const double PI = 3.14159265358979323846;

1. **Distance Between Two Points (Centers of Circles)**:

The distance d between two points $(x1, y1)$ and $(x2, y2)$ is calculated using the Euclidean distance formula:
$d = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$
This is used to determine the relative positions of the two circles.

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2. **Area of a Circle**:

The area (A) of a circle with radius r is given by:
$A = \pi r^2$
This is used to calculate the area of each circle.

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3. **Conditions for Circle Intersection**:

- No Intersection:
  If the distance d between the centers is greater than or equal to the sum of the radii $(d \geq r1 + r2)$, the circles do not intersect.
- One Circle Inside the Other:
  If the distance d is less than the absolute difference of the radii $(d < |r1 - r2|)$, one circle is completely inside the other without intersecting.
- Tangent Circles:
  If the distance d equals the sum or difference of the radii $(d = r1 + r2)$ or $(d = |r1 - r2|)$, the circles touch at exactly one point (tangent).
- Partial Intersection:
  If the distance d is between the sum and difference of the radii $(|r1 - r2| < d < r1 + r2)$, the circles intersect at two points.

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4. **Area of Intersection of Two Circles:**

When two circles intersect partially, the area of intersection can be calculated using the following steps:

- Step 1: Calculate the distance d between the centers.
- Step 2: Use the Law of Cosines to find the angles subtended by the chord at the centers of the circles:
  $\text{angle1} = \cos^{-1}\left(\frac{r1^2 + d^2 - r2^2}{2 \cdot r1 \cdot d}\right)$
  $\text{angle2} = \cos^{-1}\left(\frac{r2^2 + d^2 - r1^2}{2 \cdot r2 \cdot d}\right)$
- Step 3: Calculate the area of the sectors of the circles:
  $\text{sectorArea1} = r1^2 \cdot \text{angle1}$
  $\text{sectorArea2} = r2^2 \cdot \text{angle2}$
- Step 4: Calculate the area of the triangles formed by the radii and the chord
  $\text{triangleArea1} = \frac{1}{2} \cdot r1^2 \cdot \sin(2 \cdot \text{angle1})$
  $\text{triangleArea2} = \frac{1}{2} \cdot r2^2 \cdot \sin(2 \cdot \text{angle2})$
- Step 5: The area of intersection is the sum of the sector areas minus the triangle areas:
  $\text{intersectionArea} = (\text{sectorArea1} - \text{triangleArea1}) + (\text{sectorArea2} - \text{triangleArea2})$

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5. **Area of the Crescent (Helal):**

The area of the largest crescent $(Helal)$ is the area of the larger circle minus the area of intersection:
$\text{HelalArea} = \max(\text{area1}, \text{area2}) - \text{intersectionArea}$
If the circles do not intersect or one is completely inside the other without touching, the $Helal$ area is undefined (output `-1`).

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6. **Concentric Circles:**

If the circles are concentric (same center) and have the same radius, they do not form a Helal. The output should be `-1`.

`double d = sqrt((x2 - x1) * (x2 - x1) + (y2 - y1) * (y2 - y1));` // distance

`if(d >= r1 + r2){` No Intersection or Externally Tangent Circles

`return -1;`

`}`

`else if(d < abs(r1 - r2)){` One Circle Completely Inside the Other Without Intersection

`return -1;`

`}`

`else if (d == 0 and r1 == r2) {` Concentric Circles with Same Radius

`return -1;`

`}`

`else{` Internally Tangent Circles or Partial Intersection $->$ Calculate the intersection area

`double angle1 = acos((r1 * r1 + d * d - r2 * r2) / (2 * r1 * d));`

`double angle2 = acos((r2 * r2 + d * d - r1 * r1) / (2 * r2 * d));`

`double area1 = r1 * r1 * angle1 - 0.5 * r1 * r1 * sin(2 * angle1);`

`double area2 = r2 * r2 * angle2 - 0.5 * r2 * r2 * sin(2 * angle2);`

`return area1 + area2;`

`}`