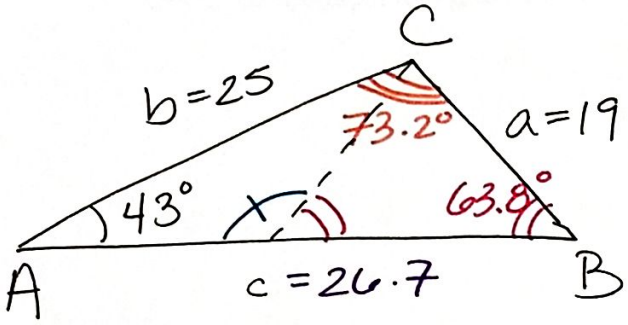
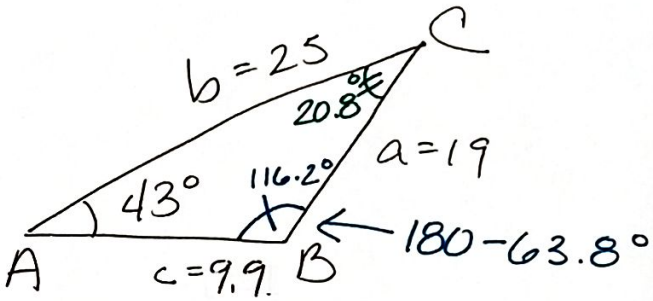
Trigonometry/Precalculus
Chapter 6 Review
Day _____

Name
Date
Block

1) Sketch two different triangles such that: $A = 43°$, $a = 19$, $b = 25$.





2) Solve the two triangles you sketched in problem 1.

$\frac{\sin 43}{19} = \frac{\sin B}{25}$

$\sin B = \frac{25 \sin 43}{19}$

$B = 63.8°$

$C = 180 - (43 + 63.8)$

$C = 73.2°$

$\frac{\sin 73.2}{c} = \frac{\sin 43}{19}$

$c = \frac{19 \sin 73.2}{\sin 43}$

$C = 26.7$

$B = 180 - 63.8 = 116.2°$

$C = 180 - (43 + 116.2) = 20.8°$

$\frac{\sin 43}{19} = \frac{\sin 20.8}{c}$

$c = \frac{19 \sin 20.8}{\sin 43}$ $\quad c = 9.9$

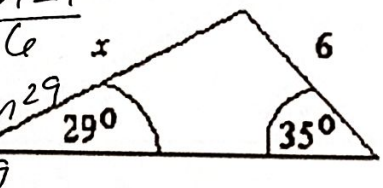
Use the Law of Sines or the Law of Cosines to find the missing sides or angles for the following triangles.

3)

$\frac{\sin 35}{x} = \frac{\sin 29}{6}$

$\frac{6 \sin 35}{\sin 29} = \frac{x \sin 29}{\sin 29}$

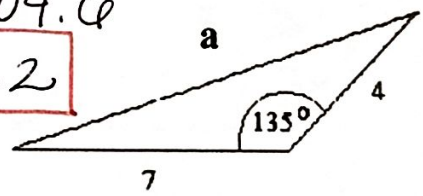
$x = 7.1$



4) $a^2 = 7^2 + 4^2 - 2(7)(4)\cos 135$

$a^2 = 104.6$

$a = 10.2$



5) angle A =

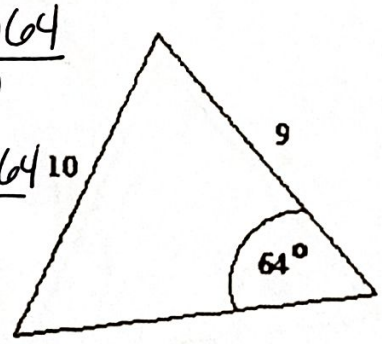
$\frac{\sin A}{9} = \frac{\sin 64}{10}$

$\frac{10 \sin A}{10} = \frac{9 \sin 64}{10}$

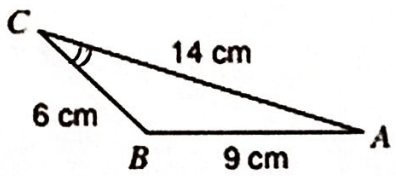
$\sin^{-1} \quad \sin^{-1}$

$\sin A = .809$

$A = 54°$



6) angle C =

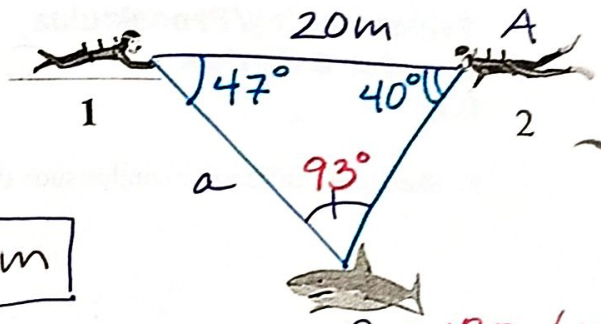


$9^2 = 6^2 + 14^2 - 2(6)(14)\cos C$

$\cos C = \frac{6^2 + 14^2 - 9^2}{2(6)(14)}$

$\cos C = .899$ $\quad C = 26°$

7) Two scuba divers are 20m apart below the surface of the water. They both spot a shark that is below them. The angle of depression from diver 1 to the shark is 47° and the angle of depression from diver 2 to the shark is 40°. How far is the first diver from the shark?



$\frac{\sin 93}{20} = \frac{\sin 40}{a}$ → $a = 12.9m$

$\frac{a\sin 93}{\sin 93} = \frac{20\sin 40}{\sin 93}$

B → 180 − (47+40) = 93°

8) A) Write a vector GS in component form with initial point G(7, 8) and S(-2, 4). Sketch and label the vector.

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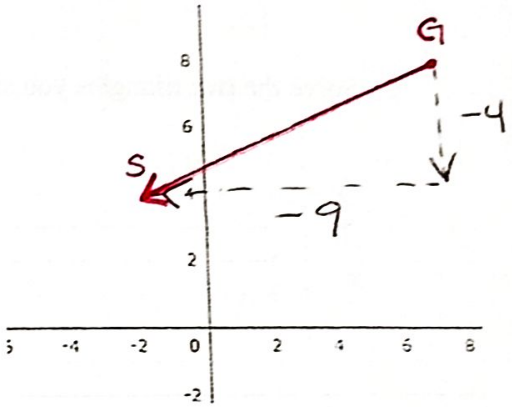
$\overrightarrow{GS} = \langle -2-7, 4-8 \rangle$

$\overrightarrow{GS} = \langle -9, -4 \rangle$



B) Find the magnitude of vector $\overrightarrow{GS}$.

$\|\overrightarrow{GS}\| = \sqrt{(-9)^2+(-4)^2}$ → $\|\overrightarrow{GS}\| = \sqrt{97} \approx 9.8$

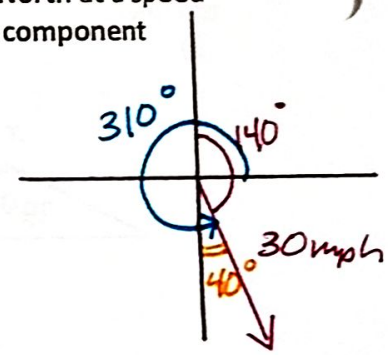
$\|\overrightarrow{GS}\| = \sqrt{81+16}$

9) An aircraft carrier travels across the ocean with a bearing of 140° **from due North** at a speed of 30 mph. Write a vector a that represents the carrier's speed and bearing in **component form.** (a sketch will help)

$\langle \|\vec{v}\|\cos\theta, \|\vec{v}\|\sin\theta \rangle$ ← θ = angle in standard form

$\langle 30\cos 310, 30\sin 310 \rangle$

$\langle 19.3, -23 \rangle$



10) Perform each of the following vector operations:

A)

Given: $P = (-4, 3)$ $Q = (6, -9)$

Find: $9\overrightarrow{PQ}$

$\overrightarrow{PQ} = \langle 6-(-4), -9-3 \rangle$

$\overrightarrow{PQ} = \langle 10, -12 \rangle$

$9\overrightarrow{PQ} = \langle 9(10), 9(-12) \rangle$

$= \langle 90, -108 \rangle$

B)

$\vec{a} = \langle -3, -12 \rangle$

$\vec{b} = \langle 4, 9 \rangle$

Find: $-3\vec{a} + 7\vec{b}$

$-3\langle -3, -12 \rangle + 7\langle 4, 9 \rangle$

$\langle 9, 36 \rangle + \langle 28, 63 \rangle$

$\langle 37, 99 \rangle$

C) $\vec{m} - \vec{n}$

, $\vec{m} = \langle -7, 1 \rangle$ $\vec{n} = \langle 12, -16 \rangle$

$\langle -7, 1 \rangle - \langle 12, -16 \rangle$

$\langle -7-12, 1+(+16) \rangle$

$\langle -19, 17 \rangle$

11) Determine whether the following vectors are either orthogonal, parallel, or neither. If they are neither, find the measure of the angle between the vectors.

A) $\vec{a}\langle -7,-9\rangle$ $\vec{b}\langle 8,4\rangle$

$\vec{a}\cdot\vec{b} = (-7)(8)+(-9)(4)$

$= -56-36 = \boxed{-92}$

$\cos\theta = \dfrac{\vec{a}\cdot\vec{b}}{\|\vec{a}\|\|\vec{b}\|}$ $\|\vec{a}\| = \sqrt{(-7)^2+(-9)^2}$

$\|\vec{a}\| = \sqrt{130}$

$\cos\theta = \dfrac{-92}{(\sqrt{130})(\sqrt{80})}$ $\|\vec{b}\| = \sqrt{8^2+4^2}$

$\|\vec{b}\| = \sqrt{80}$

$\cos\theta = -.902$

$\theta = 154.4^\circ$ → neither

B) $\vec{k}\langle -3,4\rangle$ $\vec{h}\langle 12,-16\rangle$

$m_{\vec{k}} = \dfrac{4}{-3}$ $m_{\vec{h}} = \dfrac{-16}{12}$

$m_{\vec{h}} = \dfrac{-4}{3}$

slopes are =, so vectors are parallel.

C)

$\vec{u} = -5\vec{i}-2\vec{j}$ $\langle -5,-2\rangle$

$\vec{v} = -10\vec{i}+25\vec{j}$ $\langle -10,25\rangle$

$\vec{u}\cdot\vec{v} = -5(-10)+(-2)(25)$

$\vec{u}\cdot\vec{v} = 50-50$

$\vec{u}\cdot\vec{v} = 0$

since $\vec{u}\cdot\vec{v}=0$, the vectors are perpendicular.

12) Find the angle θ between u = ⟨-4,-3⟩ and v = ⟨-1,5⟩.

$\cos\theta = \dfrac{\vec{u}\cdot\vec{v}}{\|\vec{u}\|\|\vec{v}\|}$ → $\cos\theta = \dfrac{-11}{(5)(\sqrt{26})}$ ⇒ $\cos^{-1}$ $\cos\theta = -.431$

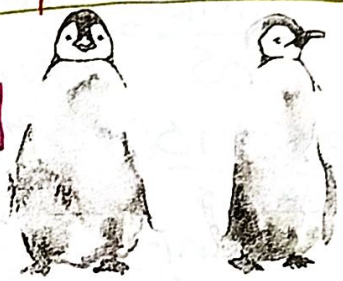
$\theta = 115.6^\circ$

$\vec{u}\cdot\vec{v} = (-4)(-1)+(-3)(5)$

$\vec{u}\cdot\vec{v} = -11$

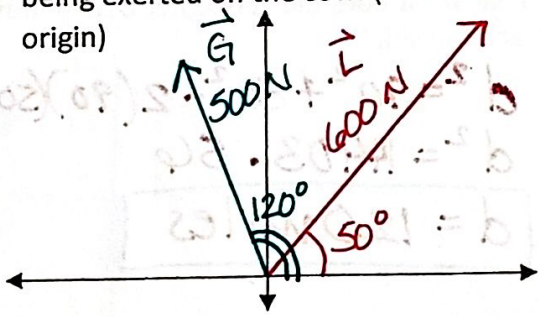
$\|\vec{u}\| = \sqrt{(-4)^2+(-3)^2}$ $\|\vec{v}\| = \sqrt{(-1)^2+5^2}$

$\|\vec{u}\| = \sqrt{25} = 5$ $\|\vec{v}\| = \sqrt{26}$



13) Farmer Larry and his daughter Gloria need to free a one of their cows stuck in deep mud with ropes attached at the same point. Larry pulls at an angle of 50° (in standard position) with a force of 600N. Gloria pulls with a force of 500N at a standard angle of 120°.

a) Draw a diagram that shows the two forces being exerted on the cow. (from the origin)



b) Write the force vectors in **component form**, then find **the sum of the vectors.**

$\vec{L} = \langle 600\cos 50, 600\sin 50\rangle$

$\vec{L} = \langle 385.7, 459.6\rangle$

$\vec{G} = \langle 500\cos 120, 500\sin 120\rangle$

$\vec{G} = \langle -250, 433\rangle$

c) What is the magnitude of the combined forces on the cow?

$\vec{L}+\vec{G} = \langle 385.7+(-250), 459.6+433\rangle$

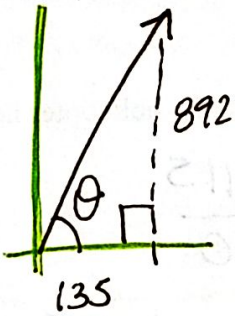
$\vec{L}+\vec{G} = \langle 135, 892.6\rangle$

$\|\vec{L}+\vec{G}\| = \sqrt{135^2+892.6^2}$

$= \sqrt{814959.8}$

$\|\vec{L}+\vec{G}\| = 902.8N$

d) What is the direction of the resulting force? (in standard form)



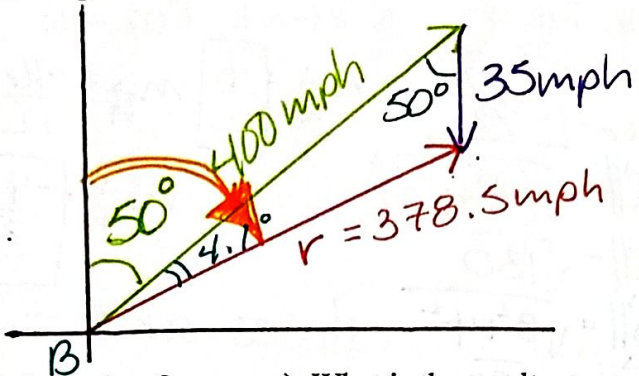
$\tan\theta = \dfrac{892.6}{135}$

$\theta = \tan^{-1}\left(\dfrac{892.6}{135}\right)$

$\theta = 81.4^\circ$

14) A plane on a course with a bearing of 50° (from due North) is flying at 400 miles per hour. A 35 mile per hour wind is blowing south.

a) Sketch and label the vectors.



b) What is the resultant bearing of the plane?

$$\frac{\sin B}{35} = \frac{\sin 50}{378.5}$$

$$\frac{35\sin 50}{378.5} = \frac{378.5\sin B}{378.5}$$

$$\sin B = .0708$$

$$\boxed{B = 4.1°}$$

→ Bearing $50 + 4.1$

$$= \boxed{54.1° \text{ from N}}$$

c) What is the resultant speed of the plane?

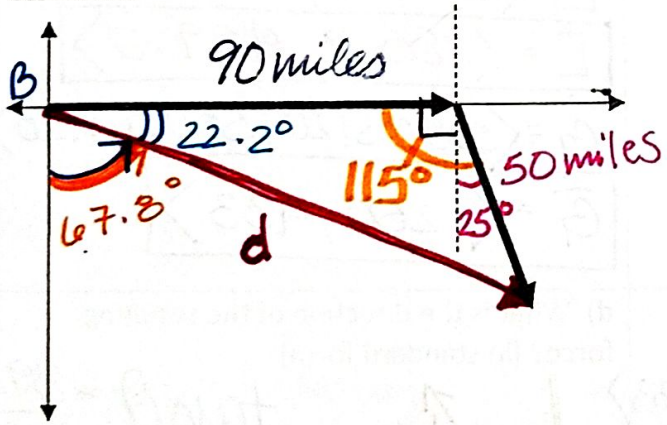
$$r^2 = 400^2 + 35^2 - 2(400)(35)\cos 50$$

$$r^2 = 143,226.9$$

$$\boxed{r = 378.5 \text{ mph}}$$

15) A ship leaves a port heading east for 90 miles, then turns and heads in a direction of S 25° E for 50 miles more. A helicopter, leaving from the same port, needs to join the ship as quickly as possible.

a) Label the diagram below with angles and distances.



b) How far does the helicopter have to travel to reach the ship?

$$d^2 = 90^2 + 50^2 - 2(90)(50)\cos 115$$

$$d^2 = 14403.56$$

$$\boxed{d = 120 \text{ miles}}$$

c) In which direction should the helicopter head to reach the ship?

$$\frac{\sin B}{50} = \frac{\sin 115}{120}$$

$$\frac{120\sin B}{120} = \frac{50\sin 115}{120}$$

$$\sin B = .378$$

→ $B = 22.2°$

$90 - 22.2° = 67.8°$

$$\boxed{S\,67.8°\,E}$$