Q.1) Evaluate the following : (i) sin20cos70 $\frac{\sin 20}{\cos 70}$

Sol (i) : Given that, sin20cos70 $\frac{\sin 20}{\cos 70}$

Since sin (90 – ΘΘ) = cosΘΘ

⇒⇒ sin20cos70 $\frac{\sin 20}{\cos 70}$ = sin(90−70)cos70 $\frac{\sin(90-70)}{\cos 70}$

⇒⇒ sin20cos70 $\frac{\sin 20}{\cos 70}$ = cos70cos70 $\frac{\cos 70}{\cos 70}$

⇒⇒ sin20cos70 $\frac{\sin 20}{\cos 70}$ =1

Therefore sin20cos70 $\frac{\sin 20}{\cos 70}$ = 1

(ii) cos19sin71 $\frac{\cos 19}{\sin 71}$

Soln.(ii): Given that, cos19sin71 $\frac{\cos 19}{\sin 71}$

⇒⇒ cos19sin71 $\frac{\cos 19}{\sin 71}$ = cos(90−71)sin71 $\frac{\cos(90-71)}{\sin 71}$

⇒⇒ cos19sin71 $\frac{\cos 19}{\sin 71}$ = sin71sin71 $\frac{\sin 71}{\sin 71}$

⇒⇒ cos19sin71 $\frac{\cos 19}{\sin 71}$ =1

Since cos(90-ΘΘ)= sin ΘΘ

Therefore cos19sin71 $\frac{\cos 19}{\sin 71}$ = 1

(iii) sin21cos69 $\frac{\sin 21}{\cos 69}$

Soln.(iii): Given that, sin21cos69 $\frac{\sin 21}{\cos 69}$

Since (90-ΘΘ) = cosΘΘ

⇒⇒ sin21cos69 $\frac{\sin 21}{\cos 69}$ = sin(90−69)cos69 $\frac{\sin(90-69)}{\cos 69}$

⇒⇒ sin21cos69 $\frac{\sin 21}{\cos 69}$ = cos69cos69 $\frac{\cos 69}{\cos 69}$

⇒⇒ sin21cos69 $\frac{\sin21}{\cos69}$ =1

(iv) tan10cot80 $\frac{\tan10}{\cot80}$

Soln.(iv): We are given that, tan10cot80 $\frac{\tan10}{\cot80}$

Since tan(90-ΘΘ) = cotΘΘ

⇒⇒ tan10cot80 $\frac{\tan10}{\cot80}$ = tan(90−80)cot80 $\frac{\tan(90-80)}{\cot80}$

⇒⇒ tan10cot80 $\frac{\tan10}{\cot80}$ =

cot80cot80 $\frac{\cot80}{\cot80}$

⇒⇒ tan10cot80 $\frac{\tan10}{\cot80}$ = 1

Therefore tan10cot80 $\frac{\tan10}{\cot80}$ = 1

(v) sec11cosec79 $\frac{\sec11}{\mathrm{cosec}79}$

Soln.(v):

Given that, sec11cosec79 $\frac{\sec11}{\mathrm{cosec}79}$

Since sec(90-ΘΘ)=cosecΘΘ

⇒⇒ sec11cosec79 $\frac{\sec11}{\mathrm{cosec}79}$ = sec(90−79)cosec79 $\frac{\sec(90-79)}{\mathrm{cosec}79}$

⇒⇒ sec11cosec79 $\frac{\sec11}{\mathrm{cosec}79}$ = cosec79cosec79 $\frac{\mathrm{cosec}79}{\mathrm{cosec}79}$

⇒⇒ sec11cosec79 $\frac{\sec11}{\mathrm{cosec}79}$ = 1

Therefore sec11cosec79 $\frac{\sec11}{\mathrm{cosec}79}$ = 1

Q.2: EVALUATE THE FOLLOWING :

(i) $(\sin 49^\circ \cos 41^\circ)^2 \left(\frac{\sin 49^\circ}{\cos 41^\circ}\right)^2 + (\cos 41^\circ \sin 49^\circ)^2 \left(\frac{\cos 41^\circ}{\sin 49^\circ}\right)^2$

Soln.(i):

We have to find: $(\sin 49^\circ \cos 41^\circ)^2 \left(\frac{\sin 49^\circ}{\cos 41^\circ}\right)^2 + (\cos 41^\circ \sin 49^\circ)^2 \left(\frac{\cos 41^\circ}{\sin 49^\circ}\right)^2$

Since $\sec 70^\circ \operatorname{cosec} 20^\circ \frac{\sec 70^\circ}{\operatorname{cosec} 20^\circ} + \sin 59^\circ \cos 31^\circ \frac{\sin 59^\circ}{\cos 31^\circ}$ sin($90^\circ 90^\circ - \Theta\Theta$) = cos$\Theta\Theta$ and cos($90^\circ 90^\circ - \Theta\Theta$) = sin$\Theta\Theta$

So

$(\sin(90^\circ-41^\circ)\cos 41^\circ)^2 \left(\frac{\sin(90^\circ-41^\circ)}{\cos 41^\circ}\right)^2 + (\cos(90^\circ-49^\circ)\sin 49^\circ)^2 \left(\frac{\cos(90^\circ-49^\circ)}{\sin 49^\circ}\right)^2 = (\cos 41^\circ \cos 41^\circ)^2 \left(\frac{\cos 41^\circ}{\cos 41^\circ}\right)^2 + (\sin 49^\circ \sin 49^\circ)^2 \left(\frac{\sin 49^\circ}{\sin 49^\circ}\right)^2$

= 1+1 = 2

So value of $(\sin 49^\circ \cos 41^\circ)^2 \left(\frac{\sin 49^\circ}{\cos 41^\circ}\right)^2 + (\cos 41^\circ \sin 49^\circ)^2 \left(\frac{\cos 41^\circ}{\sin 49^\circ}\right)^2$ is 2

(ii) $\cos 48^\circ \cos 48^\circ - \sin 42^\circ \sin 42^\circ$

Soln.(ii)

We have to find: $\cos 48^\circ \cos 48^\circ - \sin 42^\circ \sin 42^\circ$

Since cos($90^\circ - \Theta 90^\circ - \Theta$) = sin$\Theta\Theta$.So

$\cos 48^\circ \cos 48^\circ - \sin 42^\circ \sin 42^\circ = \cos(90^\circ-42^\circ) - \sin 42^\circ \cos(90^\circ - 42^\circ) - \sin 42^\circ$

$= \sin 42^\circ \sin 42^\circ - \sin 42^\circ \sin 42^\circ = 0$

So value of $\cos 48^\circ \cos 48^\circ - \sin 42^\circ \sin 42^\circ$ is 0

(iii) $\cot 40^\circ \tan 50^\circ - 12 (\cos 35^\circ \sin 55^\circ) \frac{\cot 40^\circ}{\tan 50^\circ} - \frac{1}{2}\left(\frac{\cos 35^\circ}{\sin 55^\circ}\right)$

Soln.(iii)

We have to find:

cot40°tan50° − 12 (cos35°sin55°) $\frac{\cot 40^\circ}{\tan 50^\circ} - \frac{1}{2}\left(\frac{\cos 35^\circ}{\sin 55^\circ}\right)$

Since cot(90°−Θ $90^\circ - \Theta$) = tanΘ Θ and cos(90°−Θ $90^\circ - \Theta$)=sinΘ Θ

cot40°tan50° − 12 (cos35°sin55°) $\frac{\cot 40^\circ}{\tan 50^\circ} - \frac{1}{2}\left(\frac{\cos 35^\circ}{\sin 55^\circ}\right)$ = cot(90°−50°)tan50° − 12 (cos(90°−55°)sin55°) $\frac{\cot(90^\circ - 50^\circ)}{\tan 50^\circ} - \frac{1}{2}\left(\frac{\cos(90^\circ - 55^\circ)}{\sin 55^\circ}\right)$

= tan50°tan50° − 12 (sin55°sin55°) $\frac{\tan 50^\circ}{\tan 50^\circ} - \frac{1}{2}\left(\frac{\sin 55^\circ}{\sin 55^\circ}\right)$

= 1 − 12 $1 - \frac{1}{2}$ = 12 $\frac{1}{2}$

So value of cot40°tan50° − 12 (cos35°sin55°) $\frac{\cot 40^\circ}{\tan 50^\circ} - \frac{1}{2}\left(\frac{\cos 35^\circ}{\sin 55^\circ}\right)$ is 12 $\frac{1}{2}$

(iv) (sin27°cos63°) 2 $\left(\frac{\sin 27^\circ}{\cos 63^\circ}\right)^2$ **− (cos63°sin27°) 2** $\left(\frac{\cos 63^\circ}{\sin 27^\circ}\right)^2$

Soln(iv)

We have to find: (sin27°cos63°) 2 $\left(\frac{\sin 27^\circ}{\cos 63^\circ}\right)^2$ − (cos63°sin27°) 2 $\left(\frac{\cos 63^\circ}{\sin 27^\circ}\right)^2$

Since sin (90°−Θ $90^\circ - \Theta$)= cosΘ Θ and cos (90°−Θ $90^\circ - \Theta$)=sinΘ Θ

(sin27°cos63°) 2 $\left(\frac{\sin 27^\circ}{\cos 63^\circ}\right)^2$ − (cos63°sin27°) 2 $\left(\frac{\cos 63^\circ}{\sin 27^\circ}\right)^2$ = (sin(90°−63°)cos63°) 2 $\left(\frac{\sin(90^\circ - 63^\circ)}{\cos 63^\circ}\right)^2$ − (cos(90°−27°)sin27°) 2 $\left(\frac{\cos(90^\circ - 27^\circ)}{\sin 27^\circ}\right)^2$

=(cos63°cos63°) 2 $\left(\frac{\cos 63^\circ}{\cos 63^\circ}\right)^2$ − (sin27°sin27°) 2 $\left(\frac{\sin 27^\circ}{\sin 27^\circ}\right)^2$ =1-1 =0

So value of (sin27°cos63°) 2 $\left(\frac{\sin 27^\circ}{\cos 63^\circ}\right)^2$ − (cos63°sin27°) 2 $\left(\frac{\cos 63^\circ}{\sin 27^\circ}\right)^2$ is 0

(v) tan35°cot55° + cot78°tan12° − 1 $\frac{\tan 35^\circ}{\cot 55^\circ} + \frac{\cot 78^\circ}{\tan 12^\circ} - 1$

Soln.(v)

We have to find:

tan35°cot55° + cot78°tan12° −1 $\frac{\tan 35^\circ}{\cot 55^\circ} + \frac{\cot 78^\circ}{\tan 12^\circ} - 1$

Since tan (90°−Θ $90^\circ - \Theta$)= cotΘΘ and cot (90°−Θ $90^\circ - \Theta$)=tanΘΘ =1

So value of tan35°cot55° + cot78°tan12° is1 $\frac{\tan 35^\circ}{\cot 55^\circ} + \frac{\cot 78^\circ}{\tan 12^\circ}$ is1

(vi) sec70°cosec20° + sin59°cos31° $\frac{\sec 70^\circ}{\operatorname{cosec} 20^\circ} + \frac{\sin 59^\circ}{\cos 31^\circ}$

Soln.(vi)

We have to find: sec70°cosec20° + sin59°cos31° $\frac{\sec 70^\circ}{\operatorname{cosec} 20^\circ} + \frac{\sin 59^\circ}{\cos 31^\circ}$

Since sec70°cosec20° + sin59°cos31° $\frac{\sec 70^\circ}{\operatorname{cosec} 20^\circ} + \frac{\sin 59^\circ}{\cos 31^\circ}$ and sec(90°−Θ $90^\circ - \Theta$)=cosecΘΘ

So

sec70°cosec20° + sin59°cos31° $\frac{\sec 70^\circ}{\operatorname{cosec} 20^\circ} + \frac{\sin 59^\circ}{\cos 31^\circ}$ =(sec(90°−20°)cosec20°)^2 $\left(\frac{\sec(90^\circ - 20^\circ)}{\operatorname{cosec} 20^\circ}\right)^2$ − (sin(90°−31°)cos31°)^2 $\left(\frac{\sin(90^\circ - 31^\circ)}{\cos 31^\circ}\right)^2$

= cosec20°cosec20° + cos31°cos31° $\frac{\operatorname{cosec} 20^\circ}{\operatorname{cosec} 20^\circ} + \frac{\cos 31^\circ}{\cos 31^\circ}$ =1+1 =2

So value of sec70°cosec20° + sin59°cos31° $\frac{\sec 70^\circ}{\operatorname{cosec} 20^\circ} + \frac{\sin 59^\circ}{\cos 31^\circ}$ is 2

(vii) cosec31°−sec59° $\operatorname{cosec} 31^\circ - \sec 59^\circ$ **.**

Soln(vii)

We have to find: cosec31°−sec59° $\operatorname{cosec} 31^\circ - \sec 59^\circ$

Since cosec(90°−Θ) $\operatorname{cosec}(90^\circ - \Theta)$ =secΘΘ.So

= cosec31°−sec59° $\operatorname{cosec} 31^\circ - \sec 59^\circ$

= cosec(90°−59°)−sec59 $\operatorname{cosec}(90^\circ - 59^\circ) - \sec 59$ =sec59°−sec59° $\sec 59^\circ - \sec 59^\circ$ =0

So value of cosec31°−sec59° $\operatorname{cosec} 31^\circ - \sec 59^\circ$ is 0

(viii) $(\sin 72^\circ + \cos 18^\circ)(\sin 72^\circ + \cos 18^\circ)$ $(\sin 72^\circ - \cos 18^\circ)(\sin 72^\circ - \cos 18^\circ)$

Soln.(viii)

We have to find: $(\sin 72^\circ + \cos 18^\circ)(\sin 72^\circ + \cos 18^\circ)$ $(\sin 72^\circ - \cos 18^\circ)(\sin 72^\circ - \cos 18^\circ)$

Since $\sin(90^\circ - \Theta)\sin(90^\circ - \Theta)$ $= \cos\Theta\Theta$, So

$(\sin 72^\circ + \cos 18^\circ)(\sin 72^\circ + \cos 18^\circ)$ $(\sin 72^\circ - \cos 18^\circ)(\sin 72^\circ - \cos 18^\circ)$ $= (\sin 72^\circ)^2 (\sin 72^\circ)^2 - (\cos 18^\circ)^2 (\cos 18^\circ)^2$

$= [\sin(90^\circ - 18^\circ)]^2 - (\cos 18^\circ)^2 [\sin(90^\circ - 18^\circ)]^2 - (\cos 18^\circ)^2$

$= (\cos 18^\circ)^2 (\cos 18^\circ)^2 - (\cos 18^\circ)^2 (\cos 18^\circ)^2$

$= \cos^2 18^\circ - \cos^2 18^\circ \cos^2 18^\circ - \cos^2 18^\circ$ $= 0$

So value of $(\sin 72^\circ + \cos 18^\circ)(\sin 72^\circ + \cos 18^\circ)$ $(\sin 72^\circ - \cos 18^\circ)(\sin 72^\circ - \cos 18^\circ)$ is 0.

(ix) $\sin 35^\circ \sin 55^\circ \sin 35^\circ \sin 55^\circ$ $-\cos 35^\circ \cos 55^\circ \cos 35^\circ \cos 55^\circ$

Soln(ix)

We find :

$\sin 35^\circ \sin 55^\circ \sin 35^\circ \sin 55^\circ$ $-\cos 35^\circ \cos 55^\circ \cos 35^\circ \cos 55^\circ$

Since $\sin(90^\circ - \Theta)\sin(90^\circ - \Theta)$ $= \cos\Theta\Theta$ and $\cos(90^\circ - \Theta)\cos(90^\circ - \Theta)$ $= \sin\Theta\Theta$

$\sin 35^\circ \sin 55^\circ \sin 35^\circ \sin 55^\circ$ $-\cos 35^\circ \cos 55^\circ \cos 35^\circ \cos 55^\circ = \sin(90^\circ - 55^\circ)\sin 55^\circ \sin(90^\circ - 55^\circ)\sin 55^\circ$ $-\cos(90^\circ - 55^\circ)\cos 55^\circ \cos(90^\circ - 55^\circ)\cos 55^\circ$ $= 1 - 1 = 0$

So value of $\sin 35^\circ \sin 55^\circ \sin 35^\circ \sin 55^\circ$ $-\cos 35^\circ \cos 55^\circ \cos 35^\circ \cos 55^\circ$ is 0

(x) $\tan 48^\circ \tan 23^\circ \tan 42^\circ \tan 67^\circ \tan 48^\circ \tan 23^\circ \tan 42^\circ \tan 67^\circ$

Soln.(x)

We have to find $\tan 48^\circ \tan 23^\circ \tan 42^\circ \tan 67^\circ$

Since $\tan(90^\circ - \Theta) = \cot\Theta$. So

$\tan 48^\circ \tan 23^\circ \tan 42^\circ \tan 67^\circ = \tan(90^\circ - 42^\circ)\tan(90^\circ - 67^\circ)\tan 42^\circ \tan 67^\circ$

$= \cot 42^\circ \cot 67^\circ \tan 42^\circ \tan 67^\circ$

$= (\tan 67^\circ \cot 67^\circ)(\tan 42^\circ \cot 42^\circ) = 1 \times 1 = 1$

So value of $\tan 48^\circ \tan 23^\circ \tan 42^\circ \tan 67^\circ$ is 1

(xi) $\sec 50^\circ \sin 40^\circ + \cos 40^\circ \operatorname{cosec} 50^\circ$

Soln.(xi)

We have to find $\sec 50^\circ \sin 40^\circ + \cos 40^\circ \operatorname{cosec} 50^\circ$

Since $\cos(90^\circ - \Theta) = \sin\Theta$, $\sec(90^\circ - \Theta) = \operatorname{cosec}\Theta$ and $\sin\Theta . \operatorname{cosec}\Theta = 1$. So

$\sec 50^\circ \sin 40^\circ + \cos 40^\circ \operatorname{cosec} 50^\circ = \sec(90^\circ - 40^\circ)\sin 40^\circ + \cos(90^\circ - 50^\circ)\operatorname{cosec} 50^\circ = 1 + 1 = 2$

So value of $\sec 50^\circ \sin 40^\circ + \cos 40^\circ \operatorname{cosec} 50^\circ$ is 2.

Q.3) Express $\cos 75^\circ + \cot 75^\circ$ in terms of angle between 0^0 and 30^0.

Soln. 3 :

Given that: $\cos 75^\circ + \cot 75^\circ$

$= \cos 75^\circ + \cot 75^\circ$

$= \cos(90^\circ - 15^\circ) + \cot(90^\circ - 15^\circ)$

$= \sin 15^\circ + \tan 15^\circ$

Hence the correct answer is sin $15^\circ 15^\circ$ +tan $15^\circ 15^\circ$

Q.4) If sin3A = cos(A – 26^0), where 3A is an acute angle, find the value of A.

Soln.4:

We are given 3A is an acute angle

We have: sin3A=cos(A-$26^\circ 26^\circ$)

$\Rightarrow\Rightarrow$ sin3A=sin($90^\circ 90^\circ$ -(A-$26^\circ 26^\circ$))

$\Rightarrow\Rightarrow$ sin3A=sin($116^\circ 116^\circ$ -A)

$\Rightarrow\Rightarrow$ 3A=$116^\circ 116^\circ$ -A

$\Rightarrow\Rightarrow$ 4A=$116^\circ 116^\circ$

$\Rightarrow\Rightarrow$ A=$29^\circ 29^\circ$

Hence thecorrect answer is $29^\circ 29^\circ$

Q.5)If A, B, C are the interior angles of a triangle ABC, prove that,

(i) tan(C+A2)=cot B2 $\tan\left(\frac{C+A}{2}\right) = \cot\frac{B}{2}$

(ii) sin(B+C2)=cos A2 $\sin\left(\frac{B+C}{2}\right) = \cos\frac{A}{2}$

Soln.5:

(i)We have to prove: tan(C+A2)=cot B2 $\tan\left(\frac{C+A}{2}\right) = \cot\frac{B}{2}$

Since we know that in triangle ABC

A+B+C=180

$\Rightarrow\Rightarrow$ C+A=$180^\circ 180^\circ$ -B

$\Rightarrow\Rightarrow$ C+A2 =90°− B2 $\frac{C+A}{2} = 90^\circ - \frac{B}{2}$

⇒⇒ tan C+A2 =tan(90° B2)$\tan\frac{C+A}{2} = \tan(90^\circ \frac{B}{2})$

⇒⇒ tan(C+A2)=cot B2 $\tan(\frac{C+A}{2}) = \cot\frac{B}{2}$

Hence proved

(ii)We have to prove : sin(B+C2)=cos A2 $\sin(\frac{B+C}{2}) = \cos\frac{A}{2}$

Since we know that in triangle ABC

A+B+C=180

⇒⇒ B+C=180°180°-A

⇒⇒ B+C2 =90°−A2 $\frac{B+C}{2} = 90^\circ - \frac{A}{2}$

⇒⇒ sin B+C2 =sin(90° A2)$\sin\frac{B+C}{2} = \sin(90^\circ \frac{A}{2})$

sin(B+C2)=cos A2 $\sin(\frac{B+C}{2}) = \cos\frac{A}{2}$

Hence proved

Q.6)Prove that :

(i)tan20°20° **tan35°**35° **tan45°**45° **tan55°**55° **tan70°**70° **= 1**

(ii)sin48°48°**.sec48°**48° **+cos48°**48°**.cosec42°**42° **= 2**

(iii) sin70°cos20° + cosec20°sec70° −2cos70°.cosec20°=0
$\frac{\sin70^\circ}{\cos20^\circ} + \frac{\text{cosec}20^\circ}{\sec70^\circ} - 2\cos70^\circ . \text{cosec}20^\circ = 0$

(iv) cos80°sin10° +cos59°.cosec31°=2$\frac{\cos80^\circ}{\sin10^\circ} + \cos59^\circ . \text{cosec}31^\circ = 2$

Soln.6:

(i)Therefore

tan20°20° tan35°35° tan45°45° tan55°55° tan70°70°

=tan(90°–70°)$\tan(90^\circ - 70^\circ)$ tan(90°–55°)$\tan(90^\circ - 55^\circ)$ tan45°45° tan55°55° tan70°70°

=cot70°70° cot55°55° tan45°45° tan55°55° tan70°70°

= (tan70°cot70°)(tan55°cot55°)tan45° $(\tan 70^\circ \cot 70^\circ)(\tan 55^\circ \cot 55^\circ)\tan 45^\circ$ =1x1x1 =1

Hence proved

(ii) We will simplify the left hand side

sin48°48° .sec48°48° +cos48°48° .cosec42°42° =sin48°48° . sec(90°−48°) $\sec(90^\circ - 48^\circ)$ cos48°48° .cosec(90°−48°)$\operatorname{cosec}(90^\circ - 48^\circ)$

=sin48°48° .cos48°48° +cos48°48° .sin48°48° =1+1 =2

Hence proved

(iii) We have, sin70°cos20° + cosec20°sec70° −2cos70°.cosec20°=0
$\frac{\sin 70^\circ}{\cos 20^\circ} + \frac{\operatorname{cosec} 20^\circ}{\sec 70^\circ} - 2\cos 70^\circ . \operatorname{cosec} 20^\circ = 0$

So we will calculate left hand side

sin70°cos20° + cosec20°sec70° −2cos70°.cosec20°=0
$\frac{\sin 70^\circ}{\cos 20^\circ} + \frac{\operatorname{cosec} 20^\circ}{\sec 70^\circ} - 2\cos 70^\circ . \operatorname{cosec} 20^\circ = 0$ = sin70°cos20° + cos70°sin20° −2cos70°.cosec(90°−70°)
$\frac{\sin 70^\circ}{\cos 20^\circ} + \frac{\cos 70^\circ}{\sin 20^\circ} - 2\cos 70^\circ . \operatorname{cosec}(90^\circ - 70^\circ)$

= sin(90°−20°)cos20° $\frac{\sin(90^\circ - 20^\circ)}{\cos 20^\circ}$ + cos(90°−20°)sin20° $\frac{\cos(90^\circ - 20^\circ)}{\sin 20^\circ}$ −2cos70°.cosec(90°−70°)
$2\cos 70^\circ . \operatorname{cosec}(90^\circ - 70^\circ)$

= cos20°cos20° + sin20°sin20° −2×1 $\frac{\cos 20^\circ}{\cos 20^\circ} + \frac{\sin 20^\circ}{\sin 20^\circ} - 2 \times 1$ =1+1-2 =2-2 =0

Hence proved

(iv)We have cos80°sin10° +cos59°.cosec31°=2 $\frac{\cos 80^\circ}{\sin 10^\circ} + \cos 59^\circ . \operatorname{cosec} 31^\circ = 2$

We will simplify the left hand side

cos80°sin10° +cos59°.cosec31°
$\frac{\cos 80^\circ}{\sin 10^\circ} + \cos 59^\circ . \operatorname{cosec} 31^\circ$ = cos(90°−10°)sin10° +cos59°.cosec(90°−59°)
$\frac{\cos(90^\circ - 10^\circ)}{\sin 10^\circ} + \cos 59^\circ . \operatorname{cosec}(90^\circ - 59^\circ)$

= sin10°sin10° +cos59°.sec59° $\frac{\sin 10^\circ}{\sin 10^\circ} + \cos 59^\circ . \sec 59^\circ$ =1+1 =2

Hence proved.

Question 7

If A,B,C are the interior of triangle ABC , show that

(i) sin(B+C2)=cos A2 $\sin(\frac{B+C}{2}) = \cos\frac{A}{2}$

Solution

A+B+C=180^0

B + C = 180^0– A2 $\frac{A}{2}$

LHS=RHS

(ii)cos(90^0–A2)=sin A2 $\cos(90^0 - \frac{A}{2}) = \sin\frac{A}{2}$

LHS=RHS

Question 8

If 2Θ+45^0and30−Θ $2\Theta + 45^0$ and $30 - \Theta$ **are acute angles , find the degree measure of**

ΘΘ satisfying sin(20+45^0)=cos(30^0+Θ)$\sin(20 + 45^0) = \cos(30^0 + \Theta)$

Solution

Here 20+45^0=sin(60^0+Θ)$\sin(60^0 + \Theta)$

We know that ,((90^0–Θ)$(90^0 - \Theta)$ = cos(Θ)$\cos(\Theta)$

= sin(2Θ+45^0)=sin(90^0–(30^0–Θ))$\sin(2\Theta + 45^0) = \sin(90^0 - (30^0 - \Theta))$

= sin(2Θ+45^0)=sin(90^0–30^0–Θ)$\sin(2\Theta + 45^0) = \sin(90^0 - 30^0 - \Theta)$

= sin(2Θ+45^0)=sin(60^0+Θ)$\sin(2\Theta + 45^0) = \sin(60^0 + \Theta)$

On equating sin of angle of we get,

= $2\Theta+45^0=60^0+\Theta 2\Theta+45^0=60^0+\Theta$ = $\Theta=15^0\Theta=15^0$

Question 9

If ΘΘ is appositive acute angle such that $\sec\Theta=\csc 60^0 \sec\Theta=\csc 60^0$, find

$2\cos^2\Theta-1 2\cos^2\Theta-1$

Solution

We know that, $\sec(90^0-\Theta)=\csc^2\Theta \sec(90^0-\Theta)=\csc^2\Theta$

= $\sec(\Theta)=\sec(90^0-60^0)\sec(\Theta)=\sec(90^0-60^0)$

= $\Theta=30^0\Theta=30^0$ = $2\cos^2\Theta-1 2\cos^2\Theta-1$

= $2\cos^2 30-1 2\cos^2 30-1$

= $2(\sqrt{3}2)^2-1 2(\frac{\sqrt{3}}{2})^2-1$

= $2(34)-1 2(\frac{3}{4})-1$ =$(32)-1(\frac{3}{2})-1$ = $(12)(\frac{1}{2})$

Q10.If $\sin 3\Theta=\cos(\Theta-6^\circ)$where3Θand$\Theta-6^{circ}$
$\sin 3\Theta=\cos(\Theta-6^\circ)$ where 3Θ and $\Theta-6^{circ}$ **acute angles, find the value of ΘΘ.**

Soln:

We have, $\sin 3\Theta=\cos(\Theta-6^\circ)\sin 3\Theta=\cos(\Theta-6^\circ)$

$\cos(90^\circ+3\Theta)=\cos(\Theta-6^\circ)\cos(90^\circ+3\Theta)=\cos(\Theta-6^\circ)$ $90^\circ-3\Theta=\Theta-6^\circ$
$90^\circ-3\Theta=\Theta-6^\circ$ $-3\Theta-\Theta=6^\circ-90^\circ-3\Theta-\Theta=6^\circ-90^\circ$ $-4\Theta=96^\circ-4\Theta=96^\circ$ $\Theta=-96^\circ-4=24^\circ$
$\Theta=\frac{-96^\circ}{-4}=24^\circ$

Q11.If $\sec 2A=\csc(A-42^\circ)\sec 2A=\csc(A-42^\circ)$ where 2A is acute angle, find the value of A.

Soln:we know that $\sec(90-3Theta)=\csc\Theta \sec(90-3Theta)=\csc\Theta$

$\sec 2A = \sec(90 - (A - 42))$ $\sec 2A = \sec(90 - (A - 42))$ $\sec 2A = \sec(90 - A + 42))$ $\sec 2A = \sec(90 - A + 42))$ $\sec 2A = \sec(132 - A))$ $\sec 2A = \sec(132 - A))$

Now equating both the angles we get

2A = 132 – A

A = = 1323 $= \frac{132}{3}$

A = 44