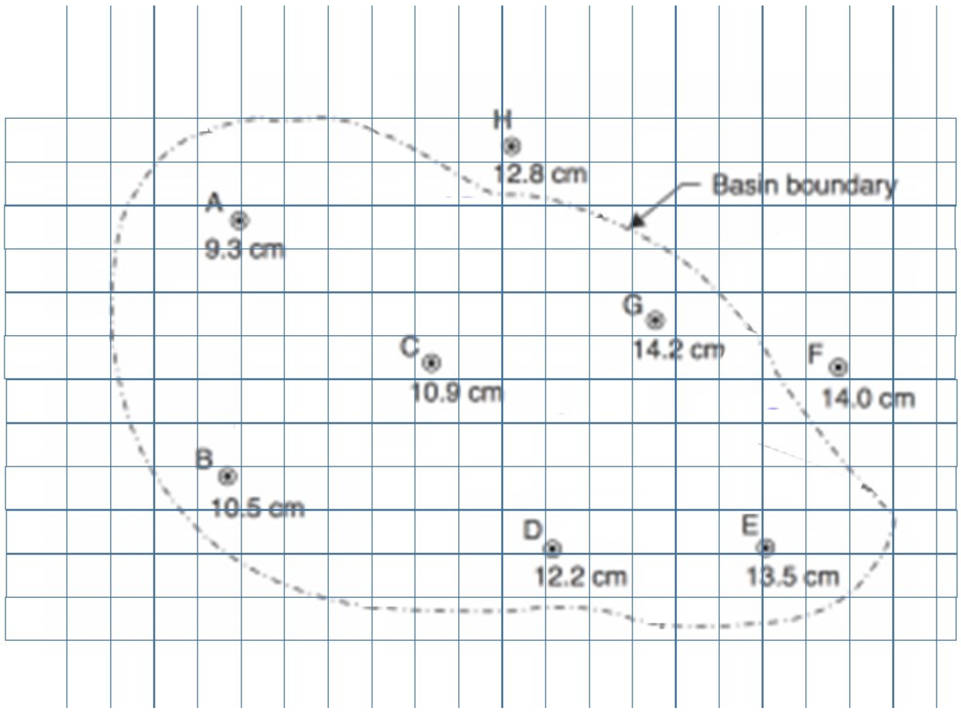
Unit 5 Applications Physical Hydrometeorology

1. **All Students: Use the figure below and determine the mean precipitation in the catchment using the Thiessen polygon method.** This catchment has the 8 gauging stations shown on the sheet and precipitation is given in cm. Draw the polygons. Use the squares of the sheet to estimate the corresponding Thiessen polygon areas in km^2 under the assumption one square corresponds to 1 km^2.

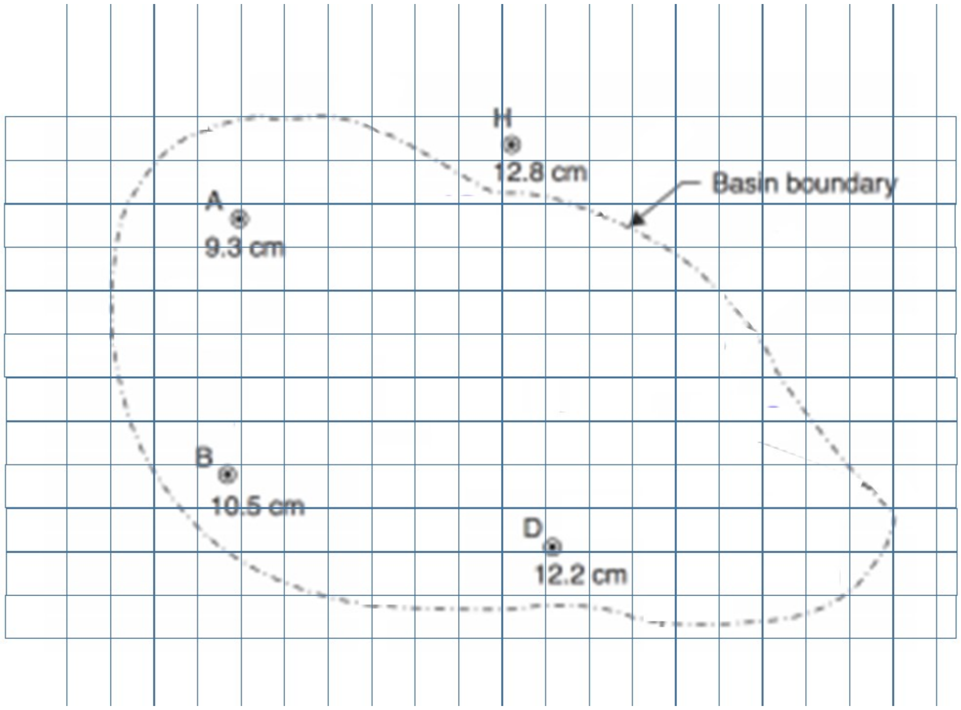
   (a) Compute the average precipitation over the basin. Recall the formula was

$$P = \frac{1}{A}\sum_{j=1}^{n} P_i\, a_i \qquad \text{with} \quad \sum_{i=1}^{n} a_i = A$$

   Use all sites when drawing your polygons.

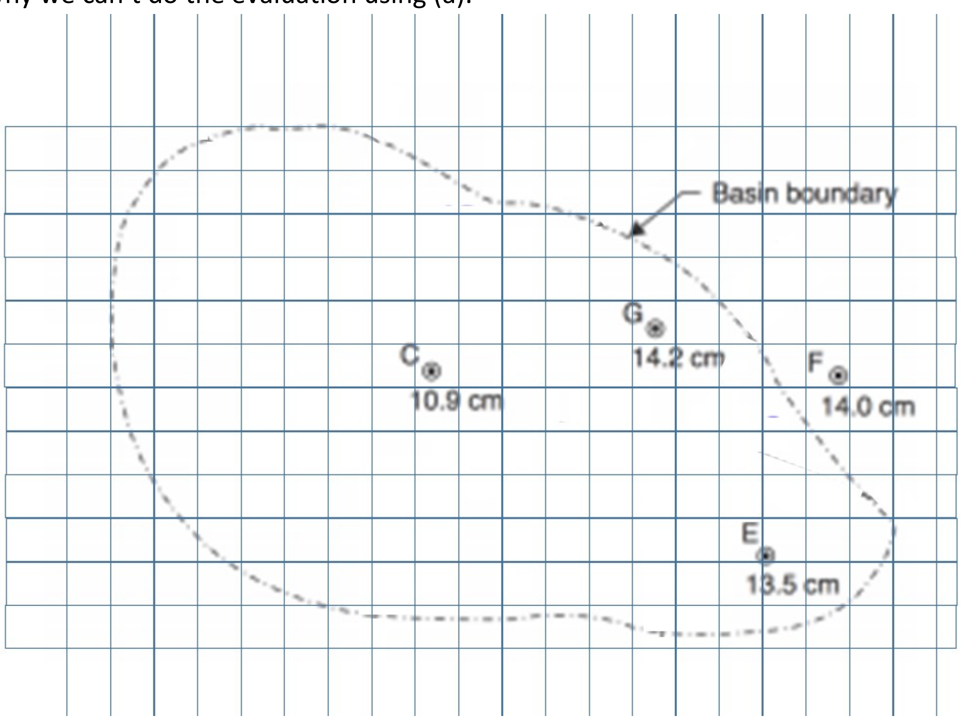


   (b) Graduate students only: For evaluation purposes use only these sites



Discuss how good" your method was.

(c) Now use these sites below as your "grand truth" to assess what you did under (b). Think about why we can't do the evaluation using (a).



2. Determine the regional precipitation for a 259 km^2 large drainage basin for the following precipitation event alternatively using the arithmetic average method (Eq. (1)), the isohyets method (Eq. (2)) (All students), and the polygon method (Eq. (3)) (graduate students). The first table gives the precipitation values; the second provides information about the isohytes. Precipitation measurements are daily accumulated values in mm. The sites g_7, g_4, g_5 and g_6 are located outside the basin at a similar distance to the borders as the sites located inside the basin are located to the borders, i.e. they can be assumed as being representative for the domain. When building the polynominal areas, the polynominal areas of sites g_7, g_4 and g_5 do not cover any area of the basin. The weights for the polygon areas covering areas within the basin are 30, 114, 36, and 79km^2 for g_3, g_1, g_6 and g_2, respectively. Hint: Start out to determine n as is needed. Recall the formulas are

$$P = \frac{1}{n}\sum_{i=1}^{n} P_i \qquad \text{(Eq. (1))}$$

$$P = \frac{1}{A}\sum_{j=1}^{n} P_i\, a_i \quad \text{with} \quad \sum_{i=1}^{n} a_i = A \qquad \text{(Eq. (2))}$$

$$P = \frac{1}{A}\sum_{i=1}^{n} a'_i P_i \quad \text{with} \quad \sum_{i=1}^{n} a'_i = A \qquad \text{(Eq. (3))}$$

Date	g_1 mm	g_2 mm	g_3 mm	g_4 mm	g_5 mm	g_6 mm	g_7 mm
6-11-2017	67	115	34	55	44	84	107
6-12-2017	0	0	2	8	4	0	0

With a_i being

	ai
g1	37
g2	35
g3	39
g4	37
g5	36
g6	38
g7	37

And the a'i being ΔA as in the following table.

Isohyte mm	mean P mm	ΔA km^2
<40	38	2
40-50	45	24
50-60	55	32
60-70	65	22
70-80	75	52
80-90	85	51
90-100	95	34
100-110	105	32
>110	115	10

Discuss what the differences mean in terms of total water received by the watershed.