



Question 18:

$$\begin{aligned}
 & \frac{-\tan \theta \cot(90^\circ - \theta) + \sec \theta \operatorname{cosec}(90^\circ - \theta) + \sin^2 35^\circ + \sin^2 55^\circ}{\tan 10^\circ \tan 20^\circ \tan 30^\circ \tan 70^\circ \tan 80^\circ} \\
 &= \frac{-\tan^2 \theta + \sec^2 \theta + \sin^2(90^\circ - 55^\circ) + \sin^2 55^\circ}{\tan 10^\circ \tan 20^\circ \tan 30^\circ \tan(90^\circ - 20^\circ) \tan(90^\circ - 10^\circ)} \\
 & \quad \left[\because \sec^2 \theta - \tan^2 \theta = 1 \right] \\
 &= \frac{1 + \cos^2 55^\circ + \sin^2 55^\circ}{\tan 10^\circ \tan 20^\circ \tan 30^\circ \times \cot 20^\circ \cot 10^\circ} \\
 &= \frac{1 + 1}{\tan 10^\circ \tan 20^\circ \times \frac{1}{\sqrt{3}} \times \frac{1}{\tan 20^\circ} \times \frac{1}{\tan 10^\circ}} \\
 & \quad \left[\because \cos^2 \theta + \sin^2 \theta = 1 \text{ and } \tan 30^\circ = \frac{1}{\sqrt{3}} \right] \\
 &= \frac{2}{\frac{1}{\sqrt{3}}} = 2 \times \frac{\sqrt{3}}{1} = 2\sqrt{3}
 \end{aligned}$$

Question 19:

$$\begin{aligned}
 & \tan 7^\circ \tan 23^\circ \tan 60^\circ \tan 67^\circ \tan 83^\circ + \frac{\cot 54^\circ}{\tan 36^\circ} \\
 & \quad + \sec 20^\circ \sec 70^\circ - 2 \\
 &= \tan 7^\circ \tan 23^\circ \tan 60^\circ \tan(90^\circ - 23^\circ) \tan(90^\circ - 7^\circ) \\
 & \quad + \frac{\cot(90^\circ - 36^\circ)}{\tan 36^\circ} + \sin 20^\circ \sec(90^\circ - 20^\circ) - 2 \\
 &= \tan 7^\circ \tan 23^\circ \tan 60^\circ \cot 23^\circ \cot 7^\circ + \frac{\tan 36^\circ}{\tan 36^\circ} \\
 & \quad + \sin 20^\circ \operatorname{cosec} 20^\circ - 2 \\
 &= \left(\tan 7^\circ + \frac{1}{\tan 7^\circ} \right) \times \left(\tan 23^\circ \times \frac{1}{\tan 23^\circ} \right) \times \sqrt{3} + \frac{1}{1} + 1 - 2 \\
 & \quad \left[\cot \theta = \frac{1}{\tan \theta}, \tan 60^\circ = \sqrt{3}, \sin \theta \operatorname{cosec} \theta = 1 \right] \\
 &= \sqrt{3}
 \end{aligned}$$

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