Grade 10th CBSE

Introduction to Trigonometry

Q1) Consider the triangle ΔPQR, Right angled at Q, In which PR = 29, RQ = 21 and $\angle PRQ = \theta$. Determine the values of

a) $\cos^2\theta + \sin^2\theta$

b) $\cos^2\theta - \sin^2\theta$

Q2) Given Sec $\theta = \frac{25}{24}$, Calculate all other trigonometric Ratios.

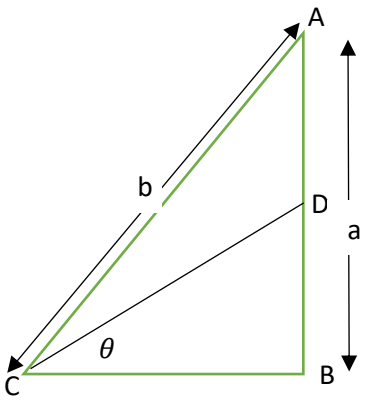
Q3) In fig (i) AD = DB and $\angle B$ is right angle. Determine

i) $\sin\theta$

ii) $\cos\theta$

iii) $\tan\theta$

iv) $\sin^2\theta + \cos^2\theta$



Fig(i)

Q4) If cos A = $\frac{\sqrt{3}}{2}$, find the value of $\frac{1}{\tan A} + \frac{sinA}{1+cosA}$

Q5) Prove that

$\frac{cos30+sin60}{1+cos60+sin30} = \frac{\sqrt{3}}{2}$

Solutions

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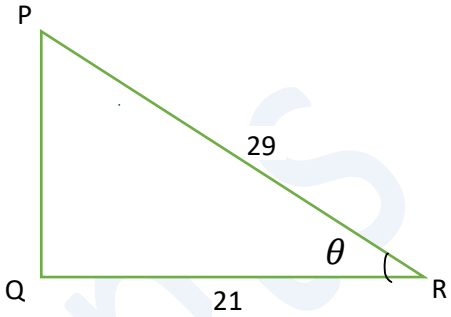
Sol1) By Pythagoras Theorem



PQ=$\sqrt{PR^2 - RQ^2}$

=$\sqrt{29^2 - 21^2}$

PQ = 20

Now,

Sin θ =$\frac{PQ}{PR}$ =$\frac{20}{29}$ and Cos θ =$\frac{QR}{PR}$ =$\frac{21}{29}$

a) $\cos^2\theta + \sin^2\theta = \left(\frac{21}{29}\right)^2 + \left(\frac{20}{29}\right)^2$

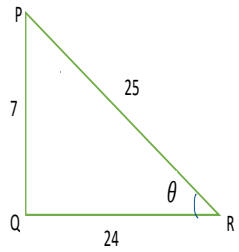
$\frac{400+441}{29^2}$ =$\frac{841}{841}$ =1

b) $\cos^2\theta - \sin^2\theta = \left(\frac{21}{29}\right)^2 - \left(\frac{20}{29}\right)^2$

$\frac{441-400}{29^2}$ =$\frac{41}{841}$

Sol. 2)

Sec θ = $\frac{25}{24}$, Cos θ = $\frac{24}{25}$



By Pythagoras Theorem PQ=7

Sin θ = $\frac{7}{25}$

Cos θ = $\frac{24}{25}$

Tan θ = $\frac{7}{24}$

Cosec θ = $\frac{25}{7}$

Cot θ = $\frac{24}{7}$

Sol 3)

Let AB = a and AC = b

Given AD = DB $\Longrightarrow Ad = DB = \frac{a}{2}$ ⟶ 1

By Pythagoras theorm

BC = $\sqrt{b^2 - a^2}$ ⟶ 2

CD = $\left(\sqrt{b^2 - a^2}\right)^2 + \left(\frac{a}{2}\right)^2 = \frac{\sqrt{4b^2-3a^2}}{2}$

By 1 and 2

$\sin\theta = \frac{DB}{CD} = \frac{a/2}{\sqrt{\frac{4b^2-3a^2}{4}}} = \frac{a}{\sqrt{4b^2-3a^2}}$

$\cos\theta = \frac{BC}{CD} = \frac{\sqrt{b^2-a^2}}{\sqrt{\frac{4b^2-3a^2}{4}}} = \frac{2\sqrt{b^2-a^2}}{\sqrt{4b^2-3a^2}}$

$\tan\theta = \frac{DB}{BC} = \frac{a/2}{\sqrt{b^2-a^2}} = \frac{a}{2\sqrt{b^2-a^2}}$

$\sin^2\theta + \cos^2\theta = \left(\frac{a}{\sqrt{4b^2-3a^2}}\right)^2 + \left(\frac{2\sqrt{b^2-a^2}}{\sqrt{4b^2-3a^2}}\right)^2$

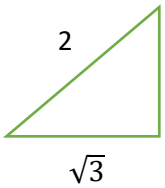
$\frac{a^2+4b^2-4a^2}{4b^2-3a^2} = \frac{4b^2-3a^2}{4b^2-3a^2} = 1$

Sol 4)

Cos A = $\frac{\sqrt{3}}{2} = \frac{Base}{hypotenuse}$

By Pythagoras theorem

Sin A = $\frac{1}{2}$



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$\tan A = \frac{1}{\sqrt{3}}$

$\frac{1}{\tan A} = \frac{\sqrt{3}}{1}$

$1 + cosA = \frac{2+\sqrt{3}}{2}$

$\frac{sinA}{1+cosA} = \frac{1/2}{\frac{2+\sqrt{3}}{2}} = \frac{1}{2+\sqrt{3}}$

$\frac{1}{\tan A} + \frac{sinA}{1+cosA} = \frac{\sqrt{3}}{1} + \frac{1}{2+\sqrt{3}} = \frac{2\sqrt{3}+3+1}{2+\sqrt{3}} = \frac{4+2\sqrt{3}}{2+\sqrt{3}} = \frac{2(2+\sqrt{3})}{2+\sqrt{3}} = 2$

Sol 5)

We know that,

$cos30 = \frac{\sqrt{3}}{2}, cos60 = \frac{1}{2}, sin30 = \frac{1}{2}, sin60 = \frac{\sqrt{3}}{2}$

$\frac{cos30+sin60}{1+cos60+sin30} = \frac{\frac{\sqrt{3}}{2}+\frac{\sqrt{3}}{2}}{1+\frac{1}{2}+\frac{1}{2}} = \frac{\sqrt{3}}{2}$