

Solving Trig Identities - Instructions

For students... see the next page for the questions.

For teachers...

1. Print all pages on B&W card

(or to be more colourful, pages 3-10 on white card and pages 11-18 on a variety of coloured card).

2. Cut pages 3-10 to A5, these will be the templates onto which pupils will place the pieces.

3. Cut the pieces from pages 11-18, being careful not to mix any up!

4. Match each of the puzzle pieces to the respective template.

The Questions

1. $\sin \theta \tan \theta + \cos \theta = \sec \theta$

2. $\operatorname{cosec} \theta + \tan \theta \sec \theta = \operatorname{cosec} \theta \sec^2 \theta$

3. $\operatorname{cosec} \theta - \sin \theta = \cot \theta \cos \theta$

4. $(\sin \theta + \cos \theta)^2 - 1 = 2 \sin \theta \cos \theta$

5. $(\sin \theta - \operatorname{cosec} \theta)^2 = \sin^2 \theta + \cot^2 \theta - 1$

6. $(\sec \theta + \tan \theta)(\sec \theta - \tan \theta) = 1$

7. $\tan^2 \theta + \sin^2 \theta = (\sec \theta + \cos \theta)(\sec \theta - \cos \theta)$

8. $\sec^2 \theta + \cot^2 \theta = \operatorname{cosec}^2 \theta + \tan^2 \theta$

9. $(\sin \theta + \cos \theta)(1 - \sin \theta \cos \theta) = \sin^3 \theta + \cos^3 \theta$

10. $\tan^4 \theta + \tan^2 \theta = \sec^4 \theta - \sec^2 \theta$

11. $\cos^4 \theta - \sin^4 \theta = \cos^2 \theta - \sin^2 \theta$

12. $\sin \theta + \cos \theta = \frac{1-2 \cos^2 \theta}{\sin \theta - \cos \theta}$

13. $\frac{\sin \theta}{1+\cos \theta} + \frac{1+\cos \theta}{\sin \theta} = 2 \operatorname{cosec} \theta$

14. $\frac{\operatorname{cosec} \theta}{\cot \theta + \tan \theta} = \cos \theta$

15. $\frac{1}{1+\tan^2 \theta} + \frac{1}{1+\cot^2 \theta} = 1$

16. $\frac{1-\sin \theta}{\cos \theta} = \frac{1}{\sec \theta + \tan \theta}$

$$\sin \theta \tan \theta + \cos \theta = \sec \theta$$

$$\sec \theta = \sec \theta$$

$$\operatorname{cosec} \theta + \tan \theta \sec \theta = \operatorname{cosec} \theta \sec^2 \theta$$

$$\operatorname{cosec} \theta \sec^2 \theta = \operatorname{cosec} \theta \sec^2 \theta$$

$$\operatorname{cosec} \theta - \sin \theta = \cot \theta \cos \theta$$

$$(\sin \theta + \cos \theta)^2 - 1 = 2 \sin \theta \cos \theta$$

$$\cot \theta \cos \theta = \cot \theta \cos \theta$$

$$2 \sin \theta \cos \theta = 2 \sin \theta \cos \theta$$

$$(\sin \theta - \operatorname{cosec} \theta)^2 = \sin^2 \theta + \cot^2 \theta - 1$$

$$(\sec \theta + \tan \theta)(\sec \theta - \tan \theta) = 1$$

$$\sin^2 \theta + \cot^2 \theta - 1 = \sin^2 \theta + \cot^2 \theta - 1$$

$$1 = 1$$

$$\tan^2 \theta + \sin^2 \theta = (\sec \theta + \cos \theta)(\sec \theta - \cos \theta)$$

$$\sec^2 \theta + \cot^2 \theta = \operatorname{cosec}^2 \theta + \tan^2 \theta$$

$$(\sec \theta + \cos \theta)(\sec \theta - \cos \theta) = (\sec \theta + \cos \theta)(\sec \theta - \cos \theta)$$

$$\operatorname{cosec}^2 \theta + \tan^2 \theta = \operatorname{cosec}^2 \theta + \tan^2 \theta$$

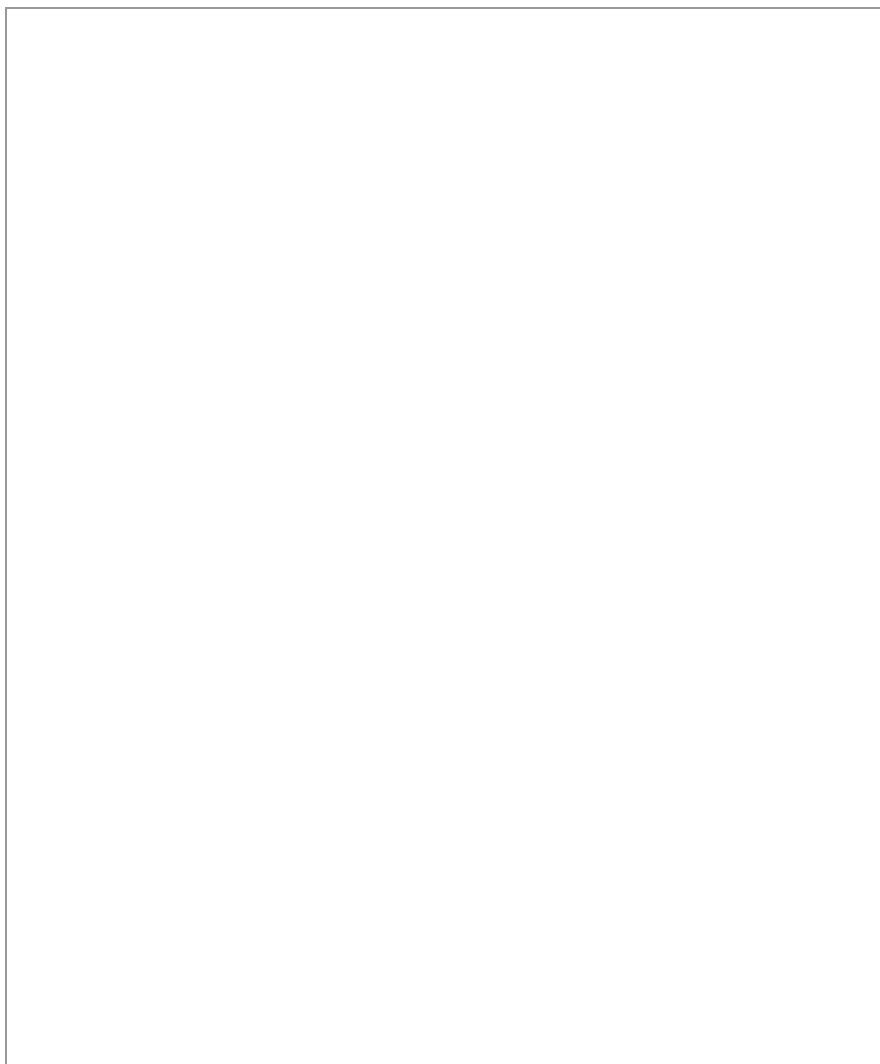
$$(\sin \theta + \cos \theta)(1 - \sin \theta \cos \theta) = \sin^3 \theta + \cos^3 \theta$$

$$\tan^4 \theta + \tan^2 \theta = \sec^4 \theta - \sec^2 \theta$$

$$\sin^3 \theta + \cos^3 \theta = \sin^3 \theta + \cos^3 \theta$$

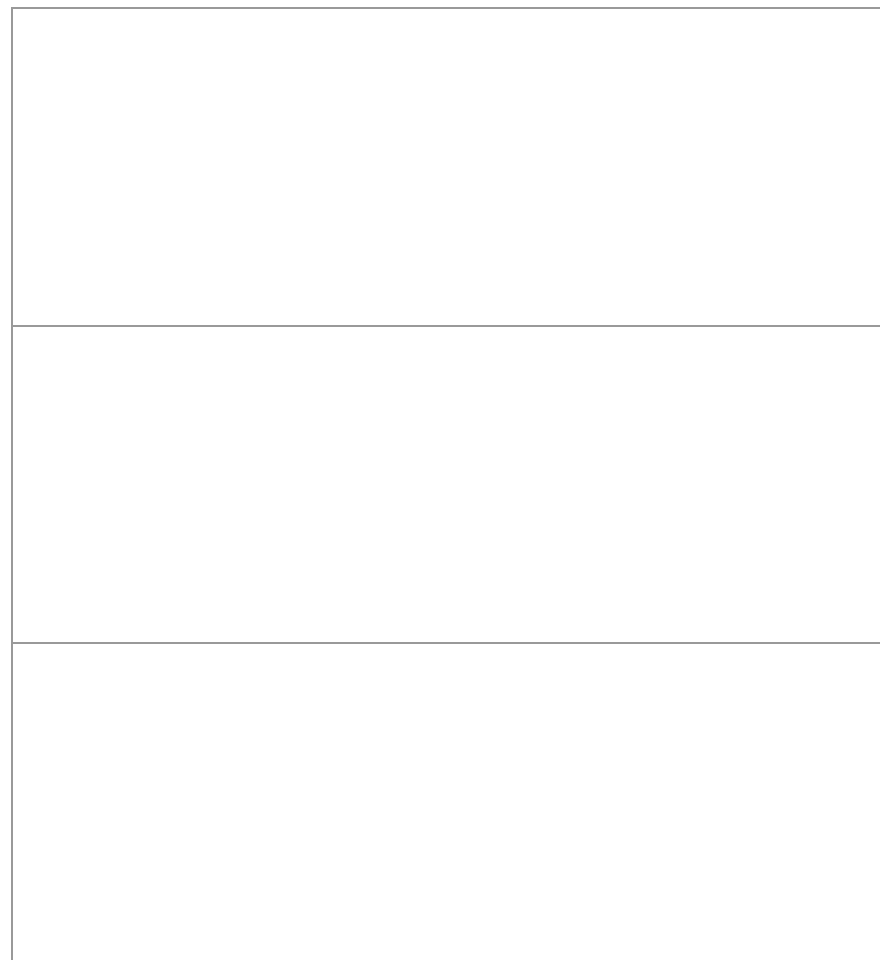
$$\sec^4 \theta - \sec^2 \theta = \sec^4 \theta - \sec^2 \theta$$

$$\cos^4 \theta - \sin^4 \theta = \cos^2 \theta - \sin^2 \theta$$



$$\cos^2 \theta - \sin^2 \theta = \cos^2 \theta - \sin^2 \theta$$

$$\sin \theta + \cos \theta = \frac{1 - 2 \cos^2 \theta}{\sin \theta - \cos \theta}$$



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

$$\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} = 2 \operatorname{cosec} \theta$$

$$2 \operatorname{cosec} \theta = 2 \operatorname{cosec} \theta$$

$$\frac{\operatorname{cosec} \theta}{\cot \theta + \tan \theta} = \cos \theta$$

$$\cos \theta = \cos \theta$$

$$\sin \theta \tan \theta + \cos \theta = \sec \theta$$

$$\frac{\sin^2 \theta}{\cos \theta} + \cos \theta = \sec \theta$$

$$\frac{\sin^2 \theta}{\cos \theta} + \frac{\cos^2 \theta}{\cos \theta} = \sec \theta$$

$$\frac{\sin^2 \theta + \cos^2 \theta}{\cos \theta} = \sec \theta$$

$$\frac{1}{\cos \theta} = \sec \theta$$

$$\sec \theta = \sec \theta$$

$$\operatorname{cosec} \theta + \tan \theta \sec \theta = \operatorname{cosec} \theta \sec^2 \theta$$

$$\frac{1}{\sin \theta} + \frac{\sin \theta}{\cos^2 \theta} = \operatorname{cosec} \theta \sec^2 \theta$$

$$\frac{\cos^2 \theta}{\sin \theta \cos^2 \theta} + \frac{\sin^2 \theta}{\sin \theta \cos^2 \theta} = \operatorname{cosec} \theta \sec^2 \theta$$

$$\frac{\cos^2 \theta + \sin^2 \theta}{\sin \theta \cos^2 \theta} = \operatorname{cosec} \theta \sec^2 \theta$$

$$\frac{1}{\sin \theta \cos^2 \theta} = \operatorname{cosec} \theta \sec^2 \theta$$

$$\frac{1}{\sin \theta} \frac{1}{\cos^2 \theta} = \operatorname{cosec} \theta \sec^2 \theta$$

$$\operatorname{cosec} \theta \sec^2 \theta = \operatorname{cosec} \theta \sec^2 \theta$$

$$\operatorname{cosec} \theta - \sin \theta = \cot \theta \cos \theta$$

$$\frac{1}{\sin \theta} - \sin \theta = \cot \theta \cos \theta$$

$$\frac{1}{\sin \theta} - \frac{\sin^2 \theta}{\sin \theta} = \cot \theta \cos \theta$$

$$\frac{1 - \sin^2 \theta}{\sin \theta} = \cot \theta \cos \theta$$

$$\frac{\cos^2 \theta}{\sin \theta} = \cot \theta \cos \theta$$

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

$$\cot \theta \cos \theta = \cot \theta \cos \theta$$

$$(\sin \theta + \cos \theta)^2 - 1 = 2 \sin \theta \cos \theta$$

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

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

$$2 \sin \theta \cos \theta = 2 \sin \theta \cos \theta$$

$$(\sin \theta - \operatorname{cosec} \theta)^2 = \sin^2 \theta + \cot^2 \theta - 1$$

$$\sin^2 \theta - 2 \sin \theta \operatorname{cosec} \theta + \operatorname{cosec}^2 \theta = \sin^2 \theta + \cot^2 \theta - 1$$

$$\sin^2 \theta - 2 + \operatorname{cosec}^2 \theta = \sin^2 \theta + \cot^2 \theta - 1$$

$$\sin^2 \theta - 2 + 1 + \cot^2 \theta = \sin^2 \theta + \cot^2 \theta - 1$$

$$\sin^2 \theta + \cot^2 \theta - 1 = \sin^2 \theta + \cot^2 \theta - 1$$

$$(\sec \theta + \tan \theta)(\sec \theta - \tan \theta) = 1$$

$$\sec^2 \theta - \tan^2 \theta = 1$$

$$1 + \tan^2 \theta - \tan^2 \theta = 1$$

$$1 = 1$$

$$\tan^2 \theta + \sin^2 \theta = (\sec \theta + \cos \theta)(\sec \theta - \cos \theta)$$

$$\tan^2 \theta + \sin^2 \theta = (\sec \theta + \cos \theta)(\sec \theta - \cos \theta)$$

$$\tan^2 \theta + 1 - \cos^2 \theta = (\sec \theta + \cos \theta)(\sec \theta - \cos \theta)$$

$$\sec^2 \theta - \cos^2 \theta = (\sec \theta + \cos \theta)(\sec \theta - \cos \theta)$$

$$(\sec \theta + \cos \theta)(\sec \theta - \cos \theta) = (\sec \theta + \cos \theta)(\sec \theta - \cos \theta)$$

$$\sec^2 \theta + \cot^2 \theta = \operatorname{cosec}^2 \theta + \tan^2 \theta$$

$$1 + \tan^2 \theta + \cot^2 \theta = \operatorname{cosec}^2 \theta + \tan^2 \theta$$

$$1 + \tan^2 \theta + \operatorname{cosec}^2 \theta - 1 = \operatorname{cosec}^2 \theta + \tan^2 \theta$$

$$\operatorname{cosec}^2 \theta + \tan^2 \theta = \operatorname{cosec}^2 \theta + \tan^2 \theta$$

$$(\sin \theta + \cos \theta)(1 - \sin \theta \cos \theta) = \sin^3 \theta + \cos^3 \theta$$

$$\sin \theta - \sin^2 \theta \cos \theta + \cos \theta - \sin \theta \cos^2 \theta = \sin^3 \theta + \cos^3 \theta$$

$$\sin \theta - (1 - \cos^2 \theta) \cos \theta + \cos \theta - \sin \theta (1 - \sin^2 \theta) = \sin^3 \theta + \cos^3 \theta$$

$$\sin \theta - \cos \theta + \cos^3 \theta + \cos \theta - \sin \theta + \sin^3 \theta = \sin^3 \theta + \cos^3 \theta$$

$$\sin^3 \theta + \cos^3 \theta = \sin^3 \theta + \cos^3 \theta$$

$$\tan^4 \theta + \tan^2 \theta = \sec^4 \theta - \sec^2 \theta$$

$$\tan^2 \theta (\tan^2 \theta + 1) = \sec^4 \theta - \sec^2 \theta$$

$$(\sec^2 \theta - 1)(\tan^2 \theta + 1) = \sec^4 \theta - \sec^2 \theta$$

$$\sec \theta (\sec^2 \theta - 1) = \sec^4 \theta - \sec^2 \theta$$

$$\sec^4 \theta - \sec^2 \theta = \sec^4 \theta - \sec^2 \theta$$

$$\cos^4 \theta - \sin^4 \theta = \cos^2 \theta - \sin^2 \theta$$

$$(\cos^2 \theta - \sin^2 \theta)(\cos^2 \theta + \sin^2 \theta) = \cos^2 \theta - \sin^2 \theta$$

$$\cos^2 \theta - \sin^2 \theta = \cos^2 \theta - \sin^2 \theta$$

$$\sin \theta + \cos \theta = \frac{1 - 2 \cos^2 \theta}{\sin \theta - \cos \theta}$$

$$\frac{(\sin \theta + \cos \theta)(\sin \theta - \cos \theta)}{\sin \theta - \cos \theta} = \frac{1 - 2 \cos^2 \theta}{\sin \theta - \cos \theta}$$

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

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

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

$$\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} = 2 \operatorname{cosec} \theta$$

$$\frac{\sin^2 \theta + (1 + \cos \theta)^2}{\sin \theta (1 + \cos \theta)} = 2 \operatorname{cosec} \theta$$

$$\frac{\sin^2 \theta + 1 + 2 \cos \theta + \cos^2 \theta}{\sin \theta (1 + \cos \theta)} = 2 \operatorname{cosec} \theta$$

$$\frac{2 + 2 \cos \theta}{\sin \theta (1 + \cos \theta)} = 2 \operatorname{cosec} \theta$$

$$\frac{2(1 + \cos \theta)}{\sin \theta (1 + \cos \theta)} = 2 \operatorname{cosec} \theta$$

$$\frac{2}{\sin \theta} = 2 \operatorname{cosec} \theta$$

$$2 \operatorname{cosec} \theta = 2 \operatorname{cosec} \theta$$

$$\frac{\operatorname{cosec} \theta}{\cot \theta + \tan \theta} = \cos \theta$$

$$\frac{1}{\sin \theta} \frac{1}{\cot \theta + \tan \theta} = \cos \theta$$

$$\frac{1}{\sin \theta \cot \theta + \sin \theta \tan \theta} = \cos \theta$$

$$\frac{1}{\frac{\sin \theta \cos \theta}{\sin \theta} + \frac{\sin^2 \theta}{\cos \theta}} = \cos \theta$$

$$\frac{1}{\cos \theta + \frac{\sin^2 \theta}{\cos \theta}} = \cos \theta$$

$$\frac{1}{\frac{\cos^2 \theta}{\cos \theta} + \frac{\sin^2 \theta}{\cos \theta}} = \cos \theta$$

$$\frac{1}{\frac{\sin^2 \theta + \cos^2 \theta}{\cos \theta}} = \cos \theta$$

$$\frac{\cos \theta}{\sin^2 \theta + \cos^2 \theta} = \cos \theta$$

$$\cos \theta = \cos \theta$$

$$\frac{1}{1 + \tan^2 \theta} + \frac{1}{1 + \cot^2 \theta} = 1$$

$\frac{1}{\sec^2 \theta} + \frac{1}{\operatorname{cosec}^2 \theta} = 1$

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

$$1 = 1$$

$$\frac{1 - \sin \theta}{\cos \theta} = \frac{1}{\sec \theta + \tan \theta}$$

$\frac{1}{\cos \theta} - \frac{\sin \theta}{\cos \theta} = \frac{1}{\sec \theta + \tan \theta}$

$\sec \theta - \tan \theta = \frac{1}{\sec \theta + \tan \theta}$

$\frac{(\sec \theta + \tan \theta)(\sec \theta - \tan \theta)}{\sec \theta + \tan \theta} = \frac{1}{\sec \theta + \tan \theta}$
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$\frac{\sec^2 \theta - \tan^2 \theta}{\sec \theta + \tan \theta} = \frac{1}{\sec \theta + \tan \theta}$

$\frac{1 + \tan^2 \theta - \tan^2 \theta}{\sec \theta + \tan \theta} = \frac{1}{\sec \theta + \tan \theta}$

$$\frac{1}{\sec \theta + \tan \theta} = \frac{1}{\sec \theta + \tan \theta}$$