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Sine and Cosine Formulae and their Applications Ex-10.1 Q1

$\angle A = 45^{\circ}, \angle B = 60^{\circ} and \angle C = 75^{\circ}$

Using sine rule,

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = k$$

$$\frac{a}{\sin 45} = \frac{b}{\sin 60} = \frac{c}{\sin 75} = k$$

$$\frac{a}{\frac{1}{\sqrt{2}}} = \frac{b}{\frac{\sqrt{3}}{2}} = \frac{c}{\frac{\sqrt{3}+1}{2\sqrt{2}}} = k$$

$a : b : c = 2 : \sqrt{6} : (\sqrt{3}+1)$

Sine and Cosine Formulae and their Applications Ex-10.1 Q2

$\angle C = 105^{\circ}, \angle B = 45^{\circ}, a = 2$

From here we can calculate that

$\angle A = 30^{\circ}$

$a \sin B = b \sin A$

$\Rightarrow 2 \sin 45 = b \sin 30$

$$\Rightarrow 2 \times \frac{1}{\sqrt{2}} = b \times \frac{1}{2}$$

$$\Rightarrow \sqrt{2} = \frac{b}{2}$$

$$\Rightarrow b = 2\sqrt{2}$$

Sine and Cosine Formulae and their Applications Ex-10.1 Q3

$a=18, b=24, c=30, \angle C=90^\circ$

let $\dfrac{\sin A}{a}=\dfrac{\sin B}{b}=\dfrac{\sin C}{c}$

$\dfrac{\sin A}{18}=\dfrac{\sin B}{24}=\dfrac{\sin 90}{30}$

$\dfrac{\sin A}{18}=\dfrac{\sin B}{24}=\dfrac{1}{30}$

$\dfrac{\sin A}{18}=\dfrac{1}{30}\Rightarrow \sin A=\dfrac{18}{30}=\dfrac{3}{5}$

$\dfrac{\sin B}{24}=\dfrac{1}{30}\Rightarrow \sin B=\dfrac{24}{30}=\dfrac{4}{5}$

$\therefore \sin A=\dfrac{3}{5}, \sin B=\dfrac{4}{5}, \sin C=1$

Sine and Cosine Formulae and their Applications Ex-10.1 Q4

$$\frac{a-b}{a+b}=\frac{\tan\left(\frac{A-B}{2}\right)}{\tan\left(\frac{A+B}{2}\right)}$$

Let $a=k\sin A, b=k\sin B$ (Using sine rule)

LHS

$=\dfrac{a-b}{a+b}$

$=\dfrac{k\sin A-k\sin B}{k\sin A+k\sin B}$

$=\dfrac{\sin A-\sin B}{\sin A+\sin B}$

$=\dfrac{2\cos(\frac{A+B}{2})\sin(\frac{A-B}{2})}{2\sin(\frac{A+B}{2})\cos(\frac{A-B}{2})}$

$=\dfrac{\tan(\frac{A-B}{2})}{\tan(\frac{A+B}{2})}=RHS$

********** END **********