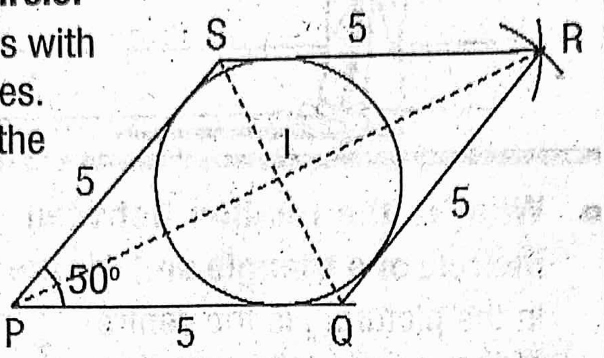
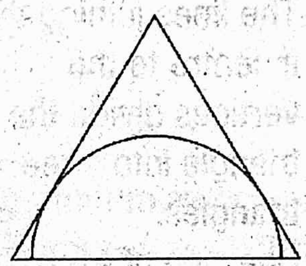
2. **Draw a rhombus of sides 5 cm and one angle 50° and draw its incircle.**

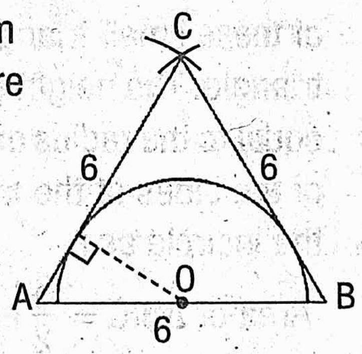
Draw the rhombus with the given measures. The diagonals of the rhombus are bisectors of the angles also. So their meeting point is the centre of the circle. Draw a circle with the perpendicular distance to any side as radius.



3. **Draw an equilateral triangle and a semicircle touching its two sides, as in the picture.**



Take the midpoint of the bottom side of the triangle as the centre and take the perpendicular distance from this point to another side as radius to draw the semicircle.

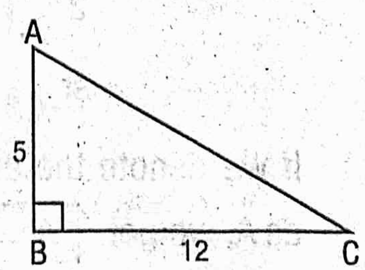


4. **What is the radius of the incircle of a right triangle having perpendicular sides of length 5 cm and 12 cm.**

We can use the formula $r = \frac{A}{s}$.

The perpendicular sides of right triangle ABC are

AB = 5 cm and BC = 12 cm.



$$AC = \sqrt{5^2 + 12^2} = \sqrt{25 + 144}$$

$$= \sqrt{169} = 13 \text{ cm}$$

Area of right triangle ABC,

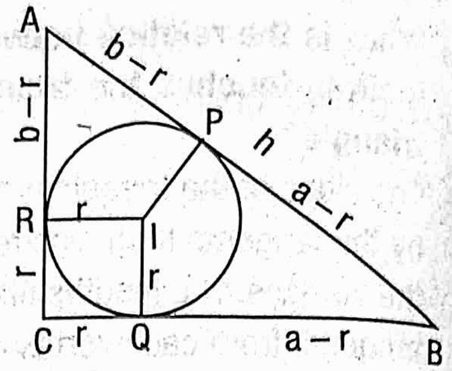
$$A = \frac{1}{2}bh = \frac{1}{2} \times 12 \times 5 = 30 \text{ sq.cm}$$

Semiperimeter, $s = \frac{5 + 12 + 13}{2} = \frac{30}{2} = 15$ cm

Radius of the incircle, $r = \frac{A}{s} = \frac{30}{15} = 2$ cm

5. **Prove that if the hypotenuse of a right triangle is h and the radius of its incircle is r, then its area is r(h + r).**

In right triangle ABC, let BC = a, AC = b and AB = h.
P, Q and R are the points where the incircle touches the triangle. I is the centre of the incircle.



Let IQ = IP = IR = r

In quadrilateral CQIR, $\angle R = 90^\circ, \angle C = 90^\circ$ and $\angle Q = 90^\circ$.

So $\angle I = 90^\circ$

This quadrilateral is a square. $\therefore CQ = r, CR = r$

Since BC = a, BQ = a − r

Since the tangents from B are equal, BP = a − r

Since AC = b, AR = b − r. Also AP = b − r.

Since area of a triangle, A = sr,

$$\text{Area of } \Delta ABC = \left(\frac{a+b+h}{2}\right) \times r \text{ ...... (1)}$$

From the picture, $h = b - r + a - r = a + b - r - r$

$h = a + b - 2r, \ \therefore a + b = h + 2r$ ..... (2)

Giving this value in (1),

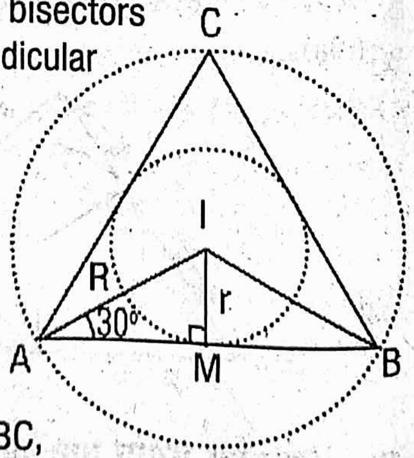
$$\text{Area of } \Delta ABC = \left(\frac{h+2r+h}{2}\right) \times r$$

$$= \left(\frac{2h+2r}{2}\right) \times r = \frac{2(h+r)}{2} \times r$$

$$= (h + r)\, r = r\,(h + r)$$

6. **Prove that the radius of the incircle of an equilateral triangle is half the radius of its circumcircle.**

In equilateral triangles, the bisectors of the angles and the perpendicular bisectors of the sides crosses through the same point. So the centre of the incircle and the centre of the circumcircle of an equilateral triangle is the same point.



In the equilateral triangle ABC,

$\angle A = \angle B = \angle C = 60^\circ$

In ΔAMI, $\angle IAM = \dfrac{60}{2} = 30^\circ$

$\angle IMA = 90^\circ, \ \therefore \angle AIM = 60^\circ$

In triangles with angles 30°, 60° and 90°, the sides opposite these angles are in the ratio $1 : \sqrt{3} : 2$,

$\therefore IM : AI = 1 : 2$

That is, the radius of the incircle of an equilateral triangle is half the radius of its circumcircle.