Railway Designer

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

You are working as a railway designer for a company who have n railways stations around the globe. Currently, each station are fully connected to each other by a railway, which means a train can travel in both direction from one station to another.

Each railway have a maintenance cost which is equal to the geographical distance between two stations in kilometer (km). Your manager tells you that cycles are not allowed in the railway connections.

Since the current railway connections incur a high maintenance cost and they need to redesign their railway connections to cut cost, how can you minimize the total number of railways that connect the stations such that the train can still travel to every station?

Find the **minimum** total maintenance cost for the new railways connection you designed and output your answer as integer after applying **floor function**.

You may calculate the maintenance cost with Haversine formula:

$$d = 2r \arcsin\left(\sqrt{\sin^2\left(\frac{\phi_2 - \phi_1}{2}\right) + \cos(\phi_1)\cos(\phi_2)\sin^2\left(\frac{\lambda_2 - \lambda_1}{2}\right)}\right)$$

In the calculation, assume r = 6371.

ϕ_1 is the latitude of the first station and ϕ_2 is the latitude of second station in radian.

λ_1 is the longitude of the first station and λ_2 is the longitude of the second station in radian.

Positive latitude represents northern hemisphere while negative latitude represents southern hemisphere.

Positive longitude represents eastern hemisphere while negative longitude represents western hemisphere.

Input

The first line of input contains an integer $t(1 \leq t \leq 100)$ - the number of test cases.

The first line of each test case contain an integer $n(3 \leq n \leq 200)$ - the number of stations.

The subsequent line of each test cases contains the integer input of the geographical location of n stations in latitude a and longitude b where $(-90 \leq a \leq 90)$ and $(-180 \leq b \leq 180)$.

Output

For every test case, print the **minimum total maintenance cost** in integer after applying floor function.

Example

standard input	standard output
2 3 -59 -130 90 -149 -4 44 4 -83 -71 59 122 64 153 -5 50	23442 21043