Pre-Calculus Name: ______________________________

(5.1) --- Law of Sines &
(5.2) --- Law of Cosines

Find the area of each triangle to the nearest tenth

1) a = 5, b = 12, c = 13

2) c = 3.58, b = 6.8, A = 39°

Solve each triangle (round to the nearest tenth)

3) b = 40, c = 45, A = 51°

4) c = 125, b = 150, C = 25°

5) $a = 24$, $b = 28$, $A = 73°$

6) $a = 8$, $b = 21$, $A = 47°$

7) $a = 9.8$, $b = 12$, $c = 23$

8) Two observers are standing on shore $\frac{1}{2}$ mile apart at points A and B. They measure the angle to a sailboat at point C at the same time. Angle A is $63°24'$ and angle B is $56°36'$. Find the distance from each observer to the sailboat.

9) Aliens are on their way to earth to abduct Mrs. Foster and Ms. Borchert in order to study brilliant Earthlings. Mrs. Foster looks due East and sees the UFO with an angle of elevation of $40°$. At the same time Ms. Borchert is 1 mile due West of Mrs. Foster. When Ms. Borchert looks due East she sees the same UFO at an angle of elevation of $25°$. Find the distance between Mrs. Foster and the UFO. How far is the UFO above the ground?

10) As Danielle stands on a bridge she notices that it is supported by triangular braces. The sides of each brace have lengths 63 ft, 46 ft, and 40 ft. In order to keep the bridge from collapsing she needs to find the angle measure opposite the 46 ft side. Help Danielle save the bridge!

11) Mr. Atkinson and Mr. Dominguez walk from opposite ends of a city block to a point on the other side of the street where they are having a *Star Trek* convention. The angle formed by their paths is $25°$. Mr. Atkinson walks 300 ft, while Mr. Dominguez walks 320 ft. How long is the city block?

12) Eric's mom will be serving *Bagel Bites* to Eric's very productive study group when they arrive. She will be serving them on a new triangular serving platter that Eric gave her for Mother's Day. If one side of the platter is 15 in long and the other two sides both measure 18 inches, find the area of the platter.

13) Ms. Borchert's 3rd period class decided to make a poster to hang on the wall of the classroom in order to declare their superiority over 4th period. To honor their Pre-Calculus knowledge they made a triangular shaped poster. Ms. Borchert's 4th period class wants to make an even bigger poster that will cover more wall space. To find the area of the 3rd period's poster they measure and find two of the sides are 8 ft and 9 ft, while the included angle measures $39°$. How large will 4th period's poster have to be in order to cover more area than 3rd periods?

14) The measures of two sides of a parallelogram are 28 in and 42 in. If the longer diagonal has measure 58 in, find the measure of the angles at the vertices.

(5.3) --- Practice with Basic Trig Identities
&
(5.4) --- Proving Basic Trig Identities

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1) The expression $\cot\theta \cdot \sec\theta$ is equivalent to

A. $\dfrac{\cos\theta}{\sin^2\theta}$ **B.** $\csc\theta$ **C.** $\dfrac{\sin\theta}{\cos^2\theta}$ **D.** $\sin\theta$ **E.** None of these

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2) The expression $\dfrac{\sec\theta}{\csc\theta}$ is equivalent to

A. $\dfrac{\cos\theta}{\sin\theta}$ **B.** $\cos\theta$ **C.** $\dfrac{\sin\theta}{\cos\theta}$ **D.** $\sin\theta$ **E.** None of these

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3) The expression $\dfrac{1-\cos^2 x}{\sin^2 x}$ is equivalent to

A. 1 **B.** $\sin x$ **C.** -1 **D.** $\cos x$ **E.** None of these

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4) The expression ((1 + cos x)(l – cos x) is equivalent to:

A. $1+\cos^2 x$ **B.** $\sin^2 x$ ` **C.** $\sec^2 x$ **D.** $\csc^2 x$ **E.** None of these

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5) The expression $\cos^2(4\theta) + \sin^2(4\theta)$ is equivalent to

A. 1 **B.** – 4 **C.** 2 **D.** 4 **E.** None of these

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6) The expression $\sin A + \cot^2 A \sin A$ is equivalent to

A. 1 **B.** $\sec A$ **C.** $\sin A$ **D.** $\csc A$ **E.** None of these

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7) If θ is a positive acute angle and $\sin\theta = a$ which expression represents $\cos\theta$ in terms of a?

A. $\sqrt{a}$ **B.** $\dfrac{1}{\sqrt{a}}$ **C.** $\sqrt{1-a^2}$ **D.** $\dfrac{1}{\sqrt{1-a^2}}$ **E.** None of these

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Simplify each of the following:

8) $\dfrac{\sin^2\beta\cot\beta}{\cos\beta}$

9) $\sin x - \sin x\cos^2 x$

10) $\sin^2 x + \cos\left(\dfrac{\pi}{2} - x\right) - 1 + \cos^2 x$

Solve each of the following on the interval from $[0, 2\pi)$

11) $2\cos^2 x - 5\cos x + 3 = 0$

12) $\cos^2 x + 4\sin x + 4 = 0$

13) $4\cos^2 x - 3 = 0$

14) $2\tan x \sin x + \tan x = 0$

Verify that each of the following is an identity

15) $\dfrac{\cos^2\theta}{\sin^2\theta} + \csc\theta\sin\theta = \csc^2\theta$

16) $\dfrac{1}{1-\sin x} + \dfrac{1}{1+\sin x} = 2\sec^2 x$

17) $\dfrac{1+\cos(2\alpha)}{\sin(2\alpha)} = \cot\alpha$

18) $\dfrac{1+\cos(2\alpha)}{\sin(2\alpha)} = \cot\alpha$

(5.5) --- Practice with Sum & Difference Identities

1) If $\sin x = \frac{4}{5}$, where $0° \le x \le 90°$, find the value of $\cos(x + 180°)$.

A. $\frac{4}{5}$ **B.** $-\frac{4}{5}$ **C.** $\frac{3}{5}$ **D.** $-\frac{3}{5}$ **E.** None of these

2) If $\sin A = \frac{4}{5}$, $\tan B = \frac{5}{12}$, and angles A, and B are in Quadrant 1, what is the value of $\sin(A+B)$?

A. $\frac{63}{65}$ **B.** $\frac{33}{65}$ **C.** $-\frac{63}{65}$ **D.** $-\frac{33}{65}$ **E.** None of these

3) The expression $\cos(40°)\ \cos(10°) + \sin(40°)\ \sin(10°)$ is equivalent to:

A. $\cos 30°$ **B.** $\sin 30°$ **C.** $\cos 50°$ **D.** $\sin 50°$ **E.** None of these

4) If A and B are positive acute angles, $\sin A = \frac{5}{13}$, and $\cos B = \frac{4}{5}$, what is the value of $\sin(A + B)$?

A. $\frac{56}{65}$ **B.** $\frac{33}{65}$ **C.** $\frac{63}{65}$ **D.** $-\frac{16}{65}$ **E.** None of these

5) If $\sin x = \frac{12}{13}$, $\cos y = \frac{3}{5}$, and x and y are acute angles, the value of $\cos(x-y)$ is

A. $\frac{21}{65}$ **B.** $-\frac{14}{65}$ **C.** $\frac{63}{65}$ **D.** $-\frac{33}{65}$ **E.** None of these

Use the sum or difference identities to find the exact value of each function

6) $\sin 105°$

7) $\tan(-15°)$

8) $\sin 10° \cos 20° + \cos 10° \sin 20°$

Use the sum or difference identities to verify that each of the following is an identity

9) $cos^2 x\ cos\left(\frac{3\pi}{2} - x\right) + sin^2 x\ cos\left(\frac{3\pi}{2} - x\right) = -sin\ x$

10) $\sin\left(\frac{3\pi}{2} - x\right) = -\cos x$

(5.6) --- Practice with Double & Half Angle Identities

1) If $0 \le \theta \le 90°$ and $\sin\theta = \dfrac{\sqrt{5}}{3}$, then $\cos(2\theta) =$ ___

(a) $\dfrac{1}{9}$ (b) $\dfrac{1}{3}$ (c) $-\dfrac{1}{9}$ (d) $-\dfrac{1}{3}$

2) If $0 \le x \le 90°$ and $\sin x = \dfrac{12}{13}$, then $\cos(2x) =$ _____

(a) $\dfrac{25}{169}$ (b) $-\dfrac{25}{169}$ (c) $\dfrac{119}{169}$ (d) $-\dfrac{119}{169}$

3) If $0 \le x \le 90°$ and $\cos x = \dfrac{4}{5}$, then $\cos(2x) =$ _____

(a) $\dfrac{6}{25}$ (b) $\dfrac{2}{25}$ (c) $\dfrac{-1}{25}$ (d) $\dfrac{7}{25}$

4) If $0 \le \theta \le 90°$ such that $\sin\theta = \dfrac{5}{13}$, then $\sin(2\theta) =$ _____

(a) $\dfrac{12}{13}$ (b) $\dfrac{60}{169}$ (c) $\dfrac{10}{26}$ (d) $\dfrac{120}{169}$

5) If $0 \le x \le 90°$ and $\sin x = \dfrac{1}{2}$, then $\sin(2x) =$ _____

(a) $-\dfrac{1}{2}$ (b) $-\dfrac{\sqrt{3}}{2}$ (c) $\dfrac{1}{2}$ (d) $\dfrac{\sqrt{3}}{2}$

6) If $0 \le \theta \le 90°$ and $\sin 2\theta = \dfrac{\sqrt{3}}{2}$, then $(\cos\theta + \sin\theta)^2$ equals

(a) 1 (b) 30° (c) $1 + \dfrac{\sqrt{3}}{2}$ (d) 60°

7) The expression $\dfrac{\sin 2A}{2\cos A}$ is equivalent to

(a) $\cos A$ (b) $\sin A$ (c) $\tan A$ (d) $\dfrac{1}{2}\sin A$

8) The expression $\dfrac{\sin 2\theta}{\sin^2\theta}$ is equivalent to

(a) $\dfrac{2}{\sin\theta}$ (b) $2\cot\theta$ (c) $2\cos\theta$ (d) $2\tan\theta$

9) The expression $\dfrac{2\cos\theta}{\sin 2\theta}$ is equivalent to

(a) $\csc\theta$ (b) $\cot\theta$ (c) $\sec\theta$ (d) $\sin\theta$

10) If θ is an obtuse angle and $\sin\theta = b$, then it can be concluded that

(a) $\tan\theta > \square b$ (b) $\cos 2\theta > b$ (c) $\cos\theta > \square b$ (d) $\sin 2\theta < \square b$

11) If $\sin\theta = 3/5$ and θ is in the 2nd quadrant find each of the following:

a) $\sin(2\theta)$ **b)** $\cos(2\theta)$ **b)** $\tan(2\theta)$

Use double angle identities to write each of the following as the function of one angle and THEN evaluate.

12) $1 - 2\sin^2\left(\dfrac{\pi}{8}\right)$

13) $\dfrac{2\tan 75°}{1 - \tan^2 75°}$