Unit 8 Study Guide
GCC Geometry

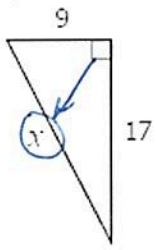
Name: _____

Topic 1: Pythagorean Theorem

For any right triangle: $a^2+b^2=c^2$, where a and b are legs and c is the hypotenuse.

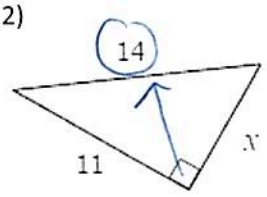
Directions: Solve for x. Round your answer to the nearest tenth.

1)



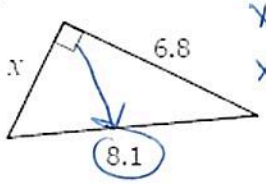
$9^2+17^2=x^2$
$81+289=x^2$
$370=x^2$
$\sqrt{370}=x$
$x\approx 19.2$

2)



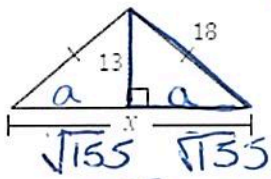
$x^2+11^2=14^2$
$x^2+121=196$
$-121\ \ -121$
$x^2=75$
$x=\sqrt{75}$
$x\approx 8.7$

3)



$x^2+6.8^2=8.1^2$
$x^2+46.24=65.61$
$-46.24\ \ -46.24$
$x^2=19.37$
$x=\sqrt{19.37}$
$x\approx 4.4$

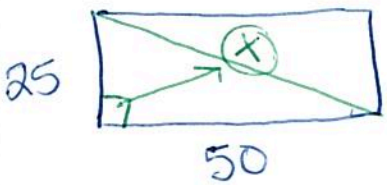
4)



$a^2+13^2=18^2$
$a^2+169=324$
$-169\ \ -169$
$a^2=155$
$a=\sqrt{155}$

$\sqrt{155}\ \ \sqrt{155}$
$x\approx\sqrt{155}+\sqrt{155}$
$x\approx 24.9$

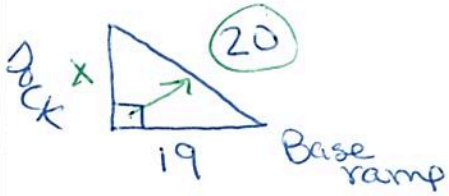
5) An Olympic-size swimming pool is approximately 50 meters long by 25 meters wide. What distance will a swimmer travel if they swim from one corner to the opposite?



$25^2+50^2=x^2$
$625+2500=x^2$
$3125=x^2$
$\sqrt{3125}=x$
$55.9\approx x$

Approx 55.9 m

6) A 20-foot ramp is used at the loading dock of a factory. If the base of the ramp is placed 19 feet from the base of the dock, how high is the loading dock?



$x^2+19^2=20^2$
$x^2+361=400$
$-361\ \ -361$
$x^2=39$
$x=\sqrt{39}$
$x\approx 6.2$

Approx. 6.2 ft

Directions: Determine if the following side lengths create a right triangle. (Test the Pythag. Theorem)

7) 20, 21, 29

$20^2+21^2=29^2$

$400+441=841$

$841=841$ ✓

Yes, it is a rt △ b/c the sides satisfy the Pyth. Theorem

8) 5, 9, 10

$5^2+9^2=10^2$

$25+81=100$

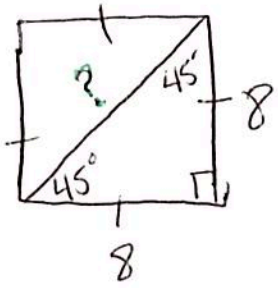
$106 \neq 100$

No, it is not a rt △ b/c the sides do not satisfy the Pyth. Theorem

Topic 2: Special Right Triangles

Directions: Set up the tables for the 30°-60°-90° or 45°-45°-90° triangles to answer each question. Draw pictures when necessary and label given parts.

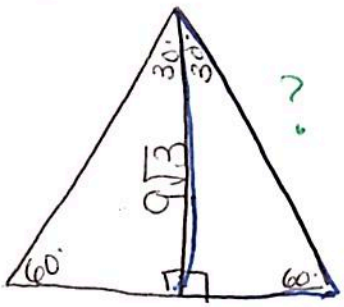
9) Find the length of a diagonal of a square, in simplest radical form, if one side measures 8 centimeters.



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

The diagonal is $8\sqrt{2}$ cm

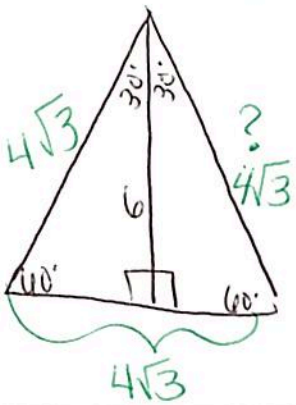
10) The length of the altitude of an equilateral triangle is $9\sqrt{3}$. Find the length of a side of the equilateral triangle.



30	x	9
60	$x\sqrt{3}$	$9\sqrt{3}$
90	2x	18

The side is 18 units

11) The altitude of an equilateral triangle is 6 inches. Find the perimeter of the triangle.



30	x	$2\sqrt{3}$
60	$x\sqrt{3}$	6
90	2x	$4\sqrt{3}$

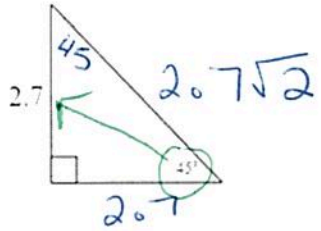
$\frac{x\sqrt{3}}{\sqrt{3}}=\frac{6}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}=\frac{6\sqrt{3}}{3}=2\sqrt{3}$

$P=4\sqrt{3}+4\sqrt{3}+4\sqrt{3}$

$P=12\sqrt{3}$ units

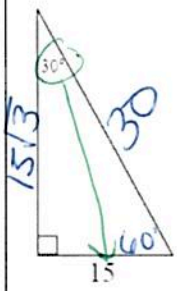
Directions:
Step 1: Fill in the missing angle measures.
Step 2: Fill in the missing side lengths of each triangle using the table we set up in class.
Write your answer in simplest radical form.

12)



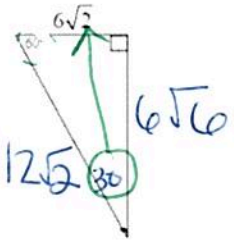
45	X	2.7
45	X	2.7
90	X√2	2.7√2

13)



30	X	15
60	X√3	15√3
90	2X	30

14)

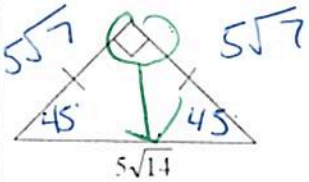


30	X	6√2
60	X√3	6√6
90	2X	12√2

$X\sqrt{3} = 6\sqrt{2}\sqrt{3}$
$= 6\sqrt{6}$

$2X = 2 \cdot 6\sqrt{2}$
$12\sqrt{2}$

15)



45	X	5√7
45	X	5√7
90	X√2	5√14

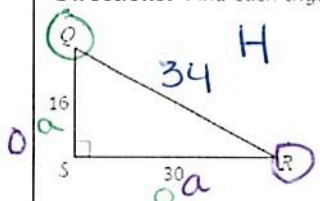
$\frac{X\sqrt{2}}{\sqrt{2}} = \frac{5\sqrt{14}}{\sqrt{2}} = 5\sqrt{7}$

Topic 3: Right Triangle Trigonometry

For Sine, Cosine, and Tangent, remember: Soh Cah Toa

16)

Directions: Find each trigonometric ratio. Give your answer as a fraction in simplest form.



- Sin Q = $30/34 = 15/17$
- Sin R = $16/34 = 8/17$
- Cos Q = $16/34 = 8/17$
- Cos R = $30/34 = 15/17$
- Tan Q = $30/16 = 15/8$
- Tan R = $16/30 = 8/15$

$16^2 + 30^2 = x^2$

$256 + 900 = x^2$

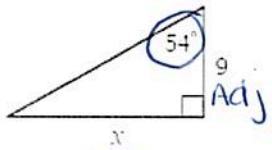
$1156 = x^2$

$\sqrt{1156} = x$

$34 = x$

Directions: Solve for x. Round your answer to the nearest tenth.

17)



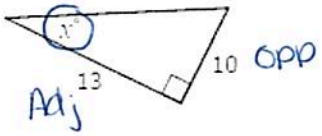
Opp

$\frac{\text{Tan } 54}{1} = \frac{x}{9}$

$x = 9 \text{Tan } 54$

$x \approx 12.4$

18)



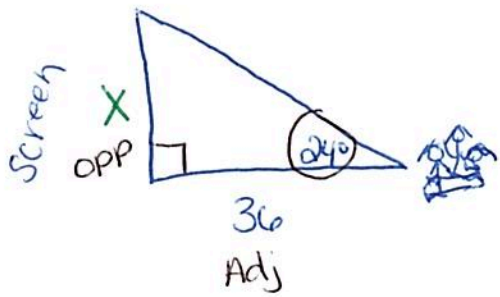
$\text{Tan } x = \frac{10}{13}$

$x = \text{Tan}^{-1}(10/13)$

$x \approx 37.6^\circ$

19)

The town park does an outdoor movie night every Saturday during the summer on a large screen. Kate is sitting 36 feet from the base of the screen, watching a movie with her family. If the angle of elevation from Kate to the top of the screen is 24°, how tall is the movie screen?

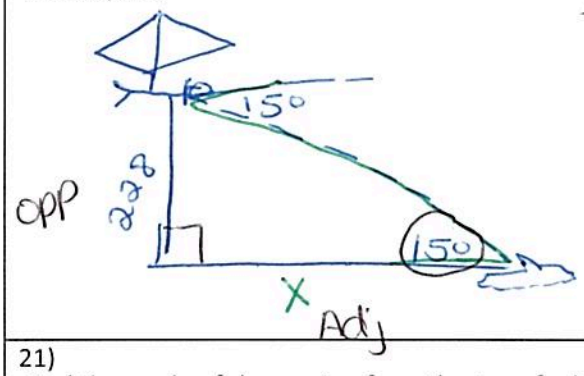


$\frac{\text{Tan } 24}{1} = \frac{x}{36}$

$x = 36 \text{ Tan } 24$

$x \approx 16 \text{ feet}$

20)
While parasailing, Ryan spots a dolphin on the water below. If Ryan is 228 feet above the water and the angle of depression to the dolphin is 15°, what is the horizontal distance between Ryan and the dolphin?



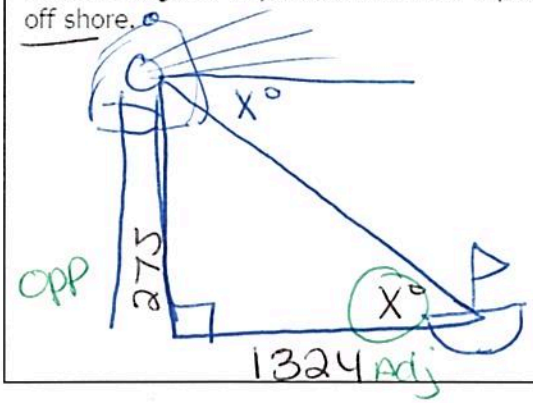
$\frac{\tan 15}{1} = \frac{228}{x}$

$x \tan 15 = 228$

$\frac{x \tan 15}{\tan 15} = \frac{228}{\tan 15}$

$x \approx 850.9$ Ft

21)
Find the angle of depression from the top of a lighthouse 275 feet above water to a boat 1,324 feet off shore.



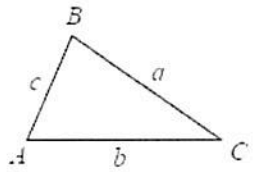
$\tan x = \frac{275}{1324}$

$x = \tan^{-1}\left(\frac{275}{1324}\right)$

$x \approx 11.7°$

Topic 4: Law of Sines

Law of Sines



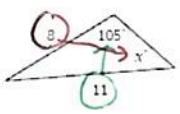
We have practiced using trigonometric ratios to find side lengths and angle measurements in right triangles.

The **Law of Sines** shows the proportional relationship between angles and their opposite sides. It can be used to find side lengths and angle measurements for **any triangle**.

Given ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Directions: Solve for x. Round to the nearest tenth, if necessary.

22)



$\frac{11}{\sin 105} = \frac{8}{\sin x}$

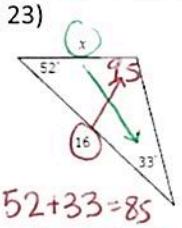
$\frac{11 \sin x}{11} = \frac{8 \sin 105}{11}$

$\sin x = \frac{8 \sin 105}{11}$

$x = \sin^{-1}\left(\frac{8 \sin 105}{11}\right)$

$x \approx 44.6°$

23)



$52 + 33 = 85$

$180 - 85 = 95$

$\frac{x}{\sin 33} = \frac{16}{\sin 95}$

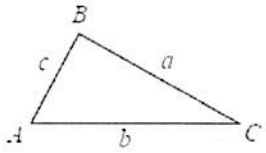
$\frac{x \sin 95}{\sin 95} = \frac{16 \sin 33}{\sin 95}$

$x = \frac{16 \sin 33}{\sin 95}$

$x \approx 8.7$

Topic 5: Law of Cosines

Law of Cosines



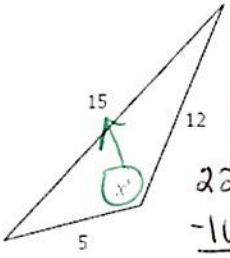
Just like the Law of Sines, the **Law of Cosines** can be used to find side lengths and angle measurements for **any triangle**.

Given ΔABC:

- $a^2 = b^2 + c^2 - 2bc \cos A$
- other 2 sides
- pair

Directions: Solve for x. Round to the nearest tenth, if necessary.

24)



$15^2 = 5^2 + 12^2 - 2(5)(12)\cos x$

$225 = 169 - 120\cos x$

$-169 \quad -169$

$\frac{56}{-120} = \frac{-120\cos x}{-120}$

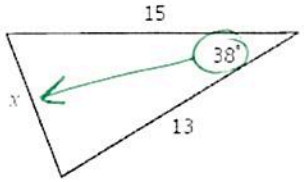
$(56/-120) = \cos x$

$\cos^{-1}(56/-120) = x$

$117.8 \approx x$

$x \approx 117.8°$

25)



$x^2 = 13^2 + 15^2 - 2(13)(15)\cos 38$

$x = \sqrt{13^2 + 15^2 - 2(13)(15)\cos 38}$

$x \approx 9.3$

Mixed Multiple Choice Practice

26) As shown in the diagram below, the angle of elevation from a point on the ground to the top of the tree is 34°.

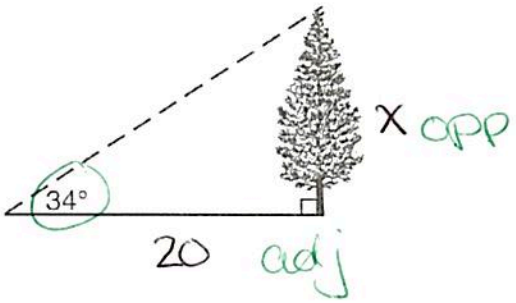
If the point is 20 feet from the base of the tree, what is the height of the tree, to the *nearest tenth of a foot*?

1) 29.7

2) 16.6

3) 13.5

4) 11.2



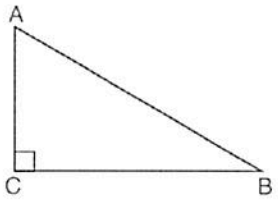
$\frac{\tan 34}{1} = \frac{x}{20}$

$x = 20\tan 34$

$x \approx 13.4901\ldots$

27) In scalene triangle ABC shown in the diagram below, $m\angle C = 90°$.

* Co-functions!



Which equation is always true?

1) $\sin A = \sin B$

2) $\cos A = \cos B$

3) $\cos A = \sin C$

4) $\sin A = \cos B$

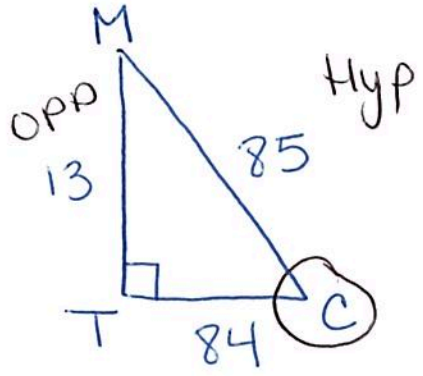
28) In triangle MCT, the measure of $\angle T = 90°$, $MC = 85$ cm, $CT = 84$ cm, and $TM = 13$ cm. Which ratio represents the sine of $\angle C$?

(1) $\frac{13}{85}$

(3) $\frac{13}{84}$

(2) $\frac{84}{85}$

(4) $\frac{84}{13}$



$\sin C = \frac{opp}{Hyp} = \frac{13}{85}$