$$=10+\log\frac{1}{\sqrt{2}}=9.84949.$$

$$L\tan 60^\circ=10+\log\tan 60^\circ$$

$$=10+\log\sqrt{3}=10.23856.$$

$$L\cos 30^\circ=10+\log\cos 30^\circ$$

$$=10+\log\frac{\sqrt{3}}{2}=9.93753.$$

3. Cher. § 23

$$\sin 120^\circ=\sin 60^\circ=\cos 30$$

also $\cos 120^\circ=-\cos 60^\circ=-\sin 30$

$$\therefore\ \tan 120^\circ=-\frac{\sin 60^\circ}{\cos 60^\circ}=-\frac{\cos 30}{\sin 30^\circ}$$

$$a=40\sec 120^\circ$$

$$\therefore\ a=-40\sec 60$$

$$\therefore\ \log(-a)=\log 40+L\sec 60-10$$

Neglecting the sign of a we may find its numerical value and then prefix the sign afterwards,

$$\log\left\{\sin A-\tan\tfrac{1}{2}A\right\}=\log\left\{\sin A-\frac{\sin\frac{1}{2}A}{\cos\frac{1}{2}A}\right\}$$

$$=\log\left\{\frac{2\sin\frac{1}{2}A\cos^2\frac{1}{2}A-\sin\frac{1}{2}A}{\cos\frac{1}{2}A}\right\}$$

$$=\log\left\{\frac{\sin\frac{1}{2}A}{\cos\frac{1}{2}A}\left(2\cos^2\tfrac{1}{2}A-1\right)\right\}$$

$$=\log(\tan\tfrac{1}{2}A\cos A)=L\tan\tfrac{1}{2}A+L\cos A-20.$$

4. Let BAC be any angle. From pt. B in AB let fall a perpendicular BC on AC. Then

$$\sin A=\frac{BC}{AB}\text{ and }\cos A=\frac{AC}{AB}$$

$$\therefore \sin^2 A+\cos^2 A=\frac{BC^2}{AB^2}+\frac{AC^2}{AB^2}=1.\quad\text{Euc. I., 47.}$$

$$\text{Also }\tan A=\frac{BC}{AC}=\frac{BC}{AB}:\frac{AC}{AB}=\frac{\sin A}{\cos A}$$

$$\text{and }\sec A=\frac{AB}{AC}=1:\frac{AC}{AB}=\frac{1}{\cos A}$$

$$\therefore\ \tan^2 A=\frac{\sin^2 A}{\cos^2 A}\text{ and}$$

$$\sec^2 A-1=\frac{1-\cos^2 A}{\cos^2 A}=\frac{\sin^2 A}{\cos^2 A}$$

$$\because\ \tan^2 A=\sec^2 A-1.$$

$$\text{Also }\operatorname{cosec} A=\frac{AB}{BC}=1\div\frac{BC}{AB}=\frac{1}{\sin},$$

$$\cot A=\frac{AC}{BC}=1:\frac{BC}{AC}=\frac{1}{\tan}=\frac{\cos A}{\sin A}.$$

$$\therefore\ \operatorname{cosec} A-\sin A=\frac{1}{\sin A}-\sin A=\frac{\cos^2 A}{\sin A},$$

$$\text{and }\cos A\cot A=\frac{\cos^2 A}{\sin A}$$

$$\therefore\ \operatorname{cosec} A-\sin A=\cos A\cot A.$$

$$\sqrt{\frac{1+\sin A}{1-\sin A}}=\frac{1+\sin A}{\sqrt{1-\sin^2 A}}=\frac{1+\sin A}{\cos A},$$

$$\text{and }\sec A+\tan A=\frac{1}{\cos A}+\frac{\sin A}{\cos A}=\frac{1+\sin A}{\cos A}$$

$$\therefore\ \sqrt{\frac{1+\sin A}{1-\sin A}}=\sec A+\tan A.$$

5. Let x = width of river in ft.

$$\tan 30^\circ=\frac{x}{x+150}$$

$$\therefore\ x=\frac{150}{\sqrt{3}-1}$$

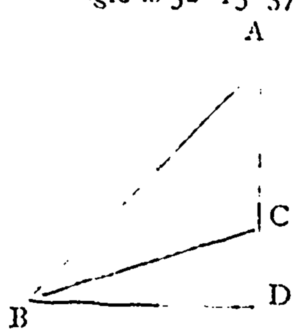
6. Let A = sun's attitude.

$$\tan A=\frac{10}{7.74}$$

$$\log\tan A=\log 10-\log 7.74$$

$$=.11126$$

$\therefore$ angle is $52^\circ\ 15'\ 37''$



Produce AC to D. ADB is a rt. angle; side, BC and angle CBD are known; ∴ sides BD and CD may be found, and since the triangle is rt. angled and the sides AD and BD are known, the angle at B may be found.

7. Cher. § 37.

In previous formula put $\frac{1}{2}A$ for A, and $\frac{1}{2}A$ for B, and we get

$$\cos A=\cos^2\tfrac{1}{2}A-\sin^2\tfrac{1}{2}A=1-2\sin^2\tfrac{1}{2}A$$

$$\therefore\ 2\sin^2\tfrac{1}{2}A=1-\cos A.$$