$$\text{It is easy to see that: } N_i = \sum_{\frac{r^2}{(i+1)^2} \leqslant x^2+y^2 < \frac{r^2}{i^2}} \delta_{gcd(x,y)=1} \tag{1}$$

$$\text{So, if } D_i = \sum_{x^2+y^2 < \frac{r^2}{i^2}} \delta_{gcd(x,y)=1} \text{ then } N_i = D_i - D_{i+1} \tag{2}$$

To compute D_i same methods as for problem 153 can be used :

$$\text{So, if } C_i = \sum_{x^2+y^2 < \frac{r^2}{i^2}} 1 \text{ , then } D_i = C_i - \sum_{2 \leqslant j \ ; \ i \times j < r} D_{i \times j} \tag{3}$$

$\lfloor \frac{r^2}{i^2} \rfloor$