Key

Unit 3A: Test Review

Vocabulary Check

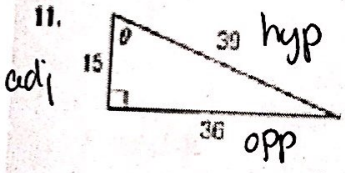
State whether each sentence is *true* or *false*. If *false*, replace the underlined term to make a true sentence.

1. The sine of an acute angle in a right triangle is the ratio of the lengths of its opposite leg to the hypotenuse. T
2. The secant ratio is the reciprocal of the sine ratio. F/cosecant
3. An angle of elevation is the angle formed by a horizontal line and an observer's line of sight to an object below the line. F/angle of depression
4. The radian measure of an angle is equal to the ratio of the length of its intercepted arc to the radius. T

6. $0°$, π, and $-\frac{\pi}{2}$ are examples of reference angles. F/corner angles (Quadrantal angles)

Find the exact values of the six trigonometric functions of θ.

11.



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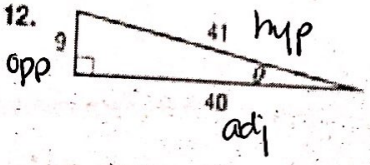
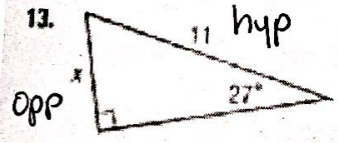


Find the value of x. Round to the nearest tenth, if necessary.

13.



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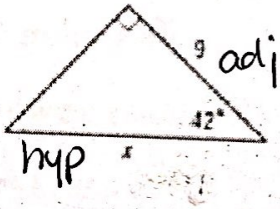
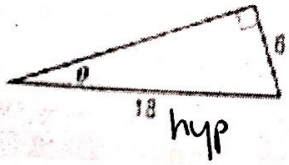


Find the measure of angle θ. Round to the nearest degree, if necessary.

15.



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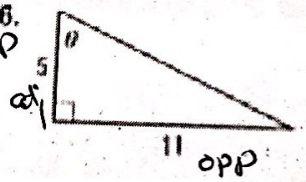


(11) $\sin\theta = \frac{36}{39} = \frac{12}{13}$ $\csc\theta = \frac{13}{12}$

$\cos\theta = \frac{15}{39} = \frac{5}{13}$ $\sec\theta = \frac{13}{5}$

$\tan\theta = \frac{36}{15} = \frac{12}{5}$ $\cot\theta = \frac{5}{12}$

(12) $\sin\theta = \frac{9}{41}$ $\csc\theta = \frac{41}{9}$

$\cos\theta = \frac{40}{41}$ $\sec\theta = \frac{41}{40}$

$\tan\theta = \frac{9}{40}$ $\cot\theta = \frac{40}{9}$

(13) $\sin 27° = \frac{x}{11}$ $x = 11 \cdot \sin 27$

$\boxed{x = 5}$

(14) $\cos 42° = \frac{9}{x}$ $x = \frac{9}{\cos 42°}$

$\boxed{x = 12.1}$

(15) $\sin\theta = \frac{6}{18}$

$\theta = \sin^{-1}\left(\frac{6}{18}\right)$

$\boxed{\theta = 19°}$

(16) $\tan\theta = \frac{11}{5}$

$\theta = \tan^{-1}\left(\frac{11}{5}\right)$

$\boxed{\theta = 66°}$

Write each degree measure in radians as a multiple of π and each radian measure in degrees.

17. 135°
18. 450°
19. $\frac{7\pi}{4}$
20. $\frac{13\pi}{10}$

~~Identify all angles coterminal with the given angle.~~ Then find and draw one positive and one negative angle coterminal with the given angle.

21. 342°
22. $-\frac{\pi}{6}$

Sketch each angle. Then find its reference angle.

25. 240°
26. 75°
27. $-\frac{3\pi}{4}$
28. $\frac{11\pi}{18}$

Find the exact values of the five remaining trigonometric functions of θ.

29. $\cos\theta = \frac{2}{5}$, where $\sin\theta > 0$ and $\tan\theta > 0$
30. $\tan\theta = -\frac{3}{4}$, where $\sin\theta > 0$ and $\cos\theta < 0$
31. $\sin\theta = -\frac{5}{13}$, where $\cos\theta > 0$ and $\cot\theta < 0$
32. $\cot\theta = \frac{2}{3}$, where $\sin\theta < 0$ and $\tan\theta > 0$

Find the exact value of each expression. If undefined, write *undefined*.

33. $\sin 180° = 0$
34. $\cot\frac{11\pi}{6} = -\sqrt{3}$
35. $\sec 450° =$ und
36. $\cos\left(-\frac{19\pi}{6}\right) = -\frac{\sqrt{3}}{2}$

17) $135° \cdot \frac{\pi}{180°} = \frac{3\pi}{4}$

18) $450° \cdot \frac{\pi}{180} = \frac{5\pi}{2}$

19) $\frac{7\pi}{4} \cdot \frac{180}{\pi} = 315°$

20) $\frac{13\pi}{10} \cdot \frac{180}{\pi} = 234°$

21) $342 + 360 = 702°$ PCA

$342 - 360 = -18°$ NCA

22) $-\frac{\pi}{6} + 2\pi = \frac{11\pi}{6}$ PCA

$-\frac{\pi}{6} - 2\pi = \frac{-13\pi}{6}$ NCA

25) 240°, 60°

26) 75°, 75°

27) $-\frac{3\pi}{4}$, $\frac{\pi}{4}$

28) $\frac{11\pi}{18}$, $\frac{7\pi}{18}$

29) $2^2 + x^2 = 5^2$; $4 + x^2 = 25$; $x^2 = 21$; $x = \sqrt{21}$

$\sin\theta = \frac{\sqrt{21}}{5}$ $\csc\theta = \frac{5\sqrt{21}}{21}$

$\cos\theta = \frac{2}{5}$ $\sec\theta = \frac{5}{2}$

$\tan\theta = \frac{\sqrt{21}}{2}$ $\cot\theta = \frac{2\sqrt{21}}{21}$

30) $\sin\theta = \frac{3}{5}$ $\csc\theta = \frac{5}{3}$

$\cos\theta = \frac{-4}{5}$ $\sec\theta = \frac{-5}{4}$

$\tan\theta = \frac{-3}{4}$ $\cot\theta = \frac{-4}{3}$

31) $x^2 + 5^2 = 13^2$; $x^2 + 25 = 169$; $x^2 = 144$; $x = 12$

$\sin\theta = \frac{-5}{13}$ $\csc\theta = \frac{-13}{5}$

$\cos\theta = \frac{12}{13}$ $\sec\theta = \frac{13}{12}$

$\tan\theta = \frac{-5}{12}$ $\cot\theta = \frac{-12}{5}$

32) $2^2 + 3^2 = x^2$; $4 + 9 = x^2$; $13 = x^2$; $\sqrt{13} = x$

$\sin\theta = \frac{-3}{\sqrt{13}} = \frac{-3\sqrt{13}}{13}$ $\csc\theta = \frac{-\sqrt{13}}{3}$

$\cos\theta = \frac{-2}{\sqrt{13}} = \frac{-2\sqrt{13}}{13}$ $\sec\theta = \frac{-\sqrt{13}}{2}$

$\tan\theta = \frac{3}{2}$ $\cot\theta = \frac{2}{3}$

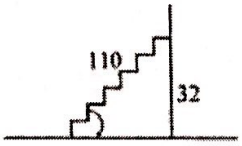
Angles of Elevation & Depression

Draw a picture, write a trig ratio equation, and then solve each problem. Round answers to the nearest tenth.

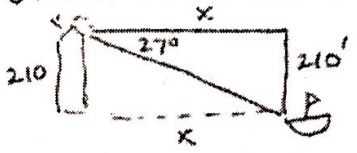
16.9° An escalator from the ground floor to the second floor of a department store is 110 ft long and rises 32 ft. vertically. What is the escalator's angle of elevation?

$\sin\theta = \frac{32}{110}$

$\theta = 16.9°$



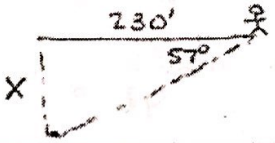
412.1 From the top of a lighthouse 210 feet high, the angle of depression of a boat is 27°. Find the distance from the boat to the foot of the lighthouse. The lighthouse was built at sea level.



$\tan 27° = \frac{210}{x}$

$x = \frac{210}{\tan 27}$

354.2' A person at one end of a 230-foot bridge spots the river's edge directly below the opposite end of the bridge and finds the angle of depression to be 57°. How far below the bridge is the river?

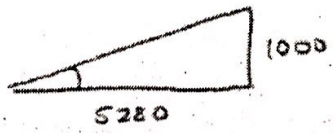


$\tan 57° = \frac{x}{230}$

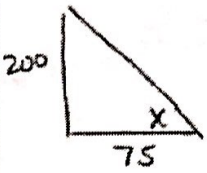
10.7° An airplane rises vertically 1000 feet over a horizontal distance of 5280 feet. What is the angle of elevation of the airplane's path?

$\tan\theta = \frac{1000}{5280}$

$\theta = 10.7$

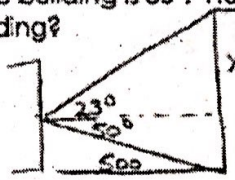


69.4° A radio tower 200 ft. high casts a shadow 75 ft. long. What is the angle of elevation of the sun?



$\tan x = \frac{200}{75}$

808.1' A person in an apartment building sights the top and bottom of an office building 500 ft. away. The angle of elevation for the top of the office building is 23° and the angle of depression for the base of the building is 50°. How tall is the office building?



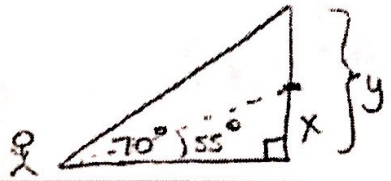
$\tan 23° = \frac{x}{500}$

$\tan 50° = \frac{y}{500}$

$x = 212.2$

$y = 595.9$

1319.4' A rescue team 1000 ft. away from the base of a vertical cliff measures the angle of elevation to the top of the cliff to be 70°. A climber is stranded on a ledge. The angle of elevation from the rescue team to the ledge is 55°. How far is the stranded climber from the top of the cliff?



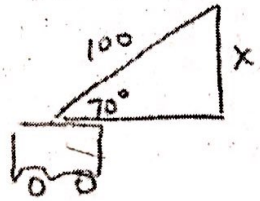
$\tan 70° = \frac{y}{1000}$

$y = 2747.5$

$\tan 55° = \frac{x}{1000}$

$x = 1428.1$

102' A ladder on a fire truck has its base 8 ft. above the ground. The maximum length of the ladder is 100 ft. If the ladder's greatest angle of elevation possible is 70°, what is the highest above the ground that it can reach?



$\sin 70° = \frac{x}{100}$

$x = 93.96$

$+ 8$

101.96