

21 Trig Identities Every Mathematics Student Should Know!

$$1. \quad \sin \theta = \frac{1}{\csc \theta}$$

$$2. \quad \csc \theta = \frac{1}{\sin \theta}$$

$$3. \quad \cos \theta = \frac{1}{\sec \theta}$$

$$4. \quad \sec \theta = \frac{1}{\cos \theta}$$

$$5.-6. \quad \tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{1}{\cot \theta}$$

$$7.-8. \quad \cot \theta = \frac{\cos \theta}{\sin \theta} = \frac{1}{\tan \theta}$$

$$9. \quad \sin^2 \theta + \cos^2 \theta = 1 \quad (\text{Pythagorean Identity})$$

$$10. \quad \tan^2 \theta + 1 = \sec^2 \theta$$

$$11. \quad \cot^2 \theta + 1 = \csc^2 \theta$$

$$12. \quad \sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

$$13. \quad \sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

$$14. \quad \cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

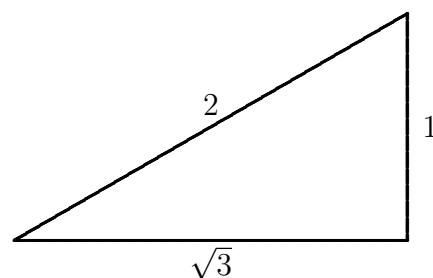
$$15. \quad \cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$16. \quad \sin 2\theta = 2 \sin \theta \cos \theta$$

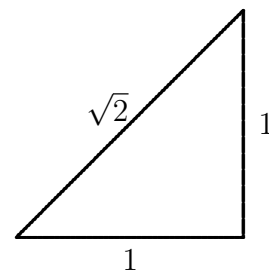
$$17.-19. \quad \cos 2\theta = \cos^2 \theta - \sin^2 \theta = 2 \cos^2 \theta - 1 = 1 - 2 \sin^2 \theta$$

$$20. \quad \cos^2 \theta = \frac{1 + \cos 2\theta}{2}$$

$$21. \quad \sin^2 \theta = \frac{1 - \cos 2\theta}{2}$$



Two Special Triangles



From the above two triangles you should be able to quickly find all extant trigonometric functional values of all the special angles θ in $[0, 2\pi]$. I.e., $\theta = 0, \pi/6, \pi/4, \pi/3, \pi/2, 2\pi/3, \dots, 2\pi$. For example:

$$\sin(3\pi/4) = 1/\sqrt{2}$$

and

$$\cot(5\pi/3) = -1/\sqrt{3}.$$