



Lesson #4.1 – Exploring the Primary Trigonometric Ratios of Obtuse Angles

Until now, you have used the primary trigonometric functions only with acute angles. Now we are going to investigate the same trigonometric ratios for **obtuse angles**.

θ	$\sin\theta$	$\cos\theta$	$\tan\theta$	$180 - \theta$	$\sin(180 - \theta)$	$\cos(180 - \theta)$	$\tan(180 - \theta)$
90°	1	0	undef.	90°	1	0	undef.
100°	0.985	-0.174	-5.671	80°	0.985	0.174	5.671
110°	0.940	-0.342	-2.747	70°	0.940	0.342	2.747
120°	0.866	-0.5	-1.732	60°	0.866	0.5	1.732
130°	0.766	-0.643	-1.192	50°	0.766	0.643	1.192
140°	0.643	-0.766	-0.839	40°	0.643	0.766	0.839
150°	0.5	-0.866	-0.577	30°	0.5	0.866	0.577
160°	0.342	-0.940	-0.364	20°	0.342	0.940	0.364
170°	0.174	-0.985	-0.176	10°	0.174	0.985	0.176
180°	0	-1	0	0°	0	1	0

What relationships do you observe when comparing the trigonometric ratios for obtuse angles with trigonometric ratios for the related supplementary acute angle?

Obtuse angle = θ Related Supp. angle
 $180^\circ - \theta$

Sine: the obtuse angle + the related acute angle have the exact same ratio

$$\sin\theta = \sin(180 - \theta)$$

Cosine
&
Tangent

The obtuse angle and the related acute angle have the same numerical value but the opposite sign!

$$\cos\theta = -\cos(180 - \theta)$$

$$\tan\theta = -\tan(180 - \theta)$$

FOUNDATIONS OF MATH 11

Chapter 4 – Oblique Triangle Trigonometry



Example 1: Calculate each of the ratios to 4 decimal places. Predict another angle that will have an **opposite trigonometric ratio**. Check your prediction.

Ratio	Result	Prediction	Result
$\cos(172^\circ) =$	-0.9900	$\cos 8^\circ$	0.9900
$\tan(102^\circ) =$	-4.7046	$\tan 78^\circ$	4.7046
$\sin(166^\circ) =$	0.2419	$-\sin 14^\circ$	-0.2419
$\cos(145^\circ) =$	-0.8192	$\cos 35^\circ$	0.8192
$\sin(71^\circ) =$	0.9455	$-\sin 109^\circ$	-0.9455
$\tan(38^\circ) =$	0.7813	$\tan 42^\circ$	-0.7813

Example 2: Calculate each of the ratios to 4 decimal places. Predict another angle that will have an **equal trigonometric ratio**. Check your prediction.

Ratio	Result	Prediction	Result
$\tan(136^\circ) =$	-0.9657	$-\tan 49^\circ$	-0.9657
$\cos(155^\circ) =$	-0.9063	$-\cos 25^\circ$	-0.9063
$\sin(23^\circ) =$	0.3907	$\sin 157^\circ$	0.3907
$\cos(94^\circ) =$	-0.0698	$-\cos 86^\circ$	-0.0698
$\tan(140^\circ) =$	-0.8391	$-\tan 40^\circ$	-0.8391
$\sin(68^\circ) =$	0.9272	$\sin 112^\circ$	0.9272

Practice Questions: Page 163, #'s 1-4