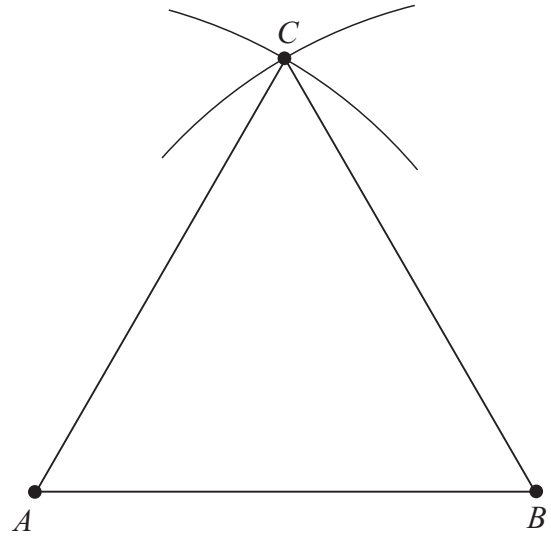


SAMPLE PAPER 6: PAPER 1

QUESTION 8 (50 MARKS)

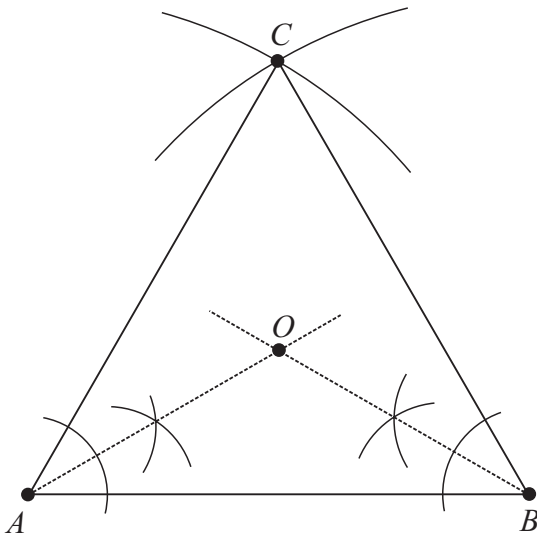
Question 8 (a) (i)

Stretch your compass so it is equal to length $|AB|$.
 With the compass at A , draw an arc above AB .
 With the compass at B (leaving the radius of the compass unchanged), draw another arc above AB .
 The intersection of these arcs is point C .
 Join A to C and B to C to construct triangle ABC .

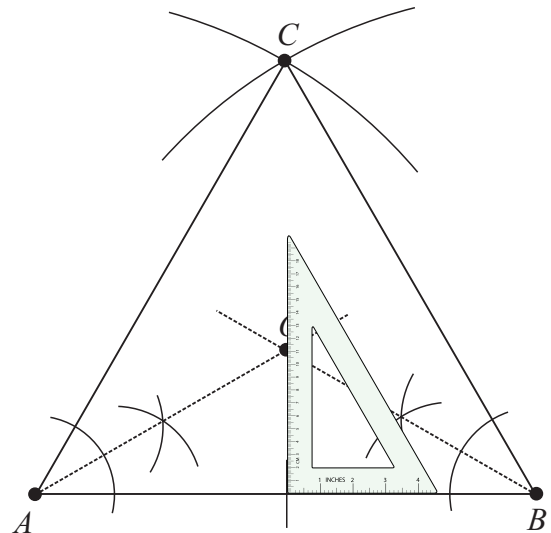


Question 8 (a) (ii)

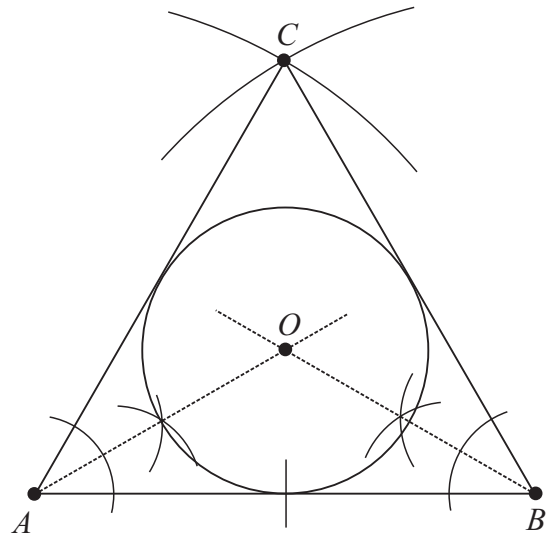
STEP 1: Use your compass to find the angle bisectors of each of the base angles. The intersection of these angle bisectors gives you the incentre O .



STEP 2: Using a set square, mark the perpendicular line through O that cuts side AB .



STEP 3: Stretch your compass from O to the point of intersection of this perpendicular line and side AB , and draw the incircle.



Question 8 (a) (iii)

A line which touches a circle at one point only is called a **tangent**.

Question 8 (a) (iv)

The radius $r = |OD|$ makes an angle of 90° with side AB because a tangent is perpendicular to the radius at the point of contact.

Question 8 (a) (v)

Consider triangles AOD and DOB .

$$|OD| = |OD| \text{ [Common side]}$$

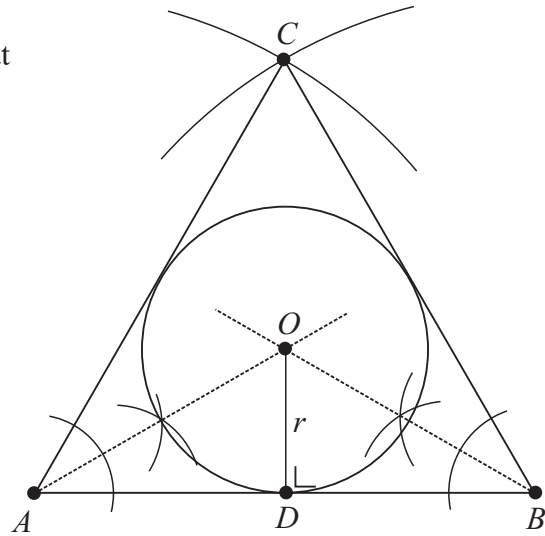
$$|\angle OAD| = |\angle OBD| \text{ [} 30^\circ \text{]}$$

$$|\angle DOA| = |\angle DOB| \text{ [} 60^\circ \text{]}$$

$$|\angle ODA| = |\angle BDO| \text{ [} 90^\circ \text{]}$$

Therefore, triangles AOD and DOB are congruent (ASA).

$$\therefore |AD| = |DB|$$



Question 8 (b) (i)

Triangle ABC is an equilateral triangle so every angle is 60° .

$$|AD| = |DB| = 5 \text{ [Already proved].}$$

$$|\angle OBD| = 30^\circ \text{ [Angle bisector]}$$

$$|\angle ODB| = 90^\circ \text{ [Tangent at point of contact]}$$

$$\tan A = \frac{\text{Opposite}}{\text{Adjacent}}$$

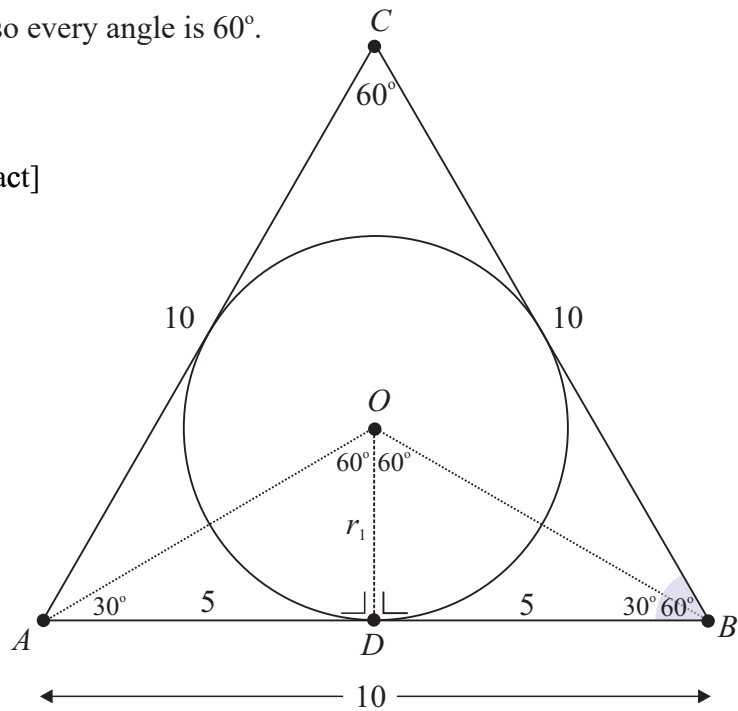
$$\tan 30^\circ = \frac{r_1}{5} \Rightarrow r_1 = 5 \tan 30^\circ = \frac{5\sqrt{3}}{3}$$

Question 8 (b) (ii)

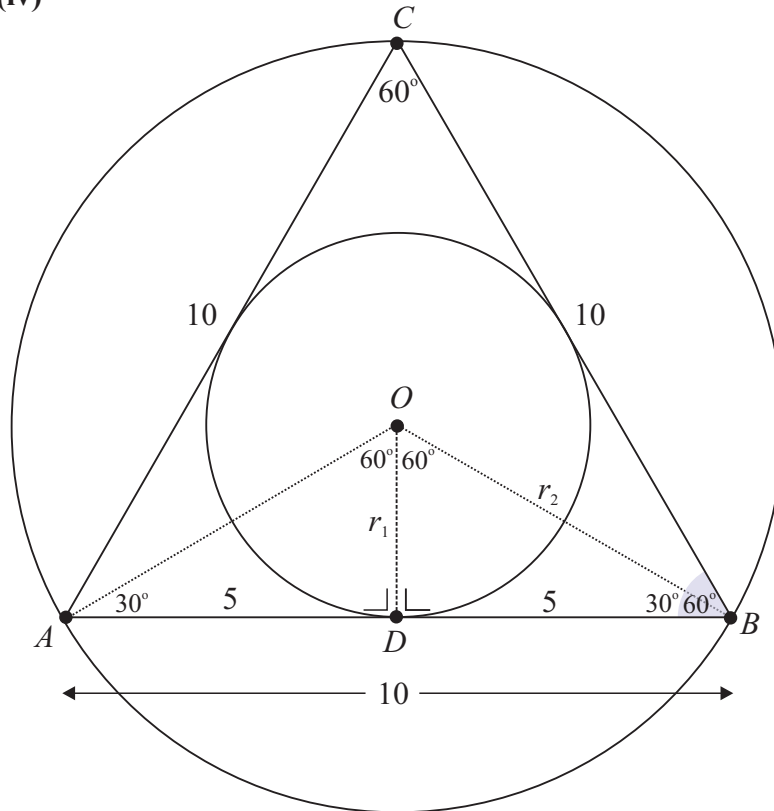
The circumcentre is the intersection of the perpendicular bisectors of the sides.

Question 8 (b) (iii)

The perpendicular bisectors of the sides intersect at O , as do the angle bisectors.



Question 8 (b) (iv)



Question 8 (b) (v)

$$\cos 30^\circ = \frac{5}{r_2} \Rightarrow r_2 = \frac{5}{\cos 30^\circ} = \frac{10\sqrt{3}}{3}$$

$\cos A = \frac{\text{Adjacent}}{\text{Hypotenuse}}$
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Question 8 (b) (vi)

$$\frac{r_1}{r_2} = \frac{\left(\frac{5\sqrt{3}}{3}\right)}{\left(\frac{10\sqrt{3}}{3}\right)} = \frac{1}{2} \Rightarrow r_1 : r_2 = 1 : 2$$
