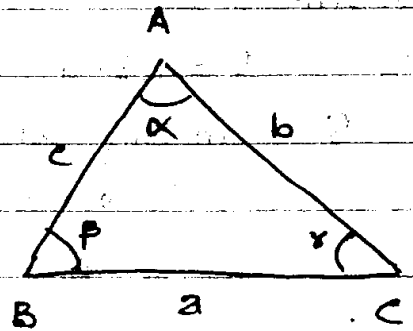


## \* Area of Triangle :- (only Formulas).

$$\begin{aligned}
 \text{i) Area of triangle } ABC &= \frac{1}{2} bc \sin \alpha \\
 &= \frac{1}{2} ca \sin \beta \\
 &= \frac{1}{2} ab \sin \gamma
 \end{aligned}$$



See proof on page 373

ii) Area of triangle denoted by  $\Delta$

$$\begin{aligned}
 \Delta &= \frac{c^2 \sin \alpha \sin \beta}{2 \sin \gamma} \\
 &= \frac{a^2 \sin \beta \sin \gamma}{2 \sin \alpha} \quad \text{OR} \quad = \frac{b^2 \sin \gamma \sin \alpha}{2 \sin \beta}
 \end{aligned}$$

See proof at page 374

iii) If  $\Delta$  denotes area of triangle then

$$\Delta = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\because s = \frac{a+b+c}{2}$$

This formula is known as "Hero's Formula"

### EXERCISE : 12.7

#### Question # 1

i)  $a = 200$  ,  $b = 120$  ,  $\gamma = 150^\circ$

Since

$$\begin{aligned}
 \Delta &= \frac{1}{2} ab \sin \gamma \\
 &= \frac{1}{2} (200)(120) \sin 150^\circ \\
 &= \frac{1}{2} (200)(120)(0.5)
 \end{aligned}$$

$$= 6000 \text{ sq. unit} \quad \text{Answer}$$

ii) & iii) Do yourself

## Question # 2

$$i) \quad b = 25.4, \quad \gamma = 36^\circ 41', \quad \alpha = 45^\circ 17'$$

Since in any triangle

$$\alpha + \beta + \gamma = 180$$

$$\Rightarrow \beta = 180 - \alpha - \gamma$$

$$= 180 - 45^\circ 17' - 36^\circ 41' = 98^\circ 2'$$

Now

$$\text{Area of triangle} = \frac{b^2 \sin \gamma \sin \alpha}{2 \sin \beta}$$

$$= \frac{(25.4)^2 \sin 36^\circ 41' \cdot \sin 45^\circ 17'}{2 \sin 98^\circ 2'}$$

$$= \frac{(645.16)(0.5974)(0.2924)}{2(0.9902)}$$

$$= 138.293 \text{ sq. unit} \quad \text{Answer}$$

## Question # 3

$$i) \quad a = 18, \quad b = 24, \quad c = 30$$

$$s = \frac{a+b+c}{2} = \frac{18+24+30}{2}$$

$$= \frac{72}{2} = 36$$

Now

$$s - a = 36 - 18 = 18$$

$$s - b = 36 - 24 = 12$$

$$s - c = 36 - 30 = 6$$

Now

$$\text{Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{36(18)(12)(6)}$$

$$= \sqrt{46656}$$

$$= 216 \text{ sq. unit} \quad \text{Answer}$$

ii) & iii) Do yourself

## Question # 4

$$\text{Area of triangle} = 2437 \text{ sq. unit}$$

$$a = 79$$

$$c = 97$$

$$, \beta = ?$$

Since

$$\text{Area of triangle} = \frac{1}{2} ac \sin \beta$$

$$\Rightarrow 2437 = \frac{1}{2} (79)(97) \sin \beta$$

$$\Rightarrow 2437 = 3831.5 \sin \beta$$

$$\Rightarrow \frac{2437}{3831} = \sin \beta \Rightarrow 0.636 = \sin \beta$$

$$\Rightarrow \beta = \sin^{-1}(0.636)$$

$$= 39^\circ 30' \quad \text{Answer}$$

## Question # 5

$$\text{Area of triangle} = \Delta = 121.34$$

$$\alpha = 32^\circ 15', \quad \beta = 65^\circ 37', \quad c = ?, \quad \gamma = ?$$

Since in any triangle

$$\alpha + \beta + \gamma = 180$$

$$\Rightarrow \gamma = 180 - \alpha - \beta$$

$$\neq 180 - 32 - 65 \quad \neq \boxed{\gamma = 83^\circ}$$

$$= 180 - 32^\circ 15' - 65^\circ 37'$$

$$\Rightarrow \boxed{\gamma = 82^\circ 8'}$$

Now

$$\text{Area of triangle} = \frac{c^2 \sin \alpha \sin \beta}{2 \sin \gamma}$$

$$\Rightarrow 121.34 = \frac{c^2 \sin 32^\circ 15' \cdot \sin 65^\circ 37'}{2 \sin 82^\circ 8'}$$

$$= \frac{c^2 (0.5336)(0.9108)}{2(0.9906)}$$

$$= c^2 (0.2453)$$

$$\Rightarrow \frac{121.34}{0.2453} = c^2$$

$$\Rightarrow c^2 = 494.66$$

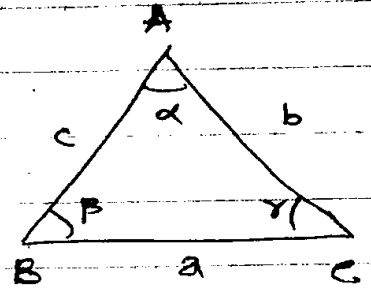
$$\Rightarrow c = \sqrt{494.66}$$

$$\Rightarrow \boxed{c = 22.24}$$

### Question # 6

Suppose ABC be a triangular garden such that

$$a = 30\text{m}, \quad \beta = 22\frac{1}{2}^\circ, \quad \gamma = 112\frac{1}{2}^\circ$$



Since in any triangle

$$\alpha + \beta + \gamma = 180$$

$$\begin{aligned} \alpha &= 180 - \beta - \gamma = 180 - 22\frac{1}{2}^\circ - 112\frac{1}{2}^\circ \\ &= 45^\circ \end{aligned}$$

Now Area of triangular garden =  $\frac{a^2 \sin \beta \sin \gamma}{2 \sin \alpha}$

$$= \frac{(30)^2 \sin 22\frac{1}{2}^\circ \cdot \sin 112\frac{1}{2}^\circ}{2 \sin 45^\circ}$$

$$= \frac{(900)(0.3827)(0.9239)}{2(0.7072)} = 224.99 \text{ m}^2$$

$$\approx 225 \text{ m}^2$$

Since

Plant Cost of planting per square meter = 5 Rs  
therefore

$$\begin{aligned} \text{Cost of planting } 225 \text{ m}^2 &= 5 \times 225 \\ &= 1125 \text{ Rs} \end{aligned}$$

Answer