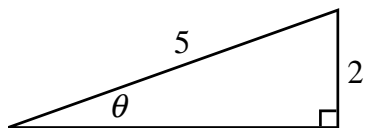


1. If $\theta = 4$, express θ in terms of degrees, minutes, and seconds, to the nearest second.
- A. $229^\circ 18' 31''$
 - B. $229^\circ 10' 59''$
 - C. $229^\circ 30' 0''$
 - D. $229^\circ 0' 18''$
 - E. $229^\circ 15' 37''$

2. Find the value of $\sec \theta$.



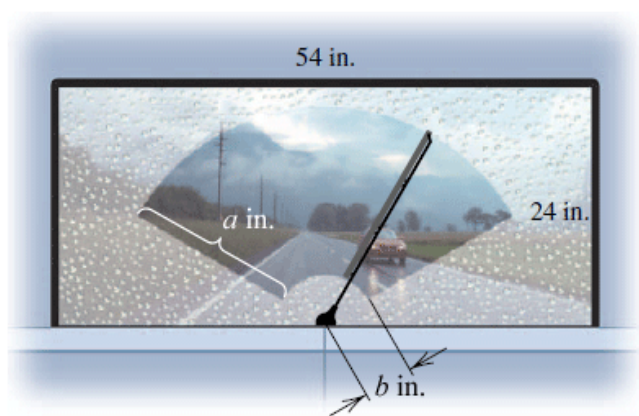
- A. $\frac{5}{\sqrt{21}}$
 - B. $\frac{\sqrt{21}}{5}$
 - C. $\frac{5}{\sqrt{29}}$
 - D. $\frac{\sqrt{29}}{5}$
 - E. None of the above
3. Write the expression $\log(x^3 y^2) - 2 \log(x \sqrt[3]{y}) - 3 \log\left(\frac{y}{x}\right)$ as one logarithm
- A. $\log(x^3 y^{8/3})$
 - B. $\log(x^2 y^{17/3})$
 - C. $\log\left(\frac{x^2}{y^{1/3}}\right)$
 - D. $\log\left(\frac{x^4}{y^{5/3}}\right)$
 - E. $\log\left(\frac{x^5}{y^{4/3}}\right)$

4. A forester, 350 feet from the base of a redwood tree, observes that the angle between the ground and the top of the tree is 42° . Estimate the height of the tree.
- A. 260 feet
 - B. 243 feet
 - C. 315 feet
 - D. 388 feet
 - E. 523 feet
5. Approximate $\cot 47^\circ 32' 57''$ to three decimal places.
- A. 0.915
 - B. 1.093
 - C. 2.208
 - D. 0.021
 - E. 4.888
6. Which of the following statements are true?
- I. As $x \rightarrow 0^+$, $\cos x \rightarrow -1$
 - II. As $x \rightarrow \frac{\pi}{2}^+$, $\tan x \rightarrow -\infty$
 - III. As $x \rightarrow \frac{\pi}{6}^-$, $\sin x \rightarrow \frac{\sqrt{3}}{2}$
- A. I and III
 - B. II and III
 - C. II
 - D. III
 - E. I, II, and III

7. Which of the sets of angles are both coterminal to 72° ?
- A. $-\frac{3\pi}{5}, \frac{7\pi}{5}$
 - B. $\frac{2\pi}{5}, \frac{7\pi}{5}$
 - C. $-\frac{3\pi}{5}, \frac{12\pi}{5}$
 - D. $-\frac{8\pi}{5}, \frac{12\pi}{5}$
 - E. All of the above are coterminal to 72°
8. A pendulum on a clock is 4 feet long and swings back and forth through an angle of 10° in 2.22 seconds. Estimate the average linear speed of a point at the end of the pendulum during one swing (half a cycle).
- A. 0.3144 feet/sec
 - B. 1.8182 feet/sec
 - C. 8.4967 feet/sec
 - D. 15.4956 feet/sec
 - E. 18.1818 feet/sec
9. If $\tan \theta = -\frac{3}{8}$ and $\sin \theta < 0$, find the value of $\sec \theta$.
- A. $-\frac{8}{\sqrt{73}}$
 - B. $-\frac{\sqrt{73}}{8}$
 - C. $-\frac{3}{\sqrt{73}}$
 - D. $-\frac{\sqrt{73}}{3}$
 - E. None of the above
10. Find the exact solution of $125(5^{-x}) = 30$ using natural logarithms.
- A. $3 + \ln 6$
 - B. $3 - \frac{\ln 30}{\ln 5}$
 - C. $3 - \ln 6$
 - D. $\frac{\ln 30}{\ln 3}$
 - E. None of the above

11. Which of the following is equivalent to $\tan x + \frac{\cos x}{1 + \sin x}$?
- A. $\cos x$
 - B. $\sec x$
 - C. $\tan x$
 - D. $\cot x$
 - E. $\csc x$
12. Find the solutions of the equation $4\sin^2 x - 3 = 0$ in the interval $[0, 2\pi)$.
- A. $\frac{\pi}{3}, \frac{2\pi}{3}$
 - B. $\frac{\pi}{3}, \frac{4\pi}{3}$
 - C. $\frac{2\pi}{3}, \frac{4\pi}{3}$
 - D. $\frac{2\pi}{3}, \frac{5\pi}{3}$
 - E. $\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$
13. Newton's Law of Cooling is given by $T = T_m + Ce^{-kt}$, where T is the temperature of an object, T_m is the temperature of the surrounding medium, C and k are constants, and t is time. Solve this equation for t .
- A. $t = \frac{\ln T - \ln T_m}{-k \ln C}$
 - B. $t = \frac{\ln(T - T_m)}{-k \ln C}$
 - C. $t = \frac{\ln\left(\frac{T - T_m}{C}\right)}{-k}$
 - D. $t = \frac{\ln\left(\frac{T}{C} - T_m\right)}{-k}$
 - E. None of the above
14. Solve for y : $\log y = \log b - k \log x$
- A. $y = \frac{b}{kx}$
 - B. $y = \frac{b}{x^k}$
 - C. $y = bx^k$
 - D. $y = b k x$
 - E. $y = \frac{kx}{b}$

15. Approximate all angles θ , in radians, in the interval $[0, 2\pi)$ that satisfy the equation $\sec \theta = -4.536$.
- A. 1.349, 1.793
B. 1.349, 4.490
C. 4.490, 4.935
D. 1.793, 4.935
E. None of the above
16. A rectangular window measures 54 inches by 24 inches. There is an $a = 12$ inch wiper blade attached to a $b = 4$ inch arm at the center of the base of the window as shown in the figure. If the arm rotates 115° , approximate the area of the window that the wiper clears.



- A. 128.46 in^2
B. 24.09 in^2
C. 8.03 in^2
D. 240.86 in^2
E. 18.51 in^2
17. Use fundamental identities to write $\sec \theta$ in terms of $\sin \theta$, for any acute angle θ .
- A. $\frac{1}{\sin \theta}$
B. $\frac{\sin \theta}{1 - \sin \theta}$
C. $\frac{1}{1 - \sin \theta}$
D. $\frac{1}{\sqrt{\sin^2 \theta - 1}}$
E. $\frac{1}{\sqrt{1 - \sin^2 \theta}}$

1. B
2. A
3. D
4. C
5. A
6. C
7. D
8. A
9. $E\left(\frac{\sqrt{73}}{8}\right)$
10. B
11. B
12. E
13. C
14. B
15. E $[1.793, 4.490]$
16. D
17. E