**Trigonometry Exam 5 – Study Guide – Equations, Identities, Law of Sines and Cosines, Vectors**

Name: ___________________________ Period: ___________ Date: _______________________

## Part 1 – Solving trigonometric equations by factoring and/or the quadratic formula (quadratic formula problems may require a calculator to evaluate angle measures).

*No identities are necessary for these problems – list ALL correct angle measures from* $(-\infty, +\infty)$.

$2\sin^2 x + sinx = 1$

$sinxtanx + \frac{1}{2}tanx = 0$

$-sec^2 x + secx = -2$

$cos^2(2x) - 4 = 3\cos(2x)$

$2sin^2 x + 2sinx - 2 = 0$

$3csc^2 x + 7cscx - 4 = 0$

**Part 2 – Using identities to solve trigonometric equations and/or evaluate trigonometric expressions.**

*Identities are necessary for these problems – list ALL correct angle measures from* $(-\infty, +\infty)$.

$-\tan^2 x - 4secx = 5$

$sin^2 x - cos^2 x = 3cosx + 2$

$-2 - 3cosx = \cos(2x)$

$-sinx = -cosx + 1$

*Use sum and difference or ½ angle identities to solve the following expressions.*

$cos105°$

$\sin -\frac{5\pi}{12}$

$sin157.5°$

$cos\frac{\pi}{8}$

$\tan\frac{\pi}{12}$

$\sin 75°$

**Part 3 – Law of sines and law of cosines.**

*Solve for all missing sides and angles (draw the picture to assist).*
*Determine which law you will need 1st and why, then solve (if possible). Calculator required.*

$a = 7, \angle A = 34°, \angle B = 62°$

Law of ___________________

Reason ___________________

$a = 20, \angle B = 21°, \angle C = 27°$

Law of ___________________

Reason ___________________

$\mathrm{b} = 13, c = 17, \angle A = 55°$

Law of ___________________

Reason ___________________

$a = 2.3, b = 1.8, \angle B = 76°$

Law of ___________________

Reason ___________________

$a = 34, b = 30, c = 28$

Law of ___________________

Reason ___________________

## Part 4 – Law of sines and law of cosines, real world problems.

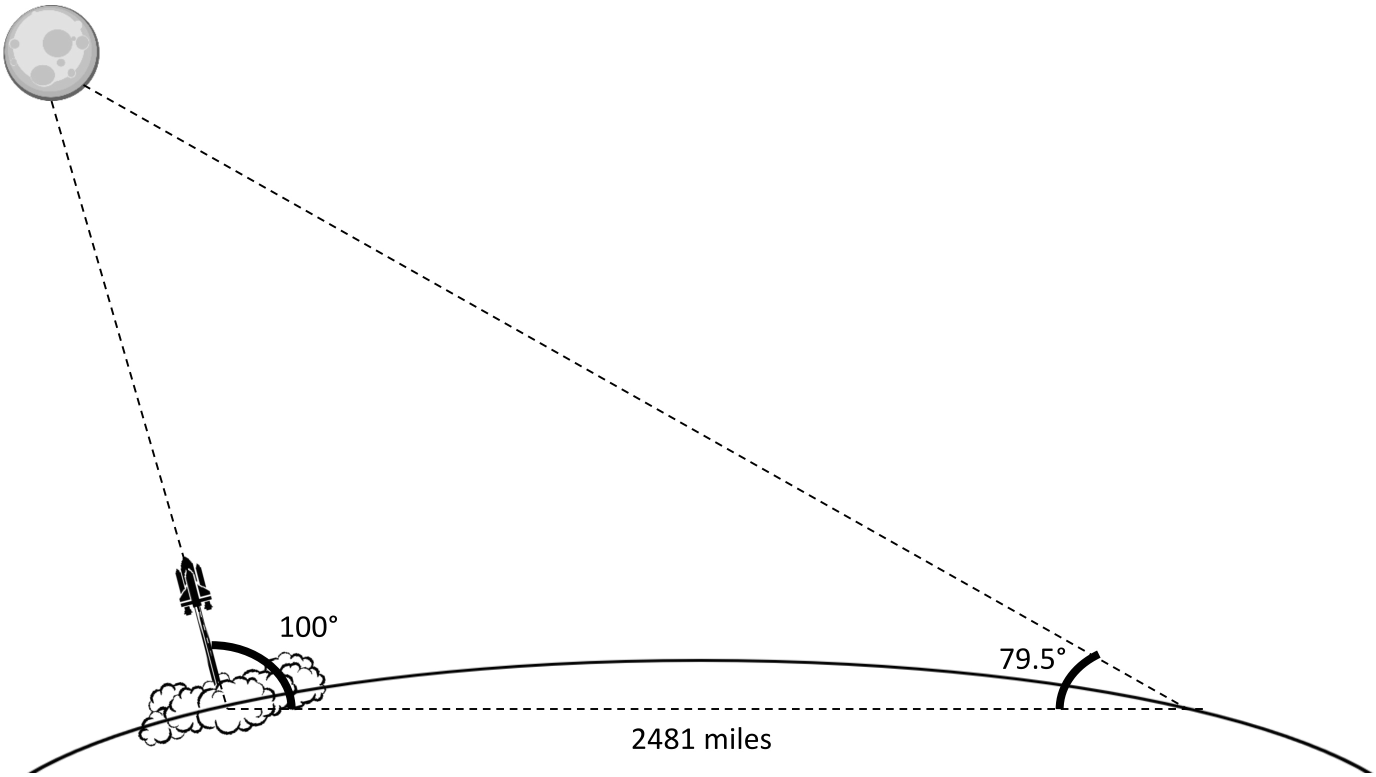
*Sketch a picture of the following problem if necessary and use either law of sines or cosines to solve.*

Two surveyors stand on opposite sides of a mountain at its base. Surveyor A measures an angle of elevation between the base of the mountain and its peak at 21°, while surveyor B measures the angle of elevation at 37°. The two surveyors are 10,000 meters apart.

a. How far is each surveyor from the top of the mountain (round your answers to the $10^{th}$ place)?
b. What is the height of the mountain?

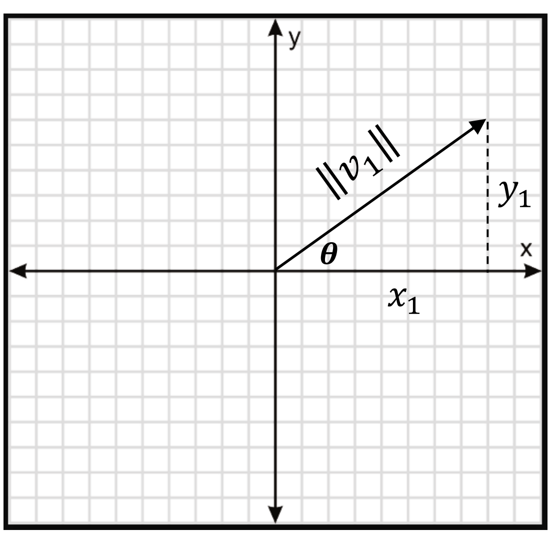
The surveyors from the previous problem are now measuring the distance across a great lake. They are standing on the eastern and western shores of the lake, directly opposite each other. There is a lighthouse on the Northern shore of the lake. Surveyor A is 650 kms from the lighthouse, while surveyor B is 923 kms from the lighthouse. The angle formed by the lighthouse and the two surveyors is 112°. What is the width of the lake (the distance between the two surveyors)?

Using the angle of elevation between any two locations on Earth, and the linear distance between those two locations, the law of sines or cosines can be used to determine the distance between any point on the surface of the Earth and the Moon. Use the following diagram to find the distance between the space shuttle and the Moon (picture not drawn to scale).




## Part 5 – Vectors, adding/subtracting, finding magnitude and direction.

*Vector Basics:*




$$Component\ form\colon\ v_1 = \langle x_1, y_1 \rangle$$

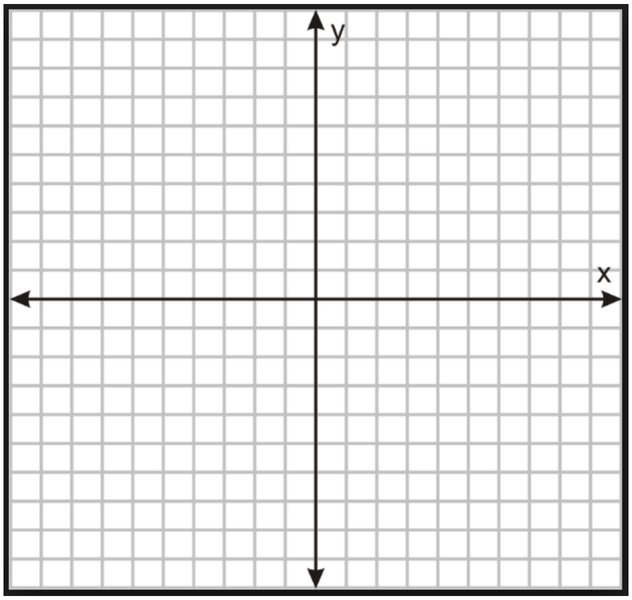
$$Magnitude\ (\text{"}length\text{"})\colon\ \|v_1\| = \sqrt{(x_1)^2 + (y_1)^2}$$

$$x_1 = \|v_1\| cos\theta \qquad \frac{x_1}{cos\theta} = \|v_1\|$$

$$y_1 = \|v_1\| sin\theta \qquad \frac{y_1}{sin\theta} = \|v_1\|$$

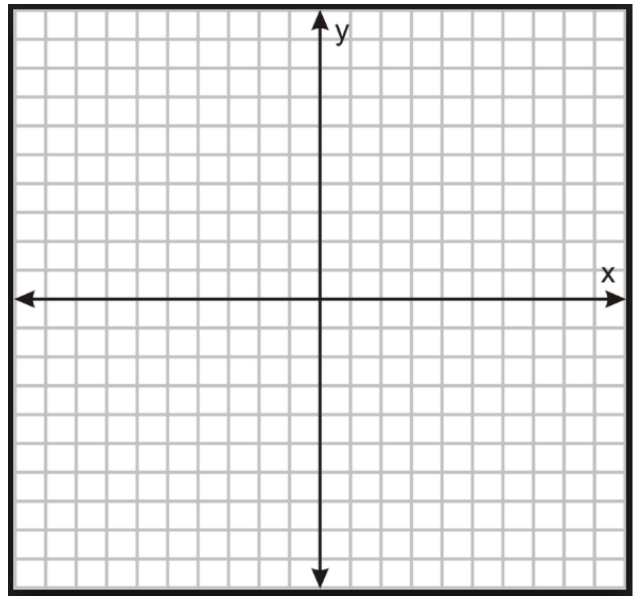
*Draw the addition/subtraction of the following vector pairs on the graphs provided, then calculate the component form of the resultant vector.*

$v_1 = \langle 3, 5 \rangle$ $v_2 = \langle 1, 4 \rangle$



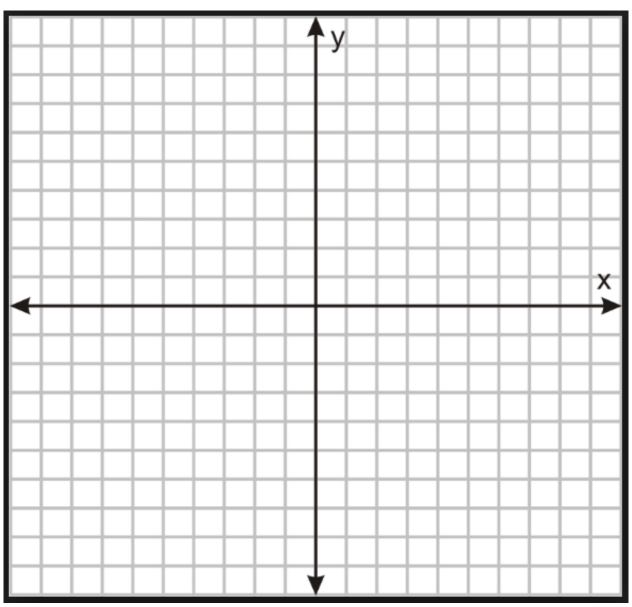

$v_1 + v_2 = \langle \quad , \quad \rangle$

$v_1 = \langle -1, 2 \rangle$ $v_2 = \langle 7, -7 \rangle$



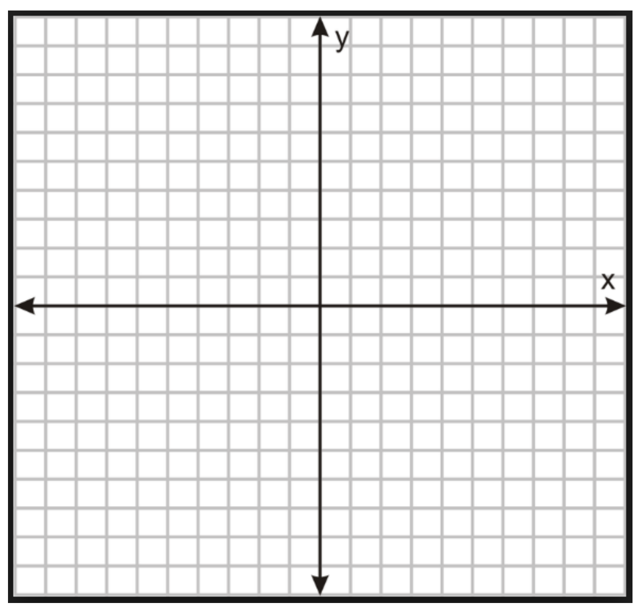

$v_1 + v_2 = \langle \quad , \quad \rangle$

$v_1 = \langle -1, 0 \rangle$ $v_2 = \langle -4, 6 \rangle$




$v_1 - v_2 = \langle \quad , \quad \rangle$

$v_1 = \langle 6, 5 \rangle$ $v_2 = \langle -1, -1 \rangle$




$v_1 - v_2 = \langle \quad , \quad \rangle$

*Determine the magnitude of the following vectors (use a calculator and round or truncate your answer to the 1,000th place).*

$v_1 = \langle -1, 2 \rangle$ $v_2 = \langle 7.2, 11.5 \rangle$ $v_3 = \langle 6, -8 \rangle$ $v_4 = \langle 0, -23.1 \rangle$

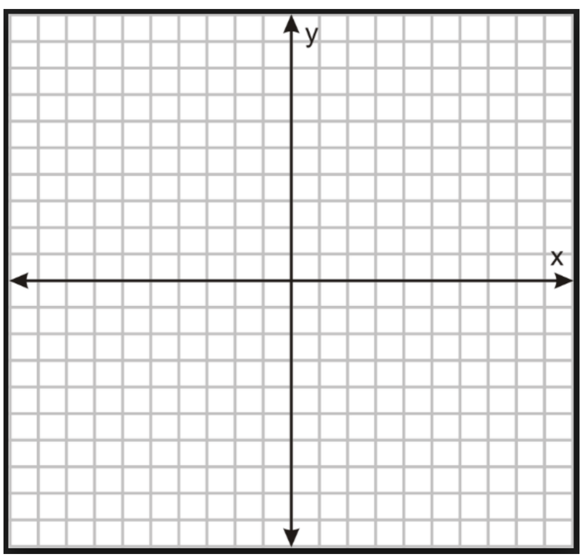
$\|v_1\| =$ $\|v_2\| =$ $\|v_3\| =$ $\|v_4\| =$

*Determine the components of each vector given its magnitude and directional angle (calculate your answer to the 1,000th place). Use the graphs to draw your vector and its components.*

$\|q\| = 22.7$

$\theta = 15°$

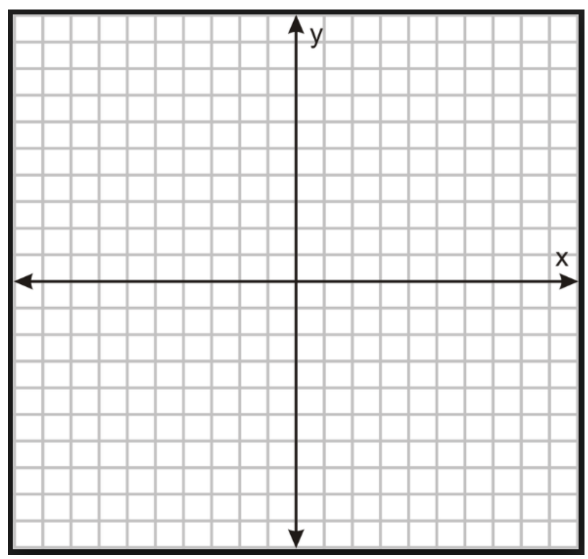
$\langle q_x, q_y \rangle = \langle \quad , \quad \rangle$




$\|g\| = 1$

$\theta = 152°$

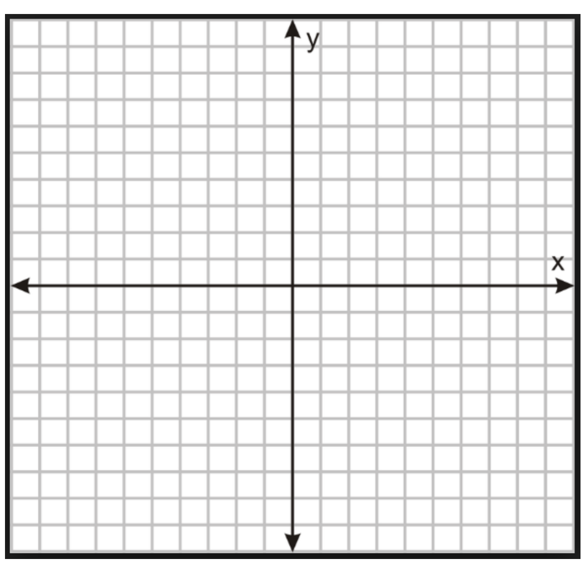
$\langle g_x, g_y \rangle = \langle \quad , \quad \rangle$




$\|h\| = 54$

$\theta = -78°$

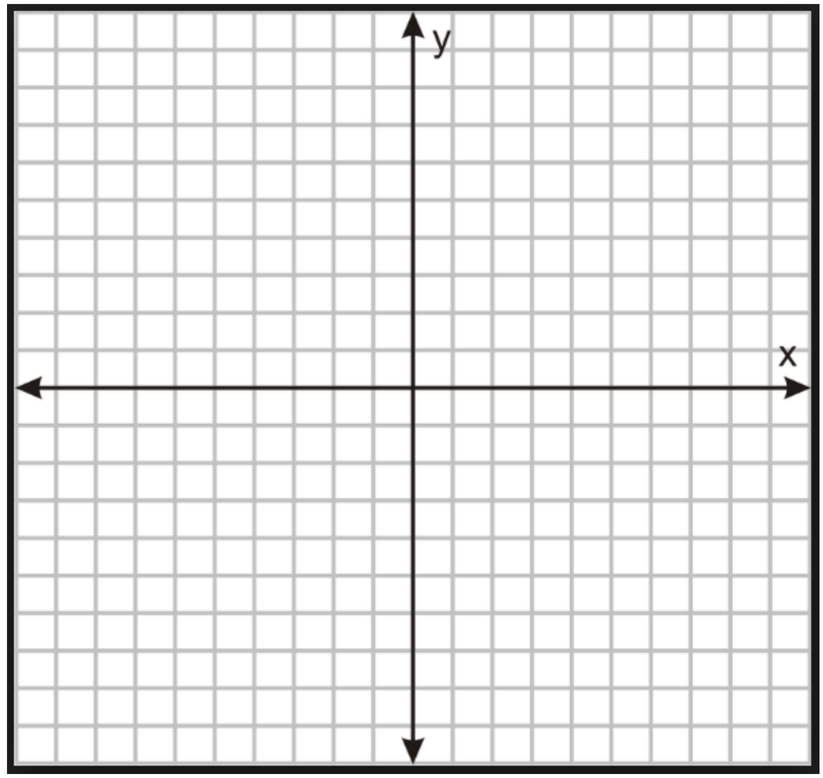
$\langle h_x, h_y \rangle = \langle \quad , \quad \rangle$



*Given the magnitude and angle of each pair of vectors, determine the magnitude and angle of the resulting vector (find the components of the initial vectors, add the vectors, then determine the magnitude and angle of the resulting vector). Use the graph to draw the three vectors (need not be perfectly to scale).*

$\|v\| = 30$ $\|u\| = 10$

$\theta_v = 21°$ $\theta_u = 50°$




$\|a\| = 25$ $\|b\| = 8$

$\theta_a = 100°$ $\theta_b = 340°$