequency of calm conditions.
- Each branch of the rose represents wind coming from that direction, with north to the top of the diagram. Eight directions are used.
- The branches are divided into segments of different thickness and colour, which represent wind speed ranges from that direction. Speed ranges of 10km/h are used in these wind roses. The length of each segment within a branch is proportional to the frequency of winds blowing within the corresponding range of speeds from that direction.



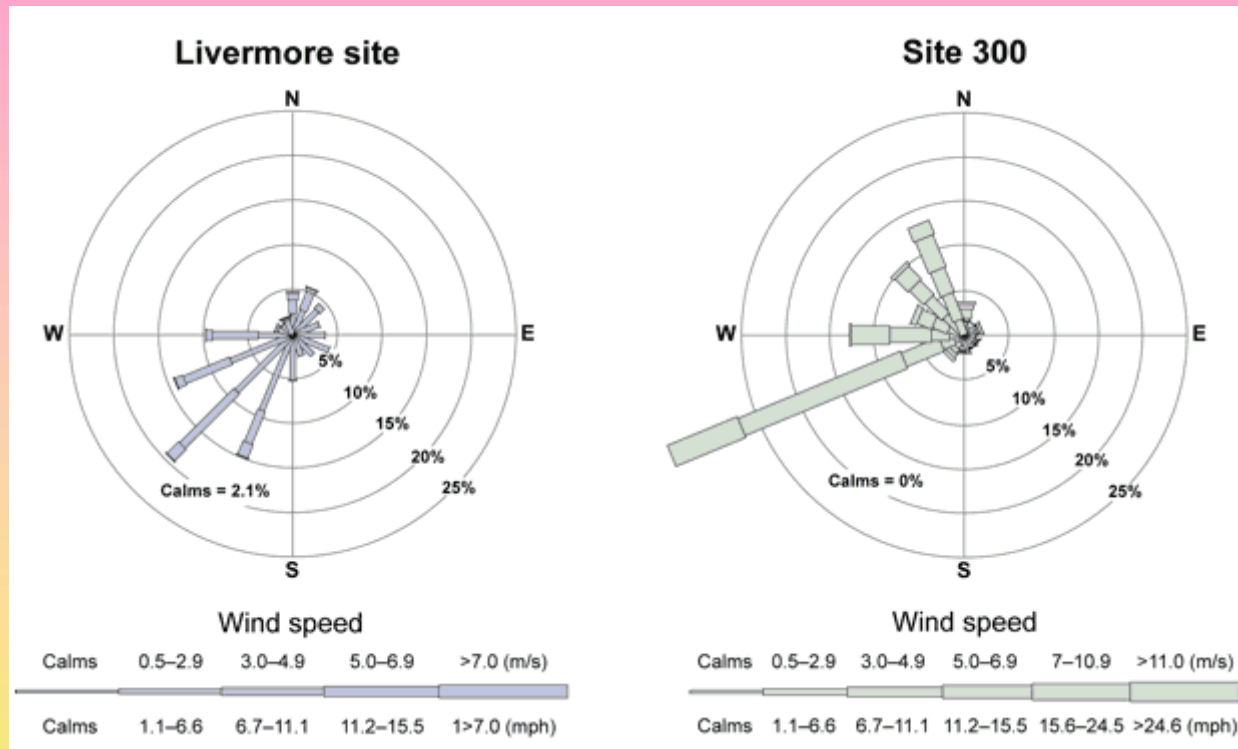
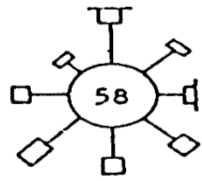


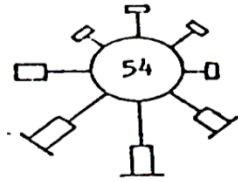
Figure 1. Wind roses, showing wind speed, direction, and frequency of occurrence at the Livermore site and Site 300 during 2007. Ref: <http://www-metdat.llnl.gov/cgi-pub/about.pl>

The length of each spoke is proportional to the frequency at which the wind blows from the indicated direction. Different line widths of each spoke represent wind speed classes. The average wind speed in 2007 at the Livermore site was 2.5 m/s (5.6 mph); at Site 300 it was 6.4 m/s (14.4 mph).

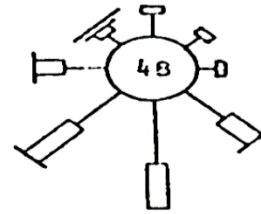
It can be seen from this data that the prevailing wind direction is from the southwest. This is the predominant wind direction during the summer. The wind does blow from the northeast and this is primarily during the winter.



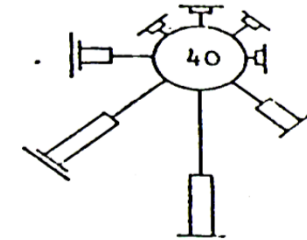
JANUARY



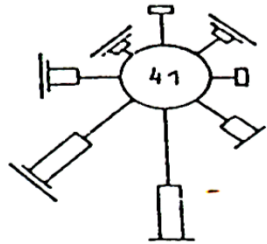
FEBRUARY



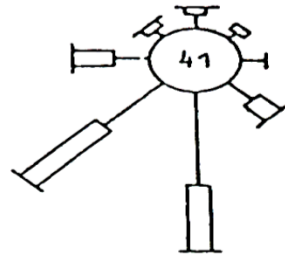
MARCH



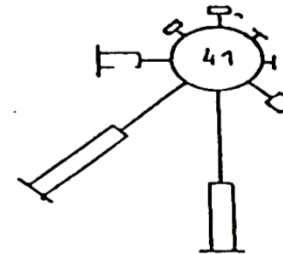
APRIL



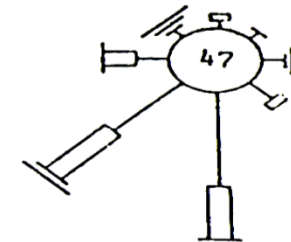
MAY



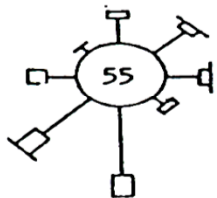
JUNE



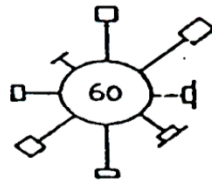
JULY



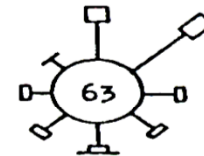
AUGUST



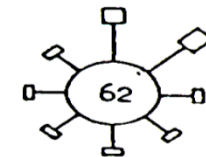
SEPTEMBER



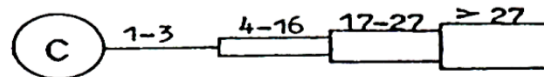
OCTOBER



NOVEMBER



DECEMBER



Wind speed in knots



Percentage scale of wind speed

LAMPANG

Lat. 18° 17' N. Long. 99° 31' E.

Height of wind vane above ground 11.8 m (253.8 m above MSL)

Height of anemometer above ground 11.8 m (253.8 m above MSL)

Questions?

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Reference:

1. วีระศักดิ์ อุดมโชค และคณะ, คณิตศาสตร์และคอมพิวเตอร์ในชีวิตประจำวัน,หนังสือ,2549
2. วีระศักดิ์ อุดมโชค , Lecture note คณิตศาสตร์และคอมพิวเตอร์ในชีวิตประจำวัน,2551,
ภาควิชาวิทยาศาสตร์พื้นฐาน คณะวิทยาศาสตร์ มก.
- 3: <http://www-metdat.llnl.gov/cgi-pub/about.pl>