

## Trigonometric identities to know by heart

$$\operatorname{cosec} x = 1/\sin x \quad \sec x = 1/\cos x \quad \cot x = 1/\tan x \quad \textit{Reciprocal trig functions}$$

$$\sin^2 x + \cos^2 x = 1 \quad \tan^2 x + 1 = \sec^2 x \quad 1 + \cot^2 x = \operatorname{cosec}^2 x \quad \textit{Pythagorean identities}$$

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

*sines and cosines of sums*

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

Putting these together in pairs, we get

$$\sin(A + B) + \sin(A - B) = 2 \sin A \cos B$$

$$\sin(A + B) - \sin(A - B) = 2 \cos A \sin B$$

*Products of sines and cosines*

$$\cos(A + B) + \cos(A - B) = 2 \cos A \cos B$$

$$\cos(A + B) - \cos(A - B) = -2 \sin A \sin B$$

Letting  $(A + B)$  be  $x$  and  $(A - B)$  be  $y$  (so  $A = \frac{1}{2}(x + y)$  and  $B = \frac{1}{2}(x - y)$ ), we get

$$\sin x + \sin y = 2 \sin \frac{1}{2}(x + y) \cos \frac{1}{2}(x - y)$$

$$\sin x - \sin y = 2 \cos \frac{1}{2}(x + y) \sin \frac{1}{2}(x - y)$$

*Sums of sines and cosines*

$$\cos x + \cos y = 2 \cos \frac{1}{2}(x + y) \cos \frac{1}{2}(x - y)$$

$$\cos x - \cos y = -2 \sin \frac{1}{2}(x + y) \sin \frac{1}{2}(x - y)$$

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

*tangents of sums*

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

Letting  $B = A$  in the functions of sums, we get

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A = 2 \cos^2 A - 1 = 1 - 2 \sin^2 A$$

*Double angles*

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

# Identities Test

Name .....

$\operatorname{cosec} x = \underline{\quad 1 \quad}$	$\sin 2x =$
$\cot x = \underline{\quad 1 \quad}$	$\cos 2x =$
$\sec x = \underline{\quad 1 \quad}$	$\tan 2x =$
$\tan A = \underline{\hspace{2cm}}$	$2 \sin x \cos y =$
$\sin^2 A + \cos^2 A =$	$2 \cos x \sin y =$
$\sec^2 A =$	$2 \cos x \cos y =$
$\operatorname{cosec}^2 A =$	$2 \sin x \sin y =$
$\sin (x + y) =$	$\sin x + \sin y =$
$\sin (x - y) =$	$\sin x - \sin y =$
$\cos (x + y) =$	$\cos x + \cos y =$
$\cos (x - y) =$	$\cos x - \cos y =$
$\tan (x + y) =$	$\sin (A + B) - \sin (A - B) =$
$\tan (x - y) =$	