Name: KEY Date: _____ Period: _____ Geometry w/ Trig

Summary of Unit 7 (Chapter 8)

Basic Algebra Skills

- Simplify Radicals: $\sqrt{76} = \sqrt{4}\cdot\sqrt{19} = 2\sqrt{19}$
- Square Radicals: $(7\sqrt{2})^2 = 49\cdot 2 = 98$
- Rationalize radical in denominator: $\frac{6}{\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}} = \frac{6\sqrt{2}}{2} = 3\sqrt{2}$

Section 8.2:

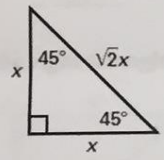
- For right triangles only → Pythagorean Theorem $c^2 = a^2 + b^2$
  - "a" and "b" are the legs of the right triangle
  - "c" is the hypotenuse of the right triangle
    - across from the right angle
    - longest side

3 numbers can be side lengths of a triangle only if $a + b > c$.

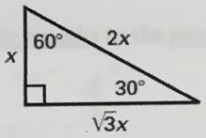
- A triangle is acute if $c^2 < a^2 + b^2$
- A triangle is obtuse if $c^2 > a^2 + b^2$
- A triangle is right if $c^2 = a^2 + b^2$

Section 8.3:

- Two special right triangles: 45°-45°-90° and 30°-60°-90°

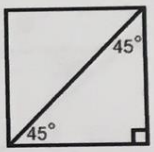


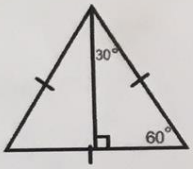
45	45	90
1	1	$\sqrt{2}$



30	60	90
1	$\sqrt{3}$	2

Found in squares and equilateral triangles:

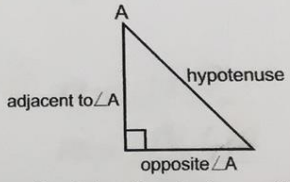




Section 8.4:

- **SOH CAH TOA**

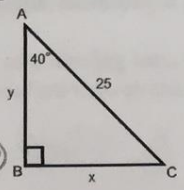
$$\sin = \frac{opp}{hyp} \qquad \cos = \frac{adj}{hyp} \qquad \tan = \frac{opp}{adj}$$



- Solving a right triangle means finding all 6 missing parts of a right triangle (you will always be given 3 parts)

Example 1: Finding 2 missing side lengths

Use regular trig (sin, cos, tan):



$\sin(40) = \frac{x}{25}$ $\cos(40) = \frac{y}{25}$

$x = 25\cdot\sin(40)$ $y = 25\cos(40)$

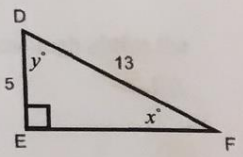
$x = 16.1$ $y = 19.2$

Example 2: Finding 2 missing angle measures

Use inverse trig ($\sin^{-1}, \cos^{-1}, \tan^{-1}$):

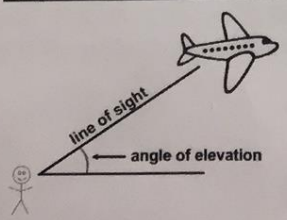
$x = \sin^{-1}\left(\frac{5}{13}\right) = 22.6°$

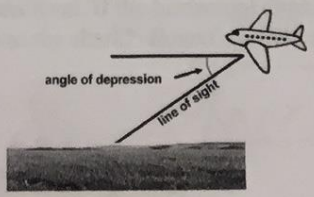
$y = \cos^{-1}\left(\frac{5}{13}\right) = 67.4°$



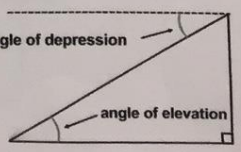
Section 8.5:

- **Angle of Elevation or Angle of Depression**: an angle that your line of sight makes with a line drawn horizontally

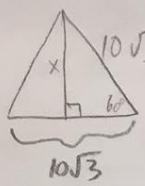




NOTICE:



19) Find the exact area of an equilateral triangle with side lengths of $10\sqrt{3}$ m.



30	60	90
1	$\sqrt{3}$	2
$5\sqrt{3}$	x	$10\sqrt{3}$

$\frac{\sqrt{3}}{x} = \frac{1}{5\sqrt{3}}$

$5 \cdot 3 = x$

$x = 15$

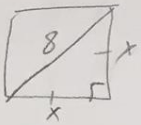
$A = \frac{1}{2}(10\sqrt{3})(15)$

$\frac{1}{2} \cdot 150\sqrt{3}$

$75\sqrt{3}$

Area = $75\sqrt{3}$ m²

20) The length of the diagonal of a square is 8 cm. Find the exact area of the square.



45	45	90
1	1	$\sqrt{2}$
x	x	8

$\frac{1}{x} = \frac{\sqrt{2}}{8}$

$8 = x\sqrt{2}$

$x = \frac{8}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{8\sqrt{2}}{2} = 4\sqrt{2}$

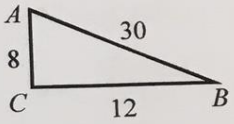
$A = 4\sqrt{2} \cdot 4\sqrt{2}$

$= 16 \cdot 2$

$= 32$

Area = 32 cm²

Find each trigonometric ratio for the given angles using the diagram. Simplify all fractions.



21) $\sin B = \frac{8}{20} = \frac{4}{15}$

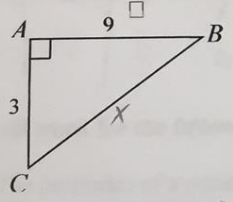
22) $\cos A = \frac{8}{30} = \frac{4}{15}$

23) $\tan A = \frac{12}{8} = \frac{3}{2}$

24) $\tan B = \frac{8}{12} = \frac{2}{3}$

Solve the right triangle. Round side lengths to the nearest tenth.

25)



$3^2 + 9^2 = x^2$

$9 + 81 = x^2$

$\sqrt{90} = \sqrt{x^2}$

$x \approx 9.5$

$\tan^{-1}\left(\frac{3}{9}\right) = B$

$m\angle B \approx 18.4$

$\tan^{-1}\left(\frac{9}{3}\right) = C$

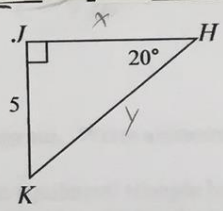
$m\angle C \approx 71.6$

$BC \approx$ 9.5

$m\angle B \approx$ 18.4°

$m\angle C \approx$ 71.6°

26)



$\tan 20 = \frac{5}{x}$

$x = \frac{5}{\tan 20} \approx 13.7$

$\sin 20 = \frac{5}{y}$

$y = \frac{5}{\sin 20} \approx 14.6$

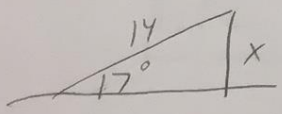
$JH \approx$ 13.7

$HK \approx$ 14.6

$m\angle K =$ 70°

Show all work for the following problems, including a labeled diagram.

27) A 14-foot ramp leads into the back of a moving van. If the angle of elevation of the ramp is 17°, how high above the ground is the end of the ramp? *Round answers to the ~~nearest foot.~~*

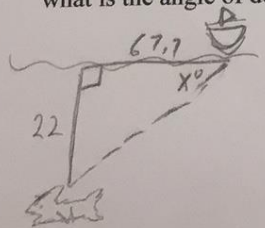


$\sin(17) = \frac{x}{14}$

$x = 14\sin(17)$

$x \approx 4.1$ ft

28) A great white shark swims 22 feet below sea level. If the horizontal distance from the shark to the sailboat is 67.7 feet, what is the angle of depression of the boat to the shark? *Round answers to the ~~nearest degree~~.*



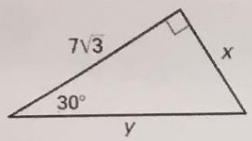
$\tan x = \frac{22}{67.7}$

$\tan^{-1}\left(\frac{22}{67.7}\right) = x$

$m\angle x \approx 18.0°$

Find the value of each variable. Write answers in simplest radical form.

14)

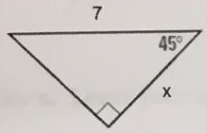


30	60	90
1	$\sqrt{3}$	2
x	$7\sqrt{3}$	y

$x = 7$

$y = 14$

15)



45	45	90
1	1	$\sqrt{2}$
x	x	7

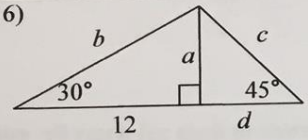
$\frac{1}{x} = \frac{\sqrt{2}}{7}$

$7 = x\sqrt{2}$

$x = \frac{7}{\sqrt{2}}$

$x = \frac{7}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{7\sqrt{2}}{2}}$

16)



30	60	90
1	$\sqrt{3}$	2
a	12	b

$\frac{1}{a} = \frac{\sqrt{3}}{12}$

$12 = a\sqrt{3}$

$a = \frac{12}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{12\sqrt{3}}{3} = 4\sqrt{3}$

45	45	90
1	1	$\sqrt{2}$
$4\sqrt{3}$	d	c

$\frac{1}{4\sqrt{3}} = \frac{\sqrt{2}}{c}$

$c = 4\sqrt{6}$

$a = 4\sqrt{3}$

$b = 8\sqrt{3}$

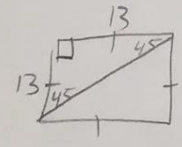
$c = 4\sqrt{6}$

$d = 4\sqrt{3}$

Show all work for the following problems, including a labeled diagram. Write answers in simplest radical form.

17) The perimeter of a square is 52 meters.

a) Sketch and label the square below with one diagonal.



b) Which special right triangle is created? Label the angle measures in your diagram.

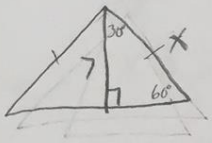
45 - 45 - 90

c) Find the exact length of the diagonal.

$13\sqrt{2}$ meters

18) An equilateral triangle has an altitude of 7 inches.

a) Sketch and label the triangle below with its altitude.



b) Which special right triangle is created? Label the angle measures in your diagram.

30 - 60 - 90

c) Find the exact length of the side of the equilateral triangle.

30	60	90
1	$\sqrt{3}$	2
7	x	

$\frac{\sqrt{3}}{7} = \frac{2}{x}$

$x\sqrt{3} = 14$

$x = \frac{14}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$x = \boxed{\frac{14\sqrt{3}}{3} \text{ in}}$

Simplify the following radicals. Show work.

1) $\sqrt{48}$ $4\sqrt{3}$

2) $(3\sqrt{5})^2$ $9 \cdot 5$ 45

3) $\frac{5}{\sqrt{6}}$ $\frac{5\sqrt{6}}{6}$

4) $\sqrt{99}$ $3\sqrt{11}$

5) $\left(4\sqrt{3}\right)^2$ $16 \cdot 3$ 48

6) $\frac{9}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{9\sqrt{3}}{3} = 3\sqrt{3}$

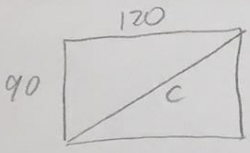
Solve for x. Leave your answer in simplified radical form.

7) $x\sqrt{2} = 16$ $x = \frac{16}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{16\sqrt{2}}{2} = 8\sqrt{2}$

8) $x = 12\sqrt{5} \cdot \sqrt{5}$ $= 12 \cdot 5$ $= 60$

Show all work for each problem, including a labeled diagram.

9) A soccer field is a rectangle 90 meters wide and 120 meters long. The coach asks players to run from one corner to the corner diagonally across. What is this distance?



$90^2 + 120^2 = c^2$

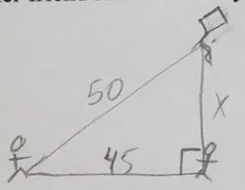
$8100 + 14400 = c^2$

$22500 = c^2$

$c = \sqrt{22500}$

$c = 150$ m

10) During a strong wind at the park, Libby has let out 50 meters of kite string and observes that his kite is directly above her friend Alex. If Libby is 45 meters from Alex, how high is the kite? Round to the nearest meter.



$45^2 + x^2 = 50^2$

$2025 + x^2 = 2500$

$x^2 = 475$

$x = \sqrt{475}$

$x \approx 21.8 \approx 22$ m

Determine whether the following can be the lengths of the sides of a triangle. If so, classify the triangle as acute, right, or obtuse. Show all work!

11) 17, 10, 14

$10 + 14 > 17$ ✓ Yes

$17^2 \quad 10^2 + 14^2$

$289 \quad 100 + 196$

$289 < 296$

Triangle? Yes

If yes, classify Δ: Acute

12) 5, 11, 7

$5 + 7 > 11$ ✓

$11^2 \quad 5^2 + 7^2$

$121 \quad 25 + 49$

$121 > 74$

Triangle? Yes

If yes, classify Δ: Obtuse

13) 9, 21, 12

$9 + 12 \neq 21$

$20 \neq 21$

Triangle? NO

If yes, classify Δ: _____