L3 Geometry

Chapter 8 Study Guide

Name: ANSWER KEY

Block: ______ Date: ______

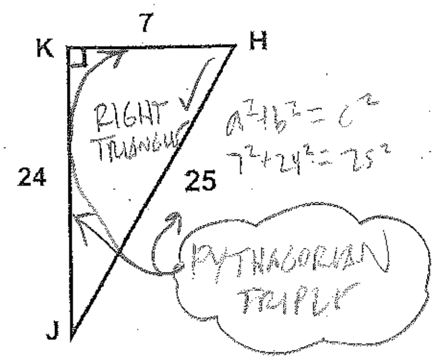
Key Concepts:

PYTHAGOREAN THEOREM:

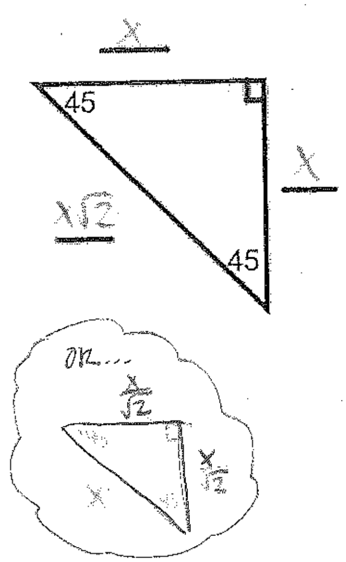
Formula for Right Triangles: $a^2 + b^2 = c^2$

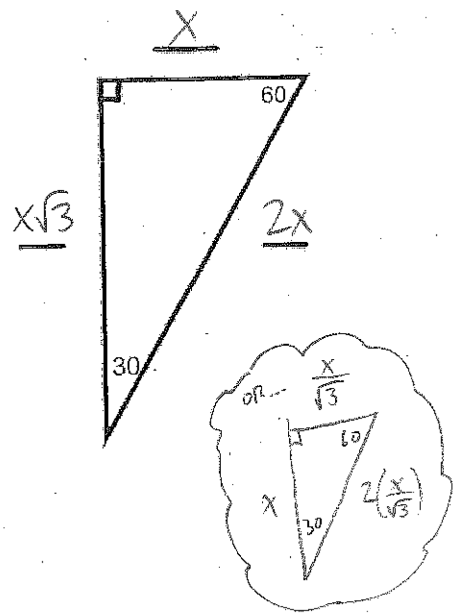
Formula for Obtuse Triangles: $a^2 + b^2 < c^2$

Formula for Acute Triangles: $a^2 + b^2 > c^2$



SPECIAL RIGHT TRIANGLES:

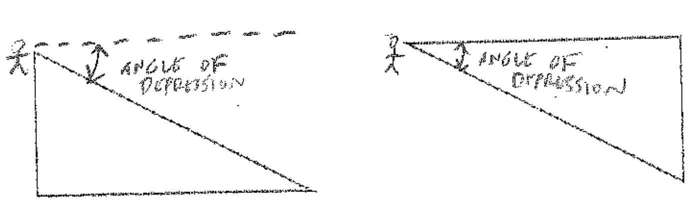




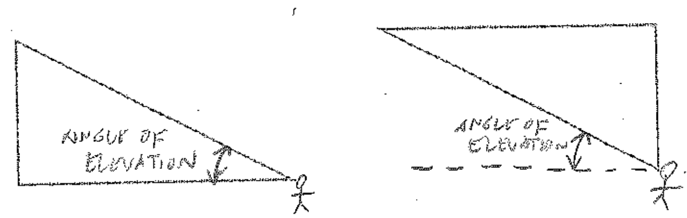
Trigonometric Ratio	Ratio (words)	Ratio (sides)
sin ∠H =	OPPOSITE LEG / HYPOTENUSE	$\frac{24}{25}$
cos ∠H =	ADJACENT LEG / HYPOTENUSE	$\frac{7}{25}$
tan ∠H =	OPPOSITE LEG / ADJACENT LEG	$\frac{24}{7}$

We use sine, cosine, and tangent when solving for MISSING SIDES in triangles. We use inverses when solving for MISSING ANGLES in triangles.

Draw a Diagram: Angle of Depression



Angle of Elevation



Law of Sines: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

Cases: 2 SIDES & NON-INCLUDED ∠ ; 2 ∠'S & NON-INCLUDED SIDE

Law of Cosines: $a^2 = b^2 + c^2 - 2bc \cos A$

Cases: ALL 3 SIDES KNOWN ; 2 SIDES & INCLUDED ANGLE

Used with ACUTE & OBTUSE Triangles

YOU CAN USE THEM ON RIGHT TRIANGLES TOO, BUT WHY WOULD YOU?

L3 Geometry

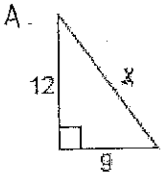
Chapter 8 Practice Problems for Test

Name: ____________________

Block: ______ Date: ______

1. Solve for the value of x. Leave answer in simplest radical form when possible. State the method used to solve for each.

A.



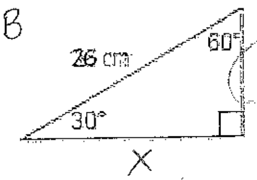
PYTHAGOREAN THEOREM

$81 + 144 = x^2$

$225 = x^2$

$x = 15$

B

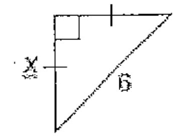


13

30-60-90

$x = 13\sqrt{3}$

C



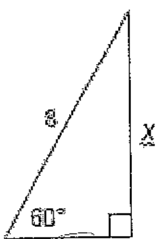
45-45-90

$x = \frac{6}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$x = \frac{6\sqrt{2}}{\sqrt{4}} = \frac{6\sqrt{2}}{2} = 3\sqrt{2}$

$x = 3\sqrt{2}$

D

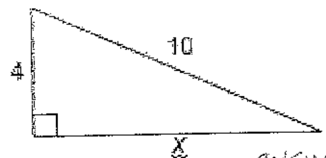


4

30-60-90

$x = 4\sqrt{3}$

E



PYTHAG. THEOREM

$x^2 + 4^2 = 10^2$

$x^2 + 16 = 100$

$\sqrt{x^2} = \sqrt{84}$

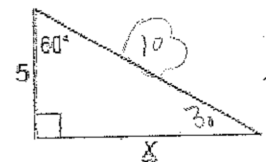
$\sqrt{84}$

$\sqrt{4}\sqrt{21}$

SIMPLIFY RADICAL

$x = 2\sqrt{21}$

F

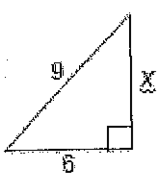


10

30-60-90

$x = 5\sqrt{3}$

G



PYTHAG. THEOREM

SIMPLIFY RADICAL

$x^2 + 6^2 = 9^2$

$x^2 + 36 = 81$

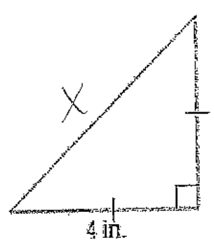
$\sqrt{x^2} = \sqrt{45}$

$\sqrt{45}$

$\sqrt{9}\sqrt{5}$

$x = 3\sqrt{5}$

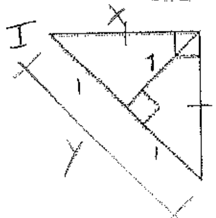
H



45-45-90

$x = 4\sqrt{2}$

I



45-45-90

$x = \sqrt{2}$ $y = 2$

2. The side lengths for a triangle are given. Classify the triangle as acute, right, or obtuse.

A. $\sqrt{5}$, 4, 5

$(\sqrt{5})^2 + 4^2 \quad 5^2$

$5 + 16 \quad 25$

$21 < 25$

OBTUSE

B. $\sqrt{3}$, 3, $\sqrt{3}$

C MUST BE THE LONGEST SIDE

$(\sqrt{3})^2 + (\sqrt{3})^2 \quad 3^2$

$3 + 3 \quad 9$

$6 < 9$

OBTUSE

C. 24, 32, 38

$24^2 + 32^2 \quad 38^2$

$576 + 1024 \quad 1444$

$1600 > 1444$

ACUTE

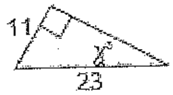
3. Solve for the value of x. Show work (1[st] step). Round to the nearest tenth and label with proper units.

A

$(5)(\tan 48) = \frac{x}{5}(5)$

$x = 5.6$

B

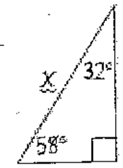


$\sin x = \frac{11}{23}$

$\cancel{\sin^{-1}}(\sin x) = \sin^{-1}\left(\frac{11}{23}\right)$

$x = 28.6°$

C



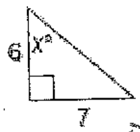
$(x)\sin 58 = \frac{8}{x}\cdot x$

$\frac{(x)(\sin 58)}{\sin 58} = \frac{8}{\sin 58}$

$x = 9.4$

$\left(\text{OR } \cos 32 = \frac{8}{x}\right)$

D

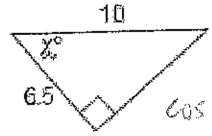


$\tan x = \frac{7}{6}$

$\cancel{\tan^{-1}}(\tan x) = \tan^{-1}\left(\frac{7}{6}\right)$

$x = 49.4°$

E

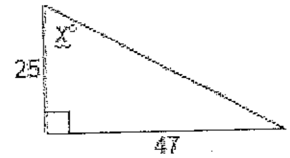


$\cos x = \frac{6.5}{10}$

$\cancel{\cos^{-1}}(\cos x) = \cos^{-1}\left(\frac{6.5}{10}\right)$

$x = 49.5°$

F



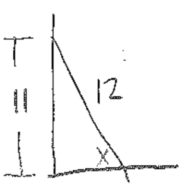
$\tan x = \frac{47}{25}$

$\cancel{\tan^{-1}}(\tan x) = \tan^{-1}\left(\frac{47}{25}\right)$

$x = 62.0$

Word Problems: Draw a diagram. Set up an equation and solve. Label with proper units.

4. A 12-ft ladder is propped against a vertical wall. The top end is 11 ft above the ground. What is the measure of the angle formed by the ladder with the ground?

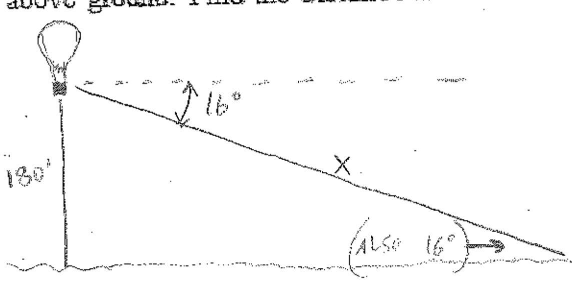


$\sin x = \frac{11}{12}$

$\cancel{\sin^{-1}}(\sin x) = \sin^{-1}\left(\frac{11}{12}\right)$

$x = 66.4°$

5 A couple is taking a balloon ride. After 25 minutes aloft, they measure the angle of depression from the balloon to its launch place as 16°. They are 180 ft above ground. Find the distance from the balloon to its launch place.



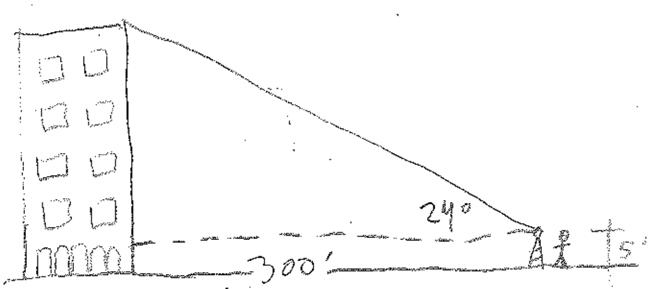
$(x)(\sin 16) = \frac{180}{x}\cdot x$

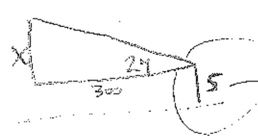
$\frac{(x)(\sin 16)}{\sin 16} = \frac{180}{\sin 16}$

$x = 653.0$ feet

6 A surveyor is 300 ft from the base of an apartment building. The angle of elevation to the top of the building is 24°, and her angle-measuring device is 5 ft above the ground. Find the height of the building.

$(300)(\tan 24) = \frac{x}{300}\cdot 300$





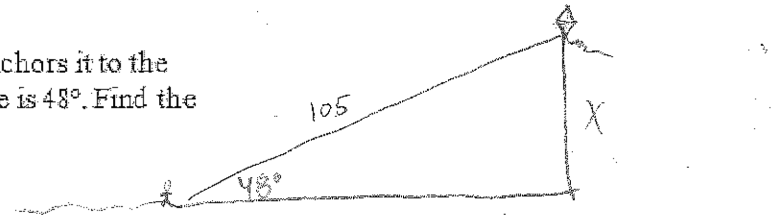
$x = (300)(\tan 24)$

$x = 133.6$

$+5$

138.6 feet

7. Your friend is flying a kite. She lets out 105 ft of string and anchors it to the ground. She determines that the angle of elevation of the kite is 48°. Find the height the kite is from the ground.

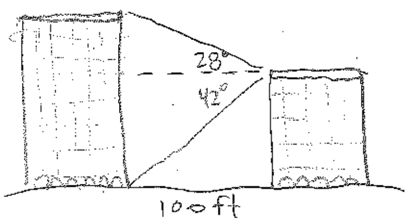


$(105)(\sin 48) = \frac{x}{105} \cdot 105$

$x = (105)(\sin 48)$

$x = 78.0$ feet above ground

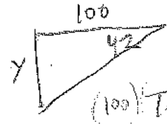
8. Two office buildings are 100 ft apart. From the edge of the shorter building, the angle of elevation to the top of the taller building is 28°, and the angle of depression to the bottom is 42°. How tall is each building? Round to the nearest foot.



$\tan 28 = \frac{x}{100}$

$x = (100)(\tan 28)$

$x = 53.2$ feet



$(100)\tan 42 = \frac{y}{100} \cdot 100$

$y = (100)(\tan 42)$

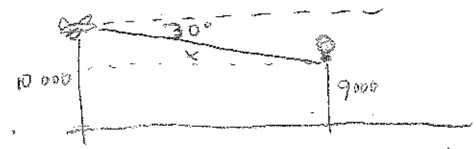
$y = 90.0$ feet

53.2
+90.0

TALL BLDG 143.2 feet

SHORT BLDG 90 feet

9. A plane flying at 10,000 ft spots a hot air balloon in the distance. The balloon is 9000 ft above ground. The angle of depression from the plane to the balloon is 30°. Find the distance from the plane to the balloon.



$(x)(\sin 30) = \frac{1000}{x} \cdot x$

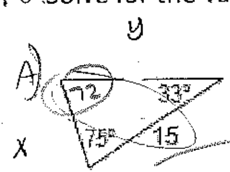
$\frac{(x)(\sin 30)}{\sin 30} = \frac{1000}{\sin 30}$

$x = \frac{1000}{\sin 30}$

$x = 2000$ feet

10. Solve for the value of the variables using Law of Sines or Law of Cosines

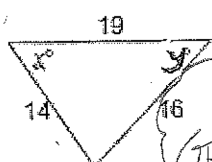
A)



180
−75
−33
72°

LAW OF SINES (TWICE)

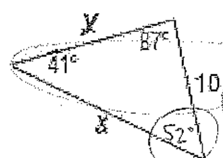
B)



LAW OF COSINES (THEN LAW OF SINES)

SEE NEXT PAGE FOR 10A – 10E

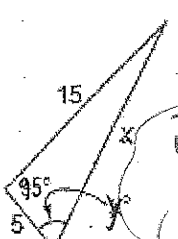
C)



180
−87
−41
52°

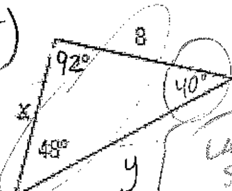
LAW OF SINES (TWICE)

D)



LAW OF COSINES (THEN LAW OF SINES)

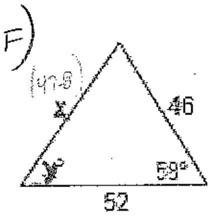
E)



180
−92
−48
40

LAW OF SINES (TWICE)

F)



LAW OF COSINES (THEN LAW OF SINES)

$x^2 = 52^2 + 46^2 - 2(52)(46)\cos 58$

$x^2 = 2704 + 2116 - (4784 \cos 58)$

$x^2 = 4820 - (2535.13376)$

$x^2 = 2284.86624$

$x = 47.8$

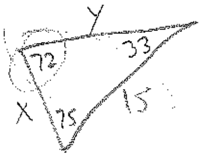
$\frac{\sin 58}{47.8} = \frac{\sin y}{46}$

$\frac{(47.8)(\sin y)}{47.8} = \frac{(46)(\sin 58)}{47.8}$

$\sin^{-1}(\sin y) = \sin^{-1}(.81611)$

$y = 54.7°$

10 A)



$$\frac{\sin 72}{15} = \frac{\sin 33}{X}$$

$$\frac{X \cancel{\sin 72}}{\cancel{\sin 72}} = \frac{15 \sin 33}{\sin 72}$$

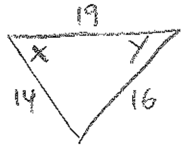
$$X = 8.6$$

$$\frac{\sin 72}{15} = \frac{\sin 75}{Y}$$

$$\frac{Y \cancel{\sin 72}}{\cancel{\sin 72}} = \frac{15 \sin 75}{\sin 72}$$

$$Y = 15.2$$

10 B)



$$16^2 = 14^2 + 19^2 - 2(14)(16)\cos X$$

$$256 = 196 + 361 - (448 \cos X)$$

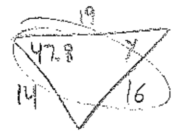
$$256 = 557 - (448 \cos X)$$

$$-557 \quad -557$$

$$\frac{-301}{-448} = \frac{-\cancel{448} \cos X}{-\cancel{448}}$$

$$\cos^{-1}(.671875) = \cancel{\cos^{-1}}(\cos X)$$

$$47.8 = X$$



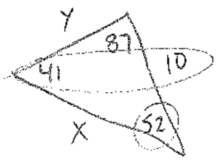
$$\frac{\sin 47.8}{16} = \frac{\sin Y}{14}$$

$$\frac{\cancel{16} \sin Y}{\cancel{16}} = \frac{14 \sin 47.8}{16}$$

$$\cancel{\sin^{-1}}(\sin Y) = \sin^{-1}(.648204)$$

$$Y = 40.4°$$

10 C)



$$\frac{\sin 41}{10} = \frac{\sin 87}{X}$$

$$\frac{X \cancel{\sin 41}}{\cancel{\sin 41}} = \frac{10 \sin 87}{\sin 41}$$

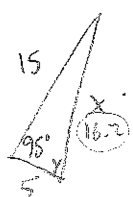
$$X = 15.2$$

$$\frac{\sin 41}{10} = \frac{\sin 52}{Y}$$

$$\frac{Y \cancel{\sin 41}}{\cancel{\sin 41}} = \frac{10 \sin 52}{\sin 41}$$

$$Y = 12.0$$

10 D)



$$X^2 = 5^2 + 15^2 - 2(5)(15)\cos 95$$

$$X^2 = 25 + 225 - (150 \cos 95)$$

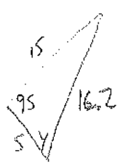
$$X^2 = 250 - (150 \cos 95)$$

$$X^2 = 250 - (-13.07336)$$

$$\sqrt{X^2} = \sqrt{263.07336}$$

$$X = 16.2$$

WATCH OUT FOR MINUS A NEGATIVE #!!
IT MAKES IT ADDITION!!



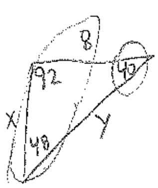
$$\frac{\sin 95}{16.2} = \frac{\sin Y}{15}$$

$$\frac{\cancel{16.2} \sin Y}{\cancel{16.2}} = \frac{15 \sin 95}{16.2}$$

$$\cancel{\sin^{-1}}(\sin Y) = \sin^{-1}(.9224)$$

$$Y = 67.3°$$

10 E)



$$\frac{\sin 48}{8} = \frac{\sin 40}{X}$$

$$\frac{X \cancel{\sin 48}}{\cancel{\sin 48}} = \frac{8 \sin 40}{\sin 48}$$

$$X = 6.9$$

$$\frac{\sin 48}{8} = \frac{\sin 92}{Y}$$

$$\frac{Y \sin 48}{\sin 48} = \frac{8 \sin 92}{\sin 48}$$

$$Y = 10.8$$