



Name: _____ () Class: _____ Date: _____

MA304.2.2 – Trigonometric Ratios of Acute Angles

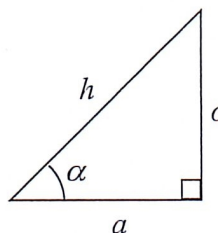
At the end of this unit, you should be able to

- recall and use the three trigonometric ratios: sine, cosine and tangent and use $\tan \theta = \frac{\sin \theta}{\cos \theta}$
- find trigonometric ratios using the right-angle triangle
- derive and use trigonometric ratios of special angles
- simplify trigonometric ratios of complementary angles

Based on a right-angled triangle, let the basic angle be α .

Then,

$\sin \alpha = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{o}{h}$
$\cos \alpha = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{a}{h}$
$\tan \alpha = \frac{\text{opposite}}{\text{adjacent}} = \frac{o}{a}$

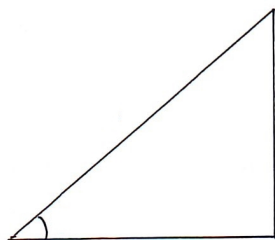


How do you plan to remember the definitions?

E1. Show that $\tan \alpha = \frac{\sin \alpha}{\cos \alpha}$ from the above.

E2. Find the value of $\sin \theta$ and $\tan \theta$ given that $\cos \theta = \frac{5}{13}$ and θ is acute.

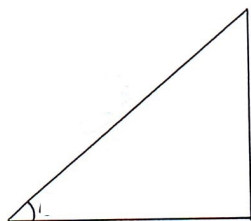
Step 1: Draw the triangle and fill in the information.



Step 2: Find the missing information (which side is unknown?).

Step 3: Evaluate the trigonometric ratios.

P1. Find the value of $\sin \theta$ and $\cos \theta$ given that $\tan \theta = 3$ and $0 < \theta < \frac{\pi}{2}$.



Special angles

E3. Draw an isosceles right-angled triangle with base and height equals to 1 unit.

(a) What is the exact length of the hypotenuse?

(b) What is the angle made between the hypotenuse and the base/height? Explain.

(c) Hence or otherwise evaluate the following:

$$\sin 45^\circ =$$

$$\cos 45^\circ =$$

$$\tan 45^\circ =$$

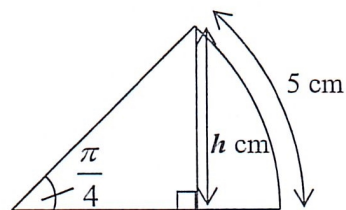
P2. Draw an equilateral triangle with side 2 units.

(a) What is the angle at each vertex?

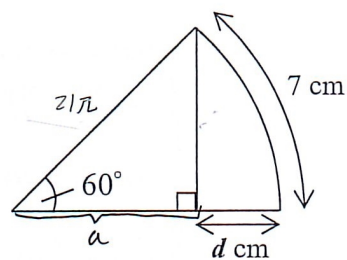
(b) By dividing the triangle into two equal parts, explain how you can derive the trigonometric values of $\sin 30^\circ$, $\cos 30^\circ$, $\tan 30^\circ$, $\sin 60^\circ$, $\cos 60^\circ$, and $\tan 60^\circ$.

$\sin 30^\circ =$	$\cos 30^\circ =$	$\tan 30^\circ =$
$\sin 60^\circ =$	$\cos 60^\circ =$	$\tan 60^\circ =$

P3. Find the value of h in the diagram on the right.



P4. Find the value of d in the diagram on the right.

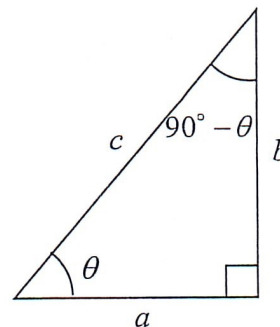


Complementary angles

E4. Consider the right-angle triangle again.

(a) Find, in terms of a , b and/or c , the following ratios:

$$\sin \theta, \sin(90^\circ - \theta), \cos \theta, \cos(90^\circ - \theta), \tan \theta, \tan(90^\circ - \theta)$$



(b) Complete the following about the equality between the 6 terms.

$\sin(90^\circ - \theta) =$
$\cos(90^\circ - \theta) =$
$\tan(90^\circ - \theta) =$

(c) Given that $\tan A = 4$, find the value of $2 \tan(90^\circ - A) - \tan A$.

E5. Without using a calculator, evaluate

(a) $\frac{\sin 45^\circ}{2 \cos 30^\circ - \sin 60^\circ}$

(b) $\tan \frac{\pi}{4} + 2 \tan \frac{\pi}{6} \tan \frac{\pi}{3}$

P5. Without using a calculator, find the value of

(a) $\frac{\cos 50^\circ}{\sin 40^\circ} + \sin 90^\circ$

(b) $\frac{\tan \frac{\pi}{4} + \cos \frac{\pi}{3}}{\tan \frac{2\pi}{5} \tan \frac{\pi}{10} + \sin \frac{\pi}{6}}$