

Solving Trig Equations using Standard Trig Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$\frac{\sin\theta}{\cos\theta} = \tan\theta$$

For each of the equations 1-10 below...

- a) Use the identities above to rewrite each equation with only one function type.
- b) Solve giving all solutions in the range $0 \leq \theta \leq 360$.

1. $2\cos\theta = 5\sin\theta$
2. $3\cos\theta + 5\sin\theta = 0$
3. $6\cos^2\theta - \sin\theta - 5 = 0$
4. $4\cos^2\theta = 4\sin\theta - 1$
5. $\sin 2\theta = \cos 2\theta$
6. $3\cos(\theta + 70) = 7\sin(\theta + 70)$
7. $8\sin^2\left(\frac{\theta}{2}\right) = 11 - 10\cos\left(\frac{\theta}{2}\right)$
8. $2\sin\theta = \frac{3}{\tan\theta}$
9. $\frac{\tan\theta}{\cos\theta} = 2$
10. $\tan^2\theta = 5 + \frac{1}{\cos\theta}$

11. Solve simultaneously for θ and t ...

$$\sin\theta = 2t$$

$$2\cos\theta + 3t = 0$$

12. Express $2\sin\theta - \cos^2\theta$ in the form $(\sin\theta + a)^2 + b$. Hence find the max and min values of the expression.

Solving Trig Equations using Standard Trig Identities - **Answers**

$$\sin^2\theta + \cos^2\theta = 1$$

$$\frac{\sin\theta}{\cos\theta} = \tan\theta$$

For each of the equations 1-10 below...

c) Use the identities above to rewrite each equation with only one function type.

d) Solve giving all solutions in the range $0 \leq \theta \leq 360$.

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|--|---------------------------|
| 1. $2\cos\theta = 5\sin\theta$ | 21.8, 201.8 |
| 2. $3\cos\theta + 5\sin\theta = 0$ | 149.0, 329.0 |
| 3. $6\cos^2\theta - \sin\theta - 5 = 0$ | 19.5, 160.5, 210, 330 |
| 4. $4\cos^2\theta = 4\sin\theta - 1$ | 46.4, 133.6 |
| 5. $\sin 2\theta = \cos 2\theta$ | 22.5, 112.5, 202.5, 292.5 |
| 6. $3\cos(\theta + 70) = 7\sin(\theta + 70)$ | 133.2, 313.2 |
| 7. $8\sin^2\left(\frac{\theta}{2}\right) = 11 - 10\cos\left(\frac{\theta}{2}\right)$ | 82.8, 120 |
| 8. $2\sin\theta = \frac{3}{\tan\theta}$ | 60, 300 |
| 9. $\frac{\tan\theta}{\cos\theta} = 2$ | 51.3, 128.7 |
| 10. $\tan^2\theta = 5 + \frac{1}{\cos\theta}$ | 70.5, 120, 240, 289.5 |

11. Solve simultaneously for θ and t ...

$$\sin\theta = 2t$$

$$2\cos\theta + 3t = 0$$

$$(t = \frac{2}{5}, \theta = 127^\circ \text{ and } t = -\frac{2}{5}, \theta = 307^\circ)$$

12. Express $2\sin\theta - \cos^2\theta$ in the form $(\sin\theta + a)^2 + b$. Hence find the max and min values of the expression. **$a=1, b=-2$, and range is $-2 \leq 2\sin\theta - \cos^2\theta \leq -1$**