Maths Circle Explorations: Session 7

TIFR, Mumbai

21st January 2022

Problem 1

Suppose you are a master of Euclidean geometry. You have started learning trigonometry, and you know the definition of six main trigonometric ratios (sine, cosine, tangent, cotangent, secant and cosecant) as the ratios of appropriate side lengths of right triangle. Without developing the theory of trigonometry any further, prove the following:

1. $4\sin 20^0 + \tan 20^0 = \sqrt{3}$

2. $2\sin^2 10^0 + 2\sin 10^0 + \sqrt{3}\sin 20$