Unit 8 Test Study Guide
(Right Triangles & Trigonometry)

Name: Key

Date: _____

Topic 1: Pythagorean Theorem & Application

State the 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. Keep all answers in **simplest radical form.**

1.

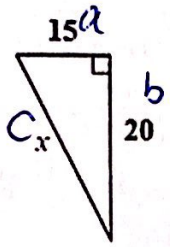
$15^2+20^2=x^2$

$225+400=x^2$

$625=x^2$

$\sqrt{625}=x$

$25=x$



2.

$11^2+x^2=14^2$

$121+x^2=196$

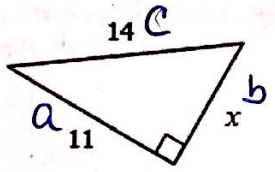
$-121 \quad -121$

$x^2=75$

$x=\sqrt{75}$

$\sqrt{25}\sqrt{3}$

$x=5\sqrt{3}$



3.

$x^2+30^2=34^2$

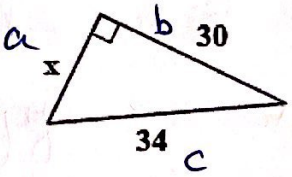
$x^2+900=1156$

$-900 \quad -900$

$x^2=256$

$x=\sqrt{256}$

$x=16$



4.

$13^2+b^2=18^2$

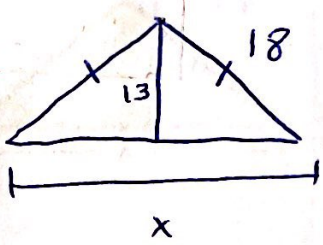
$169+b^2=324$

$b^2=155$

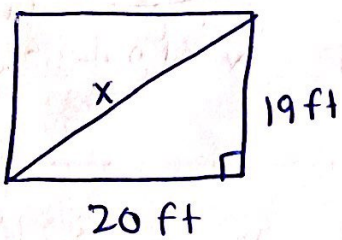
$b=\sqrt{155}$

$x=\sqrt{155}+\sqrt{155}$

$x=2\sqrt{155}$



5. A rectangular classroom has dimensions of 20 feet by 19 feet. The school is running electric through the room and the cord must go on a diagonal from one corner to the opposite, how long does the wire need to be?



$20^2+19^2=x^2$

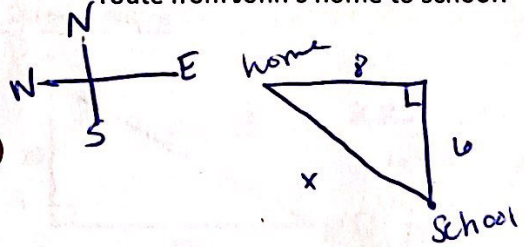
$400+361=x^2$

$761=x^2$

$\sqrt{761}=x$

$x=27.6$ ft

6. John leaves school to go home. He walks 6 blocks north, and then 8 blocks west. How far is the most direct route from John's home to school?



$6^2 + 8^2 = x^2$

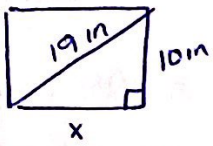
$36 + 64 = x^2$

$100 = x^2$

$\sqrt{100} = x$

$x = 10$ blocks

7. In a computer catalog, a computer monitor is listed as being 19 inches. This distance is the diagonal across the screen. If the screen measures 10 inches in height, what is the actual width of the monitor to the nearest tenth of an inch?



$10^2 + x^2 = 19^2$

$100 + x^2 = 361$

$-100 \quad -100$

$x^2 = 261$

$x = \sqrt{261}$

$x = 16.2$in

Topic 2: Pythagorean Theorem Converse & Classifying Triangles

Given a triangle with side lengths a, b, and c:

- If $a^2 + b^2 = c^2$, then it is a **right** triangle.
- If $a^2 + b^2 > c^2$, then it is an **acute** triangle.
- If $a^2 + b^2 < c^2$, then it is an **obtuse** triangle.

⚠ Recall: In order to be a triangle, the sum of the two smaller sides must be greater than the third largest side.

Directions: Given the side lengths, determine whether the triangle is acute, right, obtuse, or not a triangle.

6. 20, 21, 29

$20+21 > 29$ ✓

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

$400 + 441 = 841$

$841 = 841$

- ☐ Not a Δ
- ☐ Acute
- ☑ Right
- ☐ Obtuse

7. 5, 9, 10

$5+9 > 10$ ✓

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

$25 + 81 = 100$

$106 > 100$

- ☐ Not a Δ
- ☑ Acute
- ☐ Right
- ☐ Obtuse

8. 3, 15, 18

$3+15 > 18$ X

- ☑ Not a Δ
- ☐ Acute
- ☐ Right
- ☐ Obtuse

9. 16, 21, 28

$16+21 > 28$ ✓

$16^2 + 21^2 = 28^2$

$256 + 441 = 784$

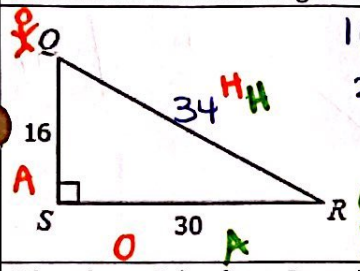
$697 < 784$

- ☐ Not a Δ
- ☐ Acute
- ☐ Right
- ☑ Obtuse

Topic 3: Trigonometry

SOH CAH TOA

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



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

$256+900=x^2$

$1156=x^2$

$\sqrt{1156}=x$

$34=x$

- Sin $Q=\frac{30}{34}=\frac{15}{17}$
- Cos $Q=\frac{16}{34}=\frac{8}{17}$
- Tan $Q=\frac{30}{16}=\frac{15}{8}$
- Sin $R=\frac{16}{34}=\frac{8}{17}$
- Cos $R=\frac{30}{34}=\frac{15}{17}$
- Tan $R=\frac{16}{30}=\frac{8}{15}$

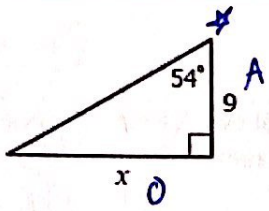
Directions: Solve for x. Round your answer to the nearest tenth.

14. TOA

$\frac{\tan(54)}{1}=\frac{x}{9}$

$9\cdot\tan(54)=x$

$x=12.4$



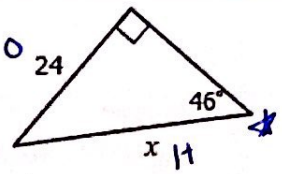
15. SOH

$\frac{\sin(46)}{1}=\frac{24}{x}$

$x\sin(46)=24$

$\frac{x\sin(46)}{\sin(46)}=\frac{24}{\sin(46)}$

$x=33.4$

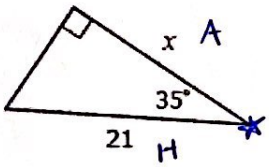


16. CAH

$\frac{\cos(35)}{1}=\frac{x}{21}$

$21\cdot\cos(35)=x$

$x=17.2$

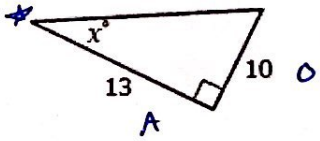


17. TOA

$\tan(x)=\frac{10}{13}$

$x=\tan^{-1}\left(\frac{10}{13}\right)$

$x=37.6^\circ$

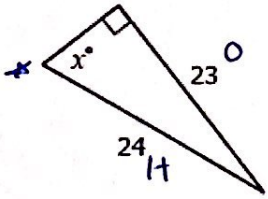


18. SOH

$\sin(x)=\frac{23}{24}$

$\sin^{-1}\left(\frac{23}{24}\right)=x$

$x=73.4^\circ$

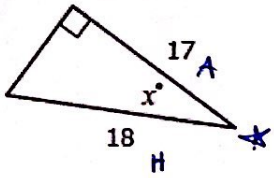


19. CAH

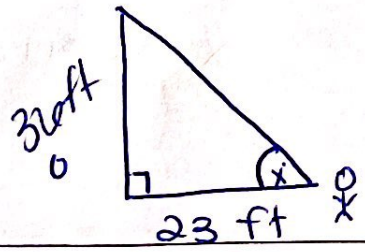
$\cos(x)=\frac{17}{18}$

$x=\cos^{-1}\left(\frac{17}{18}\right)$

$x=19.2^\circ$



20. The town park does an outdoor movie night every Saturday during the summer on a large screen. The screen is 36 feet tall. If Katie is sitting 23 feet from the base of the screen, what is the **angle of elevation** from Katie to the top of the screen?

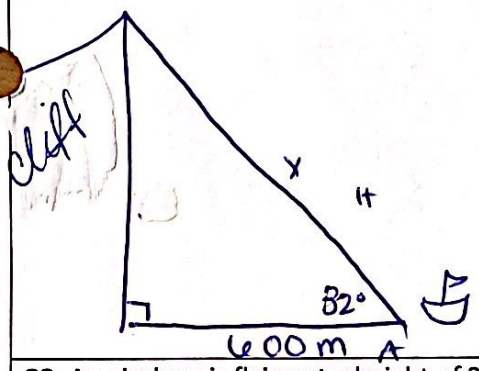


$\tan(x)=\frac{36}{23}$

$x=\tan^{-1}\left(\frac{36}{23}\right)$

$x=57.4^\circ$

21. A boat is 600 meters from the base of a cliff. Erika, who is sitting in the boat, notices that the **angle of elevation** to the top of the cliff is 32°.

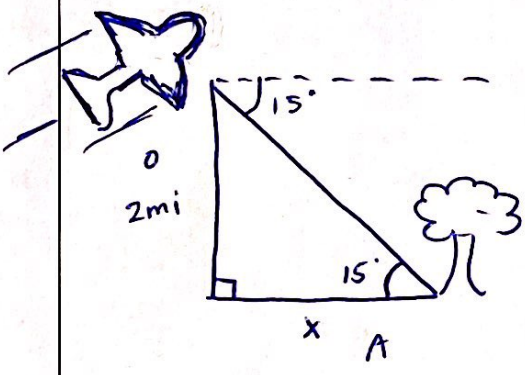


$$\frac{\cos(32)}{1} = \frac{600}{x}$$

$$\frac{x\cos(32) = 600}{\cos(32)}$$

$$x = 707.5\ m$$

22. An airplane is flying at a height of 2 miles above level ground. The **angle of depression** from the plane to the foot of the tree is 15°. What is the distance the plane must fly to be directly above the tree **(horizontal distance)**?

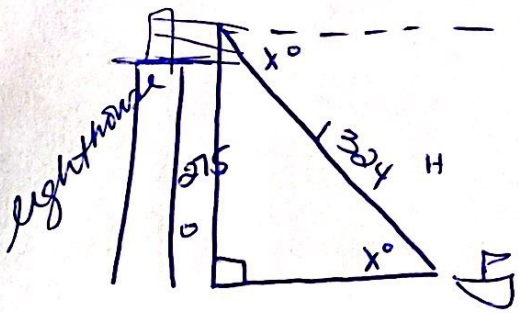


$$\frac{\tan(15)}{1} = \frac{2}{x}$$

$$\frac{x\tan(15) = 2}{\tan(15)}$$

$$x = 7.5 miles$$

23. Find the **angle of depression** from the top of a lighthouse 275 feet above water to a boat 1,324 feet **directly** from the top of the lighthouse.

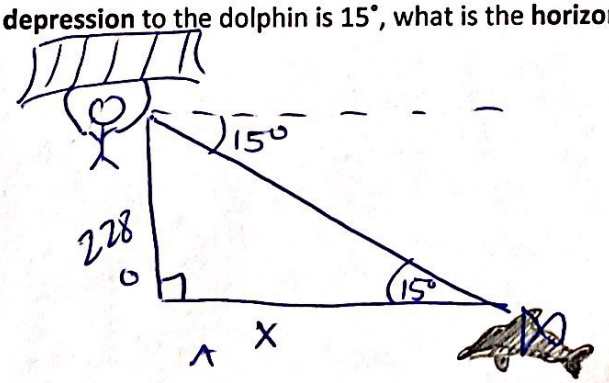


$$\sin(x) = \frac{275}{1324}$$

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

$$x = 11.99°$$

24. While parasailing, Ryan spots a dolphin in 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?



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

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

$$\boxed{x = 850.9\ ft}$$