Precalculus
4.7, 4.8, 6.1, 6.2 Test Review

Name **Key**

Period_____ Date_____

Solve the following triangles.

1. $m\angle C = 31°, b = 22, c = 14$

A
22 / 14
C /31° \ B

SSA pattern
could be 2 triangles

A
/31°\
C /___\ B

$$\frac{\sin B}{22} = \frac{\sin 13°}{14}$$

$\angle B = 20.7°$
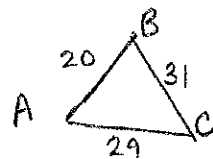
$\angle A = 128.3°$

$\angle B = 159.3°$

$\angle A = $ Not possible

$$\frac{a}{\sin 128.3°} = \frac{14}{\sin 31°}$$

$a = 21.3$

2. $a = 31, c = 20, b = 29$

B
20 / \ 31
A /____\ C
    29

$31^2 = 20^2 + 29^2 - 2(20)(29)\cos A$

$-280 = -1160 \cos A$
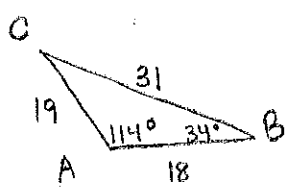
$\angle A = 76.0°$

$$\frac{\sin C}{20} = \frac{\sin 76°}{31}$$

$\angle C = 38.8°$

$\angle B = 65.2°$

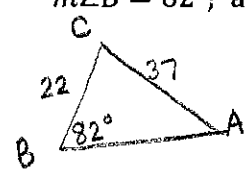**3.** $m\angle A = 114°, m\angle B = 34°, a = 31$
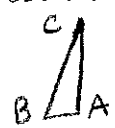
C
/ \ 31
19 /114° 34°\ B
A   18

$\angle C = 32°$

$$\frac{b}{\sin 34°} = \frac{31}{\sin 114°} \quad b = 19$$

$$\frac{c}{\sin 32°} = \frac{31}{\sin 114°} \quad c = 18$$

4. $m\angle B = 82°, a = 22, b = 37$
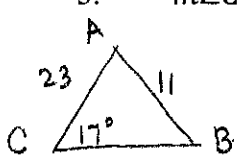
C
22 / 37
B /82°___ A

SSA Pattern
could be 2 triangles

C
/|
B /_| A

$$\frac{\sin A}{22} = \frac{\sin 82°}{37}$$

$\angle A = 36.1°$

$\angle C = 61.9°$

$\angle A = 143.9°$

$\angle C = $ Not Possible

$$\frac{c}{\sin 61.9°} = \frac{37}{\sin 82°}$$

$c = 33$

5. $m\angle C = 17°, b = 23, c = 11$

A
23 / \ 11
C /17°\ B

SSA Pattern
could be 2 triangles

A
/|
C /_| B
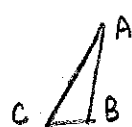
$$\frac{\sin B}{23} = \frac{\sin 17°}{11}$$

$\angle B = 37.7°$

$\angle A = 125.3°$

$\angle B = 142.3°$

or $\angle A = 20.7°$

$$\frac{a}{\sin 125.3°} = \frac{11}{\sin 17°}$$
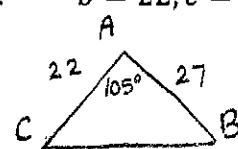
$a = 30.7$

$$\frac{a}{\sin 20.7°} = \frac{11}{\sin 17°}$$

$a = 13.3$

6. $b = 22, c = 27, m\angle A = 105°$

A
22 /105°\ 27
C /_____\ B

$a^2 = 22^2 + 27^2 - 2(22)(27)\cos 105°$
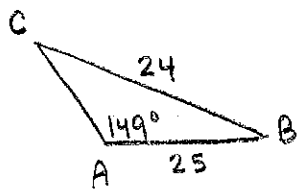
$a = 39$

$$\frac{\sin B}{22} = \frac{\sin 105°}{39}$$

$\angle B = 33°$

$\angle C = 42°$

7. $m\angle A = 149°, c = 25, a = 24$

C
24
$149°$
A 25 B
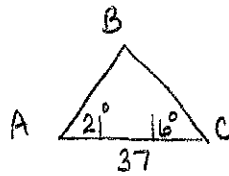
$\dfrac{\sin C}{25} = \dfrac{\sin 149°}{24}$

$\angle C = 32.4°$

$\angle B = $ Not possible

No Solution

8. $m\angle C = 16°, m\angle A = 21°, b = 37$

B
A $21°$ $16°$ C
37

$\angle B = 143°$

$\dfrac{c}{\sin 16°} = \dfrac{37}{\sin 143°}$ $c = 16.9$

$\dfrac{a}{\sin 21°} = \dfrac{37}{\sin 143°}$ $a = 22$

Find the area of each triangle to the nearest tenth.

9. ΔFDE: $d = 6$ mi, $m\angle F = 106°, e = 7$ mi

F
7 $106°$ 6
D   E

Area $= \dfrac{1}{2}(7)(6)\sin 106°$

$A = 20.2$

10. ΔCAB: $a = 7$ in, $b = 8.9$ in, $c = 14.3$ in

B
7   14.3
C   A
8.9
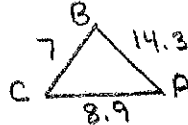
$S = (7 + 14.3 + 8.9)/2$

$S = 14.65$

$A = \sqrt{14.65(14.65-7)(14.65-14.3)(14.65-8.9)}$

$A = 15.0$

11. ΔEFD: $d = 6$ mi, $m\angle E = 107°, f = 5$ mi

$A = \dfrac{1}{2}(6)(5)\sin 107°$

$A = 14.3$
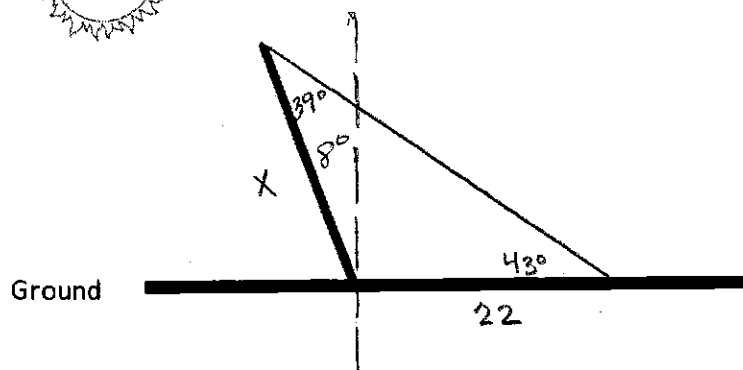
12. ΔHPK: $p = 15$ km, $k = 7$ km, $h = 11.1$ km

$S = (15 + 7 + 11.1)/2$

$S = 16.55$

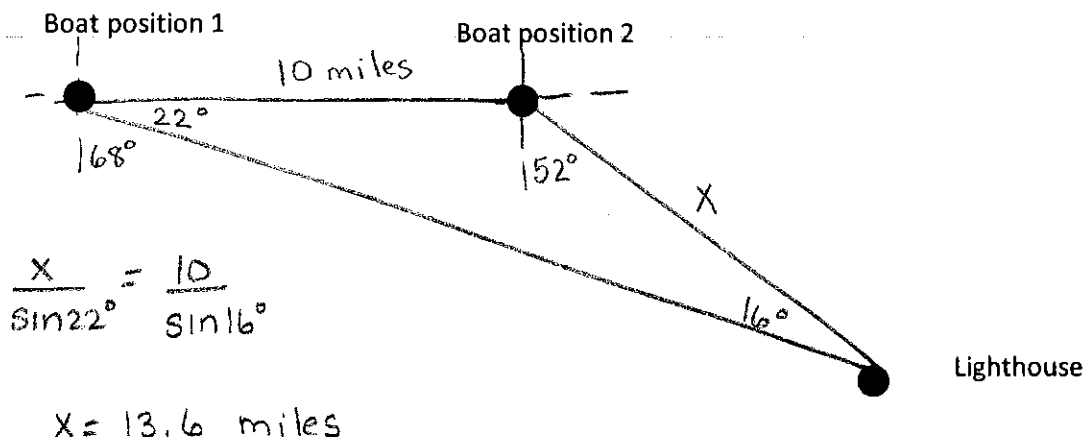$A = \sqrt{16.55(16.55-15)(16.55-7)(16.55-11.1)}$

$A = 36.5$

13. A poll tilts towards the sun at an 8° angle from the vertical as it casts a 22 foot shadow. The angle of elevation from the shadow to the top of the pole is 43°. How tall is the pole?

$39°$
$8°$
X
$43°$
Ground
22

$\dfrac{X}{\sin 43°} = \dfrac{22}{\sin 39°}$

$X = 23.8$ ft

14. A boat is sailing due east parallel to the shoreline at a speed of 20 miles per hour. At a given time the bearing to a lighthouse is S 68° E, and 30 minutes later the bearing is S 52° E. Find the distance from the boat to the light house at Boat Position 2.

Boat position 1   Boat position 2

10 miles

22°

168°

152°

X

16°

Lighthouse

$$\frac{X}{\sin 22°} = \frac{10}{\sin 16°}$$

X = 13.6 miles

15. Two planes leave an airport at the same time. One plane is flying 650 mph at a bearing N 37° E, and the other plane is flying at 825 mph at a bearing of N 53° w. How far apart are the planes after flying for 2 hours?

X   Plane 1

Plane 2

1650 mi   1300 mi

53°   37°

Airport
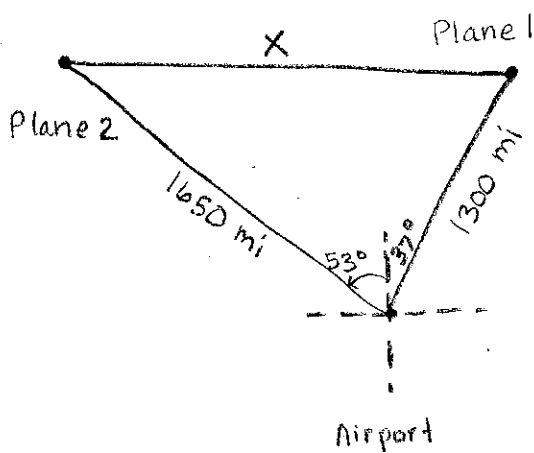
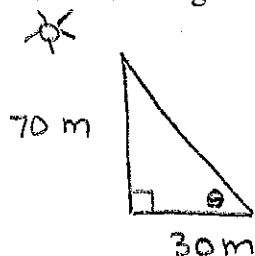$$X^2 = 1650^2 + 1300^2 - 2(1650)(1300)\cos 90°$$

X = 2100.6 miles

or

Pythagorean theorem since it is a right triangle.

$$X^2 = (1650)^2 + (1300)^2$$

X = 2100.6 miles

16. . The height of a radio transmission tower is 70 meters, and it casts a shadow of length 30 meters. Draw a diagram and find the angle of elevation of the sun.
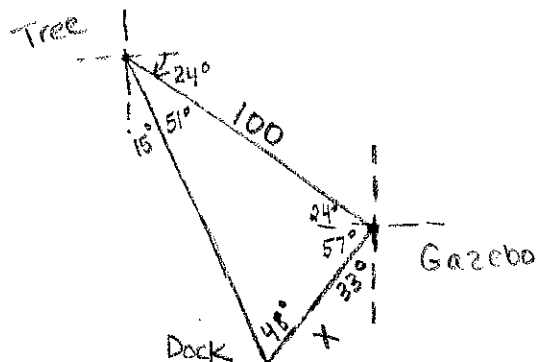
70 m

θ

30 m

$$\tan \theta = \frac{70}{30}$$

$$\tan^{-1}\left(\frac{70}{30}\right) = \theta$$

$$\theta = 66.8°$$

17. A footbridge is to be built across a small lake from a gazebo to a dock. From a tree 100 yards from the gazebo the bearing in E 24° S. From the tree to the dock the bearing is S 15° E. The bearing from the gazebo to the dock is S 33° W. What is the length of the bridge?

$$\frac{x}{\sin 51°} = \frac{100}{\sin 48°}$$

$$x = 104.6 \text{ yds}$$

18. A footbridge is to be built across a small lake from a gazebo to a dock. From a tree 100 yards from the gazebo the bearing in E 16° S. From the tree to the dock the bearing is S 28° E. The bearing from the gazebo to the dock is S 41° W. What is the length of the bridge?

$$x = 77.1 \text{ yds}$$

19.   A town planning board wishes to place sod on their village commons that is in the shape of a triangle whose sides have lengths of 120 feet, 165 feet, and 200 feet. If the sod costs $0.35 per square foot, determine the cost, to the nearest dollar, for covering the commons in sod.
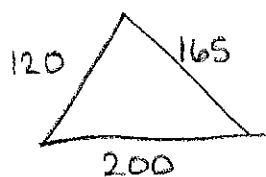
$$S = 242.5$$
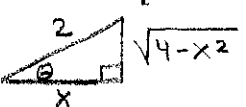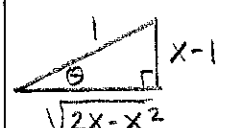
$$A = \sqrt{242.5\,(242.5-120)(242.5-200)(242.5-165)}$$
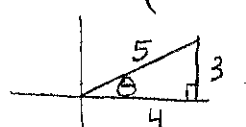
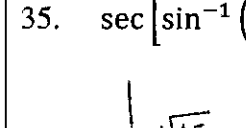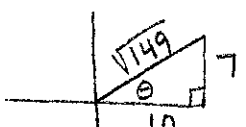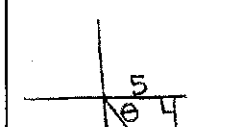$$A = 9891.7 \text{ ft}^2$$

cost $3462.08
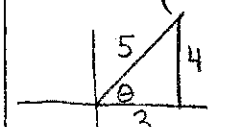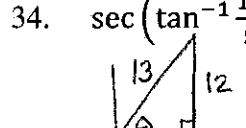
Use your unit circle to answer the following questions.

20. $\sin^{-1}\left(-\frac{1}{2}\right) = -\frac{\pi}{6}$	21. $\tan \pi/4 = 1$
22. $\sec(5\pi/6) = \frac{-2}{\sqrt{3}} = \frac{-2\sqrt{3}}{3}$	23. $\cos^{-1} 1 = 0$
24. $\tan^{-1} 1 = \pi/4$	25. $\sin(4\pi/3) = \frac{-\sqrt{3}}{2}$
26. $\tan(3\pi/2) = \frac{-1}{0} = $ undefined	27. $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right) = \frac{5\pi}{6}$
28. $\tan^{-1}(-\sqrt{3}) = -\frac{\pi}{3}$	29. $\sin^{-1} 1 = \pi/2$

Write an algebraic expression that is equivalent to the expression.

30. $\tan\left[\arccos\left(\frac{x}{2}\right)\right]$ $\tan\theta = \frac{\sqrt{4-x^2}}{x}$	31. $\sec[\arcsin(x-1)]$ $(x-1)^2 + a^2 = 1^2$ $a = \sqrt{1-(x-1)^2}$ $a = \sqrt{1-(x^2-2x+1)}$ $a = \sqrt{-x^2+2x}$ $\sec\theta = \frac{1}{\sqrt{2x-x^2}}$

Find the exact value of the expression.

32. $\cos\left(\arctan\frac{3}{4}\right)$ $\cos\theta = \frac{4}{5}$	33. $\tan\left(\arccos\frac{3}{5}\right)$ $\tan\theta = \frac{4}{3}$
34. $\sec\left(\tan^{-1}\frac{12}{5}\right)$ $\sec\theta = \frac{13}{5}$	35. $\sec\left[\sin^{-1}\left(-\frac{1}{4}\right)\right]$ $\sec\theta = \frac{4}{\sqrt{15}} = \frac{4\sqrt{15}}{15}$
36. $\cot\left(\arctan\frac{7}{10}\right)$ $\cot\theta = \frac{10}{7}$	37. $\cot\left[\arcsin\left(-\frac{12}{13}\right)\right]$ $\cot\theta = \frac{-5}{12}$