TRIGONOMETRY EXPRESSIONS AND IDENTITIES– WORKSHEET

COURSE/LEVEL

NSW Secondary High School Year 11 Preliminary Mathematics.
Syllabus reference: 5.1 – 5.2.

1. Simplify the following trigonometric expressions:

	I	**II**	**III**
(a)	$\frac{1}{\sec\theta}$	$\frac{2}{\cos\theta}$	$(\text{cosec}\theta)^{-1}$
(b)	$\sin\theta\sec\theta$	$\sin x\cot x$	$\tan\alpha\cot\alpha$
(c)	$\frac{\sin y}{\tan y}$	$\frac{2}{\sin\theta\cot\theta}$	$\frac{\sin\beta}{\tan\beta\cos\beta}$
(d)	$1-\cos^2 x$	$\frac{\sin^2\phi}{\cos^2\phi-1}$	$\frac{-\sin^2 A}{\cos^2 A-1}$
(e)	$\sin^2 z+\tan^2 z+\cos^2 z$	$\cos^2\delta+\cos^2\delta\tan^2\delta$	$\frac{1}{\sin^2 x}-\frac{1}{\tan^2 x}-\frac{1}{\sec^2 x}$
(f)	$5-5\cos^2 A$	$2+\cos^2 A-2\sin^2 A$	$2+\frac{2\sin^2 x}{\cos^2 x}$
(g)	$\cos\theta(1+\tan^2\theta)$	$\tan^2\theta(1-\sin^2\theta)$	$\frac{\tan^2 x-\cot^2 x}{\sec^2 x-\text{cosec}^2 x}$
(h)	$\frac{\sqrt{1-\cos^2\alpha}}{\sin\alpha}$	$\sqrt{1+\frac{\sin^2 A}{\cos^2 A}}$	$\sqrt{\frac{4+4\tan^2 B}{9\sec^2 B-9}}$
(i)	$\frac{\sec x}{\tan x+\cot x}$	$(1-\sin x)(\sec x+\tan x)$	$\frac{\cos x}{1+\sin x}+\tan x$
(j)	$\frac{\sin A}{1+\cos A}+\frac{1+\cos A}{\sin A}$	$\frac{\cos\theta}{1-\sin\theta}-\frac{\cos\theta}{1+\sin\theta}$	$\frac{1}{\text{cosec}\theta-1}-\frac{1}{\text{cosec}\theta+1}$

2. Simplify the following expressions:

	I	**II**
(a)	$4-u^2$ if $u=2\sin\theta$	a^2-u^2 if $u=a\sin\theta$
(b)	$\sqrt{9-u^2}$ if $u=3\cos\theta$	$\sqrt{a^2-u^2}$ if $u=a\cos\theta$
(c)	$\dfrac{2}{\sqrt{4+x^2}}$ if $x=2\tan\theta$	$\dfrac{a}{\sqrt{a^2+x^2}}$ if $x=a\tan\theta$
(d)	$\left(4-x^2\right)^{\frac{3}{2}}$ if $x=2\sin\theta$	$\left(a^2-x^2\right)^{\frac{3}{2}}$ if $x=a\sin\theta$

3. Verify the following identities:

	I	**II**
(a)	$\cot x=\operatorname{cosec}x\ \cos x$	$\operatorname{cosec}x=\cot x\ \sec x$
(b)	$\sin x=\dfrac{\tan x}{\sec x}$	$\sin x=\dfrac{\tan x}{\sec x}$
(c)	$\cos^2 x\left(1+\tan^2 x\right)=1$	$\sin^2 x\left(1+\cot^2 x\right)=1$
(d)	$\dfrac{\cos\alpha\sec\alpha}{1+\tan^2\alpha}=\cos^2\alpha$	$\dfrac{1+\tan^2\theta}{1+\cot^2\theta}=\tan^2\theta$
(e)	$(1+\cos\theta)(1-\cos\theta)\sec^2\theta=\tan^2\theta$	$\dfrac{\cos x\left(1+\tan^2 x\right)}{\sec x}=1$
(f)	$(\cos\alpha+\sin\alpha)^2+(\cos\alpha-\sin\alpha)^2=2$	$\left(\sin^2 x+\cos^2 x\right)^2=1$
(g)	$\dfrac{\cos A}{1-\sin A}-\tan A=\sec A$	$\dfrac{\sin x}{1-\cos x}-\cot x=\operatorname{cosec}x$
(h)	$1-\sin\theta=(1+\sin\theta)(\sec\theta-\tan\theta)^2$	$1+\cos\theta=(1-\cos\theta)(\operatorname{cosec}\theta+\cot\theta)^2$