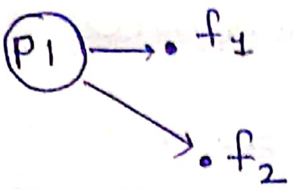
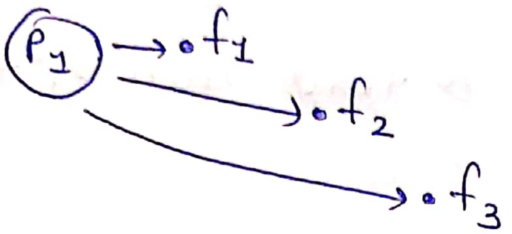
Watering Flowers



Suppose we set $r_1 = dist(f_2, P_1)$ then P_1 will be able to water f_1 since

$dist(f_1, P_1) < dist(f_2, P_1)$

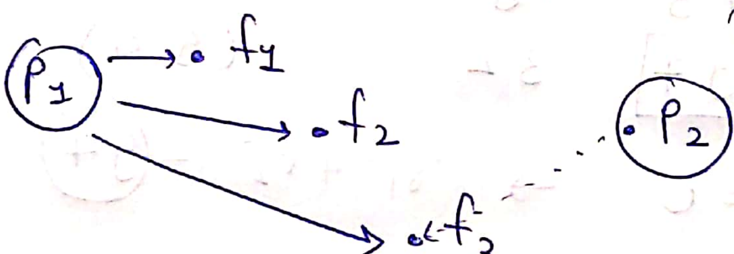
Similarly,



Suppose f_3 is farthest away from P_1. If P_1 can water f_3, it can water all the other flowers since

$dist(f_{others}, P_1) < dist(f_3, P_1)$

Now consider the second fountain P_2



① Suppose $dist(f_3, P_1) = r_1$

$\Rightarrow$ all the flower are watered

set $r_2 = 0$

$r_1^2 + r_2^2 \Rightarrow r_1^2 + 0^2 = r_1^2$

② Take $dist(f_2, P_1) = r_1$

$\Rightarrow f_3$ is left unwatered $\rightarrow$ take P_2 to water f_3

$$\Rightarrow \left.\begin{aligned} r_1 &= dist(f_2, P_1) \\ r_2 &= dist(f_3, P_2) \end{aligned}\right\} r_1^2 + r_2^2 = dist(f_2, P_1)^2 + dist(f_3, P_2$$

③ Take $dist(f_1, P_1) = r_1$

$\{f_2, f_3\} \rightarrow$ left unwatered $\rightarrow$ take P2

$r_1 = dist(f_1, P_1)$

$r_2 = max(dist(f_2, P_2), dist(f_3, P_2))$

① Calculate $d1 = dist(flower_i, fountain_1)^2$
$d2 = dist(flower_i, fountain_2)^2$

② Sort all the flowers by distances

③ Take the farthest flower from fountain 1, then second farthest, and keep calculating max dist from fountain 2 for remaining ones.

④ Add both distances & find min $r_1^2 + r_2^2$

Ex-

$n = 4 \quad \{x_1, y_1\} \to 0,0 \quad \{x_2, y_2\} \to 5,0$

Flowers →

1	36	(-1,0)
17	32	(1,4)
73	18	(8,3)
$\boxed{97}$	32	(9,4)

$r_1^2 = 97, \; r_2^2 = 0 \quad \to \quad r_1^2 + r_2^2 = 97$

1	36
17	32
$\boxed{73}$	18
97	$\boxed{32}$

$r_1^2 = 73 \quad r_2^2 = 32$

$\to r_1^2 + r_2^2 = 105$

1	36
$\boxed{17}$	32
73	18
97	32

$r_1^2 = 17$

$r_2^2 = max(18, 32) = 32$

$r_1^2 + r_2^2 = 17 + 32 = 49$

$\boxed{1}$	36
17	32
73	18
97	32

$r_1^2 = 1$

$r_2^2 = \max(32, 18, 32) = 32$

$r_1^2 + r_2^2 = 1 + 32 = 33$

$\min(97, 105, 49, 33) = 33$ $\therefore \min r_1^2 + r_2^2 = 33$