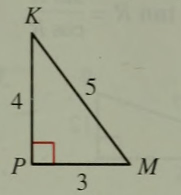
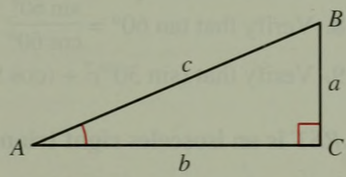
Example 1 Use right triangle KPM to show that $\frac{\sin K}{\cos K} = \tan K$.



Solution $\sin K = \frac{3}{5}$, $\cos K = \frac{4}{5}$, and $\tan K = \frac{3}{4}$

$$\frac{\sin K}{\cos K} = \frac{\frac{3}{5}}{\frac{4}{5}} = \frac{3}{5} \cdot \frac{5}{4} = \frac{3}{4} = \tan K$$

Refer again to $\triangle ABC$ with $\sin A = \frac{a}{c}$ and $\cos A = \frac{b}{c}$.



$(\sin A)^2 = \frac{a}{c} \cdot \frac{a}{c} = \frac{a^2}{c^2}$ and $(\cos A)^2 = \frac{b}{c} \cdot \frac{b}{c} = \frac{b^2}{c^2}$

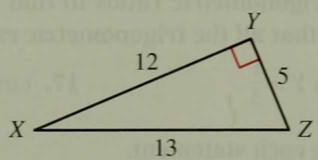
$(\sin A)^2 + (\cos A)^2 = \frac{a^2}{c^2} + \frac{b^2}{c^2} = \frac{a^2 + b^2}{c^2}$

By the Pythagorean theorem, $a^2 + b^2 = c^2$.

Therefore, $(\sin A)^2 + (\cos A)^2 = \frac{a^2 + b^2}{c^2} = \frac{c^2}{c^2} = 1$.

For any acute $\angle A$, $(\sin A)^2 + (\cos A)^2 = 1$.

Example 2 Use right triangle XYZ to show that $(\sin X)^2 + (\cos X)^2 = 1$.



Solution $\sin X = \frac{5}{13}$ and $\cos X = \frac{12}{13}$

$$(\sin X)^2 + (\cos X)^2 = \left(\frac{5}{13}\right)^2 + \left(\frac{12}{13}\right)^2$$

$$= \frac{25}{169} + \frac{144}{169}$$

$$= \frac{169}{169} = 1$$