Double Angle Formulae

$$\boldsymbol{sin2\theta \equiv 2sin\theta cos\theta}$$

$$\boldsymbol{cos2\theta \equiv cos^2\theta - sin^2\theta}$$

$$\boldsymbol{tan2\theta \equiv \frac{2tan\theta}{1 - tan^2\theta}}$$

We can use the Pythagorean Identity to write $cos2\theta$ in terms of only $cos^2\theta$

$cos2\theta \equiv cos^2\theta - sin^2\theta$

$cos2\theta \equiv cos^2\theta - (1 - cos^2\theta)$

$$\boldsymbol{cos2\theta \equiv 2cos^2\theta - 1}$$

We can use the Pythagorean Identity to write $\cos 2\theta$ in terms of only $sin^2\theta$

$cos2\theta \equiv cos^2\theta - sin^2\theta$

$cos2\theta \equiv 1 - sin^2\theta - sin^2\theta$

$$\boldsymbol{cos2\theta \equiv 1 - 2sin^2\theta}$$

We can derive these formulae from using the compound name formula. This is a useful technique, since we can re-use this idea to find $\boldsymbol{sin3\theta}$, $\boldsymbol{sin4\theta}$, etc

$\boldsymbol{sin(A + B) \equiv sinAcosB + cosAsinB}$

$\boldsymbol{sin(\theta + \theta) \equiv sin\theta cos\theta + cos\theta sin\theta}$

$\boldsymbol{sin2\theta \equiv 2sin\theta cos\theta}$

$\boldsymbol{cos(A + B) \equiv cosAcosB - sinAsinB}$

$\boldsymbol{cos(\theta + \theta) \equiv cos\theta cos\theta - sin\theta sin\theta}$

$\boldsymbol{cos2\theta \equiv cos^2\theta - sin^2\theta}$

$$\tan(A+B) \equiv \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(\theta+\theta) \equiv \frac{\tan\theta + \tan\theta}{1 - \tan\theta \tan\theta}$$

$$\tan 2\theta \equiv \frac{2\tan\theta}{1 - \tan^2\theta}$$