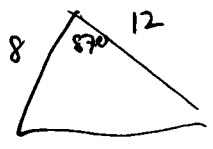Name: **KEY**   Date: _____

Review law of sin/cos, ambig case and vectors

1.)

Jack is planting a triangular rose garden. The lengths of two sides of the plot are 8 feet and 12 feet, and the angle between them is 87°. Which expression could be used to find the area of this garden?
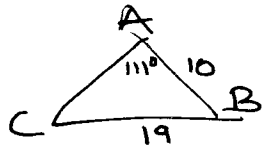
[A] $8 \cdot 12 \cdot \cos 87°$ [B] $8 \cdot 12 \cdot \sin 87°$ (C) $\frac{1}{2} \cdot 8 \cdot 12 \cdot \sin 87°$ [D] $\frac{1}{2} \cdot 8 \cdot 12 \cdot \cos 87°$

2.)

In $\triangle ABC$, $a = 19$, $c = 10$, and $m\angle A = 111$. Which statement can be used to find the value of $\angle C$?

[A] $\sin C = \frac{19 \sin 69°}{10}$ [B] $\sin C = \frac{10 \sin 21°}{19}$ [C] $\sin C = \frac{10}{19}$ (D) $\sin C = \frac{10 \sin 69°}{19}$

3.)

How many distinct triangles can be formed if $m\angle A = 30$, side $b = 12$, and side $a = 8$?

[A] 3   (B) 2   [C] 0   [D] 1

$$\frac{\sin 30°}{8} = \frac{\sin B}{12}$$

$\sin^{-1}(\frac{3}{4}) \approx 49°$ $180 - 49 = 131°$
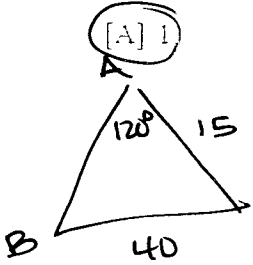$30°$ $30°$
$101°$ $19°$

4.)

Sam is designing a triangular piece for a metal sculpture. He tells Martha that two of the sides of the piece are 40 inches and 15 inches, and the angle opposite the 40-inch side measures 120°. Martha decides to sketch the piece that Sam described. How many different triangles can she sketch that match Sam's description?

(A) 1   [B] 0   [C] 3   [D] 2

$$\frac{\sin 120}{40} = \frac{\sin B}{15}$$

$\sin^{-1}(.3247...) = B$

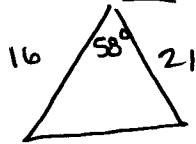$B \approx 19°$ $180 - 19 = 161°$
$120°$ $120°$
$41°$ ╳ DNMS.

5.)

Two sides of a triangular-shaped pool measure 16 feet and 21 feet, and the included angle measures 58°. What is the area, to the *nearest tenth of a square foot*, of a nylon cover that would exactly cover the surface of the pool?

16 /58°\ 21

$A = \frac{1}{2} ab \sin C°$

$A = \frac{1}{2} \cdot 16 \cdot 21 \cdot \sin 58°$

$A \approx 142.5 \, ft^2$

6.)

Two straight roads, Elm Street and Pine Street, intersect creating a 40° angle, as shown in the accompanying diagram. John's house (J) is on Elm Street and is 3.2 miles from the point of intersection. Mary's house (M) is on Pine Street and is 5.6 miles from the intersection. Find, to the *nearest tenth of a mile*, the direct distance between the two houses.
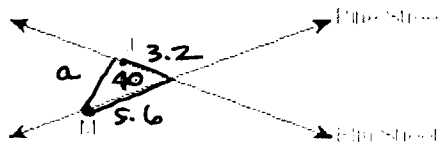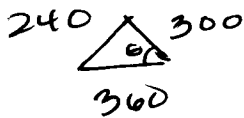
3.2   40   5.6   a   **3.8 mi**

$a^2 = b^2 + c^2 - 2bc \cos C°$

$a^2 = 3.2^2 + 5.6^2 - 2(3.2)(5.6) \cos 40°$

$a^2 = 14.1\cancel{45}.. \implies a \approx 3.8$

7.)

A farmer has a triangular field with sides of 240 feet, 300 feet, and 360 feet. He wants to apply fertilizer to the field. If one 40-pound bag of fertilizer covers 6,000 square feet, how many bags must he buy to cover the field?

240 /θ\ 300
      360

$240^2 = 300^2 + 360^2 - 2(300)(360) \cos \theta$

$\theta = \cos^{-1}(\frac{3}{4}) \approx 41.4096°$

$A = \frac{1}{2} ab \sin C$

$= \frac{1}{2}(300)(360)\sin 41.4096$

≈ 35717.6 357176   ≈ **6 BAGS**

8.)

A ski lift begins at ground level 0.75 mile from the base of a mountain whose face has a 50° angle of elevation, as shown in the accompanying diagram. The ski lift ascends in a straight line at an angle of 20°. Find the length of the ski lift from the beginning of the ski lift to the top of the mountain, to the *nearest hundredth of a mile.*

$\dfrac{\sin 30}{.75} = \dfrac{\sin 130}{7}$

Top of mountain
30°
20°   130°   50°
Beginning   Base of
of ski lift   mountain
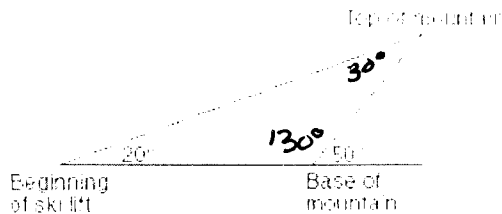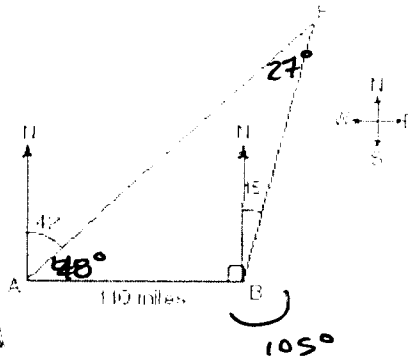
$\boxed{\approx 1.15 \text{ miles}}$

9.)

As shown in the accompanying diagram, two tracking stations, A and B, are on an east-west line 110 miles apart. A forest fire is located at F, on a bearing $42°$ northeast of station A and $15°$ northeast of station B. How far, to the *nearest mile*, is the fire from station A?
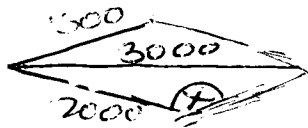
$$\frac{\sin 27°}{110} = \frac{\sin 105°}{b}$$

$$b \approx 234$$

$$\boxed{234 \text{ miles}}$$

10.)

Two tow trucks try to pull a car out of a ditch. One tow truck applies a force of 1,500 pounds while the other truck applies a force of 2,000 pounds. The resultant force is 3,000 pounds. Find the angle between the two applied forces, rounded to the *nearest degree*.

$$3000^2 = 2000^2 + 1500^2 - 2(2000)(1500)\cos x$$

$$\angle x \approx 117.2796$$

$$\boxed{117°}$$

11.)

A jet is flying at a speed of 526 miles per hour. The pilot encounters turbulence due to a 50-mile-per-hour wind blowing at an angle of $47°$, as shown in the accompanying diagram.

$$x^2 = 50^2 + 526^2 - 2(50)(526)\cos 133°$$
$$x^2 = 315049.113739259$$
$$x \approx \pm 561.292$$
$$y = 43.2616$$
$$\frac{\sin x}{526} = \frac{\sin 133}{561.292...}$$
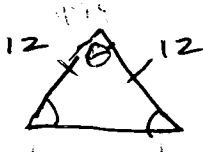$$\boxed{xy \approx 43°}$$
$$\boxed{561 \text{ mi/hr}}$$

Find the resultant speed of the jet, to the *nearest tenth of a mile per hour*. Use this answer to find the measure of the angle between the resultant force and the wind vector, to the *nearest tenth of a degree*.

$$\boxed{.43°}$$

12.)

Gregory wants to build a garden in the shape of an isosceles triangle with one of the congruent sides equal to 12 yards. If the area of his garden will be 55 square yards, find, to the *nearest tenth of a degree*, the *three* angles of the triangle.

$$A = \tfrac{1}{2} \cdot 12 \cdot 12 \cdot \cos \theta$$
$$55 = \tfrac{1}{2} \cdot 144 \cos \theta$$
$$\theta \approx 49.8°$$

$$\boxed{49.8°}$$