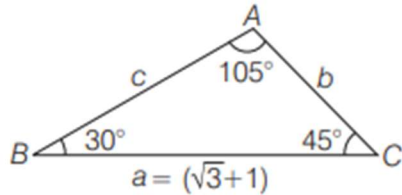**Question: -**

If the angle of a triangle are 30° and 45° and the included side is $(\sqrt{3}+1)$ cm, then the area of the triangle is ... . **(1988, 2M)**

Solution: -

By sine rule, $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

$\Rightarrow \qquad \dfrac{\sqrt{3}+1}{\sin(105°)} = \dfrac{b}{\sin 30°}$

$\Rightarrow \qquad b = \dfrac{(\sqrt{3}+1)\sin 30°}{\sin 105°}$

∴ Area of triangle

$= \dfrac{1}{2}\, ab \sin 45° = \dfrac{1}{2}\,(\sqrt{3}+1)\dfrac{(\sqrt{3}+1)\sin 30° \sin 45°}{\sin 105°}$

$= \dfrac{1}{2} \cdot \dfrac{(\sqrt{3}+1)^2}{(\sin 45° \cos 60° + \cos 45° \sin 60°)} \cdot \dfrac{1}{2} \cdot \dfrac{1}{\sqrt{2}}$

$= \dfrac{1}{4\sqrt{2}}\dfrac{(3+1+2\sqrt{3})}{\left(\dfrac{1}{\sqrt{2}}\cdot\dfrac{1}{2} + \dfrac{1}{\sqrt{2}}\cdot\dfrac{\sqrt{3}}{2}\right)} = \dfrac{(4+2\sqrt{3})}{4\sqrt{2}(1+\sqrt{3})}\cdot 2\sqrt{2}$

$= \dfrac{(1+\sqrt{3})^2}{2(1+\sqrt{3})} = \dfrac{1+\sqrt{3}}{2}$ sq cm