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170 FenwickTree (BIT) sum query on 2D-Array:
171 //range-update and range-query //One-based indexing
172 struct FenwickTree2D{
173     vector<vector<vector<ll>>> M , A;
174     const int n , m;
175
176     FenwickTree2D(int n , int m) : n(n) , m(m) {
177         M.assign(n, vector<vector<ll>>(m , vector<ll>(2 , 0)));
178         A.assign(n, vector<vector<ll>>(m , vector<ll>(2 , 0)));
179     }
180
181     FenwickTree2D(vector<vector<ll>> a) : FenwickTree2D(a.size() , a[0].size()){
182         for (int i = 1; i < a.size(); i++)
183             for (int j = 1; j < a[0].size(); j++)
184                 update(i , j , i , j , a[i][j]);
185     }
186
187     void upd2(vector<vector<vector<ll>>> &t, int x, int y, ll mul, ll add){
188         for (int i = x; i < n; i += i & -i){
189             for (int j = y; j < m; j += j & -j){
190                 t[i][j][0] += mul;
191                 t[i][j][1] += add;
192             }
193         }
194     }
195
196     void upd1(int x, int y1, int y2, ll mul, ll add){
197         upd2(M, x, y1, mul, -mul * (y1 - 1));
198         upd2(M, x, y2, -mul, mul * y2);
199         upd2(A, x, y1, add, -add * (y1 - 1));
200         upd2(A, x, y2, -add, add * y2);
201     }
202
203     void update(int x1, int y1, int x2, int y2, ll val){
204         upd1(x1, y1, y2, val, -val * (x1 - 1));
205         upd1(x2, y1, y2, -val, val * x2);
206     }
207
208     ll query2(vector<vector<vector<ll>>> &t , int x, int y){
209         ll mul = 0, add = 0;
210         for (int i = y; i > 0; i -= i & -i){
211             mul += t[x][i][0];
212             add += t[x][i][1];
213         }
214         return mul * y + add;
215     }
216
217     ll query1(int x, int y){
218         ll mul = 0, add = 0;
219         for (int i = x; i > 0; i -= i & -i){
220             mul += query2(M, i, y);
221             add += query2(A, i, y);
222         }
223         return mul * x + add;
224     }
225
226     ll query(int x1, int y1, int x2, int y2){
227         return query1(x2, y2)-query1(x1-1, y2)-query1(x2, y1-1)+query1(x1-1, y1-1);
228     }
229 };

```