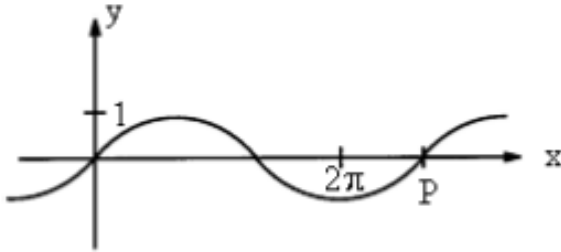College Placement Test Practice: Trigonometry

1. The sine function shown below has a minimum at $x = 2\pi$ and an x-intercept at $x = 0$:
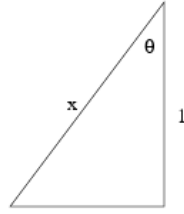

The x-intercept at P is given by:

[A] $x = \frac{9\pi}{4}$

[B] $x = \frac{5\pi}{2}$

[C] $x = \frac{8\pi}{3}$

[D] $x = 3\pi$

[E] $x = 4\pi$

2. $\sin x + \sin(\pi - x) =$

[A] 0

[B] 1

[C] $2 \sin x$

[D] $\sin x + \cos x$

[E] $\cos^2 x$

3. Of the following numbers, which is the largest?

[A] $\cos 0$

[B] $\cos \frac{\pi}{6}$

[C] $\cos \frac{\pi}{4}$

[D] $\cos \frac{\pi}{3}$

[E] $\cos \pi$

4. In the right triangle shown, $\tan \theta =$

   [A] x
   [B] $x\sqrt{x^2 - 1}$
   [C] $x^2 + 1$
   [D] $\frac{1}{2}(x^2 - 1)$
   [E] $\sqrt{x^2 - 1}$

5. When $\frac{\pi}{2} < \theta < \frac{3\pi}{4}$, which of the following could possibly be $\tan \theta$?

   [A] -8
   [B] $-\frac{1}{8}$
   [C] 0
   [D] $\frac{1}{8}$
   [E] 8

6. For all real numbers x, $\cos^2 x - \sin^2 x =$

   [A] 0
   [B] 1
   [C] $\sin 2x$
   [D] $\cos 2x$
   [E] $\cos\left(\frac{x}{2}\right)$

7. If the angle $\theta = \frac{3\pi}{5}$ radians, then

   [A] $0° < \theta < 90°$
   [B] $90° < \theta < 180°$
   [C] $180° < \theta < 270°$
   [D] $270° < \theta < 360°$

8. If a light beam makes one complete circular revolution in 20 seconds, how long will it take to sweep out an angle of 150°?

   [A] less than 3 seconds
   [B] between 3 and 5 seconds
   [C] between 5 and 7 seconds
   [D] between 7 and 10 seconds

9. If $\tan \theta = 3$ and $\sin \theta > 0$, then $\cos \theta$ equals

[A] $-\frac{3\sqrt{10}}{10}$

[B] $\frac{3\sqrt{10}}{10}$

[C] $\frac{\sqrt{10}}{10}$

[D] $-\frac{\sqrt{10}}{10}$

10. If $\csc \theta = \frac{13}{5}$ and $\cos \theta < 0$, then $\cot \theta$ equals

[A] $\frac{12}{5}$

[B] $-\frac{12}{5}$

[C] $\frac{5}{12}$

[D] $-\frac{13}{12}$

11. Find the exact value of $\csc 225°$.

[A] $-\sqrt{2}$

[B] $-\frac{\sqrt{2}}{2}$

[C] $\sqrt{2}$

[D] $\frac{\sqrt{2}}{2}$

12. Find the exact value of $\cot(420°)$.

[A] $\frac{\sqrt{3}}{2}$

[B] $\frac{\sqrt{3}}{3}$

[C] $\sqrt{3}$

[D] $\frac{1}{2}$

13. If the angle θ in standard position meets the unit circle at $\left(\sqrt{\frac{5}{6}}, -\sqrt{\frac{1}{6}}\right)$, find the value of $\sin\theta$ and $\cos\theta$.

[A] $\sin\theta = \sqrt{\frac{5}{6}}$ and $\cos\theta = \sqrt{\frac{1}{6}}$

[B] $\sin\theta = -\sqrt{\frac{1}{6}}$ and $\cos\theta = \sqrt{\frac{5}{6}}$

[C] $\sin\theta = -\sqrt{\frac{5}{6}}$ and $\cos\theta = \sqrt{\frac{1}{6}}$

[D] $\sin\theta = \sqrt{\frac{1}{6}}$ and $\cos\theta = -\sqrt{\frac{5}{6}}$

14. Find the expression that is equal to $\frac{1+\sin x}{1-\sin x}$.

[A] $\sin x + \cos^2 x$
[B] $\frac{\csc x+1}{\csc x-1}$
[C] 0
[D] $\sec^2 x + \tan^2 x$

15. The minute hand of a clock is 6cm long. How far does the tip of the minute hand travel in 15 minutes?

[A] 12π cm
[B] $9\,\pi$ cm
[C] $6\,\pi$ cm
[D] $3\,\pi$ cm

16. Find the area of a sector of a circle with central angle $\theta=3$ radians, if the radius of the circle is 6 in.

[A] 54 in^2
[B] 36 in^2
[C] 27 in^2
[D] 18 in^2

17. Solve $4\cos\theta + 6 = 5(\cos\theta + 1), 0 \le \theta < 360°$.

    [A] 0°
    [B] 90°
    [C] 180°
    [D] 270°

18. Solve $(2\sin\theta - 3)(\cos\theta + 2) = 0, 0 \le \theta \le \pi$.

    [A] No solution
    [B] $\theta = \frac{\pi}{3}, 0$
    [C] $\theta = 0, \frac{\pi}{2}$
    [D] $\theta = \frac{\pi}{3}, \frac{\pi}{2}$

19. Solve $2\sin^2\theta = \sin\theta + 1, -\frac{\pi}{2} \le \theta \le \frac{\pi}{2}$.

    [A] $-\frac{\pi}{6}, \frac{\pi}{2}$
    [B] $\frac{\pi}{3}, -\frac{\pi}{2}$
    [C] $\frac{\pi}{6}, -\frac{\pi}{2}$
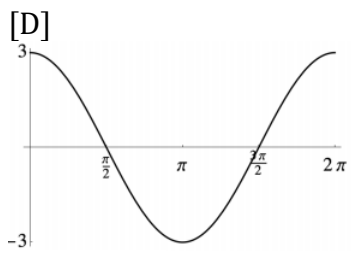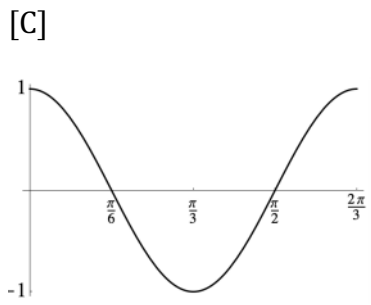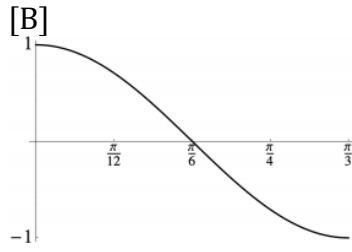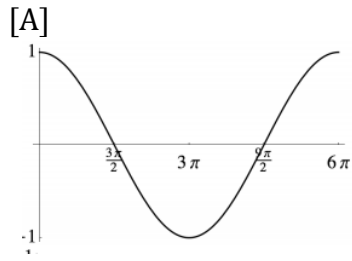   [D] $-\frac{\pi}{3}, \frac{\pi}{2}$

20. In a right triangle ABC, $\angle C = 90°$ and $AC = 12$ and $\sin B = \frac{3}{5}$. Find AB.

    [A] 20
    [B] 6
    [C] $2\sqrt{14}$
    [D] 8
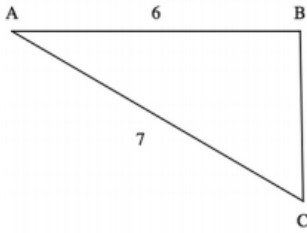
21. For all real numbers x, $\cos^2(99x) + \sin^2(99x)$ equals

    [A] 0
    [B] 1
    [C] $\cos(198x)$
    [D] 99
    [E] $\sin(198x)$

22. Which of the following best represents one cycle of the graph of $y = \cos(4x)$?

[A]

[B]

[C]

[D]

[E]
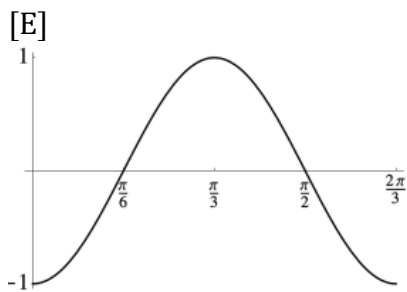
23. If $m\angle = 30°$, then find the length of BC.

[A] $\sqrt{43}$
[B] $85 - 42\sqrt{3}$
[C] $\sqrt{85 + 42\sqrt{3}}$
[D] $\sqrt{85 - 42\sqrt{3}}$
[E] $\sqrt{85}$

24. Which of the following is larger than $\cos\frac{\pi}{6}$?

[A] $\cos\frac{\pi}{2}$
[B] $\cos\left(-\frac{\pi}{4}\right)$
[C] $\cos\frac{\pi}{4}$
[D] $\cos 0$
[E] $\cos\frac{\pi}{3}$

25. Evaluate $\arccos\left(\cos\frac{7\pi}{4}\right)$.

[A] 1
[B] $-\frac{7\pi}{4}$
[C] $\frac{7\pi}{4}$
[D] $-\frac{3\pi}{4}$
[E] $\frac{\pi}{4}$

26. Evaluate $\tan\frac{5\pi}{3}$.

[A] $\frac{1}{2}$

[B] $-\sqrt{3}$

[C] $\sqrt{3}$

[D] $\frac{1}{\sqrt{3}}$

[E] $-\frac{1}{\sqrt{3}}$

27. $\cot\left(\frac{\pi}{2} - \theta\right) =$

[A] $2\tan\theta$

[B] $1 - \cot\theta$

[C] ∞

[D] $\tan\theta$

[E] $\frac{1}{2}\tan\theta$

28. For all real numbers x, $\cos(94x)\cos(92x) + \sin(94x)\sin(92x) =$

[A] $1 - 2\sin^2 x$

[B] $\cos^2 x - \sin^2 x$

[C] $2\cos^2 x - 1$

[D] All of the above

[E] $\cos(2x)$

29. In simplified form, $\frac{3\cos x \sin x + 6\cos^2 x}{6\cos^2 x}$ equals

[A] $3\cos x \sin x$

[B] $\frac{1}{2}\tan x$

[C] $\frac{1}{2}\cot x + 6\cos^2 x$
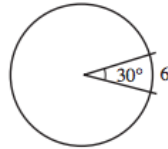
[D] $\frac{1}{2}\cot x + 1$

[E] $\frac{1}{2}\tan x + 1$

30. If $\cot^2 x = \frac{13}{8}$, then $\sec^2 x =$

[A] $\frac{21}{104}$

[B] $\frac{13}{5}$

[C] $\frac{21}{13}$

[D] $\frac{5}{13}$

[E] $\frac{13}{21}$

31. Find the set of θ in the range $[0, 2\pi)$ that satisfy the equation $2\cos^2\theta + 3\cos\theta = 2$.

[A] $\left\{-\frac{\pi}{3}, \frac{5\pi}{3}\right\}$

[B] $\left\{-\frac{\pi}{3}\right\}$

[C] $\left\{\frac{\pi}{3}, \frac{2\pi}{3}\right\}$

[D] $\left\{\frac{\pi}{3}, \frac{5\pi}{3}\right\}$

[E] $\left\{\frac{\pi}{6}, \frac{5\pi}{6}\right\}$

32. If a central angle of 30° is subtended by a circular arc of length 6 meters, as illustrated below, how many meters in length is the radius of the circle?
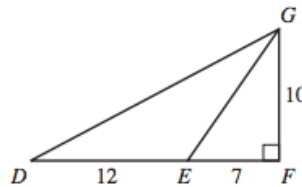

[A] $\frac{\pi}{36}$

[B] $\frac{1}{5}$

[C] π

[D] $\frac{36}{\pi}$

[E] 180

33. A 6-foot spruce tree is planted 15 feet from a lighted streetlight whose lamp is 18 feet above ground. How many feet long is the shadow of the tree?
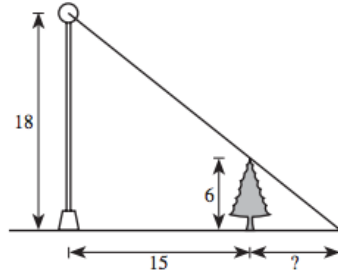
[A] 5.0
[B] 7.5
[C] 7.8
[D] 9.6
[E] 10.0

34. In the figure below, the lengths of DE, EF and FG are given. What is the area of ΔDEG in square units?
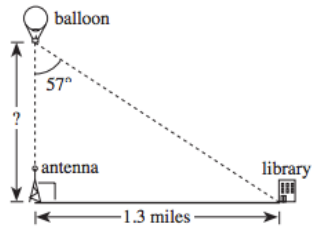

[A] 29
[B] 47.5
[C] 60
[D] $6\sqrt{149}$
[E] 120

35. If $\sin x = \frac{12}{13}$ and $\cos x = \frac{5}{13}$ then $\tan x =$?

[A] $\frac{5}{12}$

[B] $\frac{7}{13}$

[C] $\frac{12}{5}$

[D] $\frac{17}{13}$

36. If $0° < x < 90°$ and $\sin x = \dfrac{1}{2}$ the $\cos x =$?

[A] $\dfrac{1}{2}$

[B] $\dfrac{\sqrt{3}}{2}$

[C] 2

[D] $\dfrac{\sqrt{3}}{3}$

[E] $\dfrac{2\sqrt{3}}{3}$

37. From a hot air balloon, the angle between the radio antenna straight below and the base of the library downtown is 57° as shown in the figure below. If the distance between the radio antenna and the library is 1.3 miles, how many miles high is the balloon?
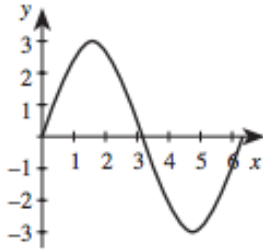

[A] $\dfrac{1.3}{\sin 57°}$

[B] $\dfrac{1.3}{\cos 57°}$

[C] $\dfrac{1.3}{\tan 57°}$

[D] $1.3 \sin 57°$

[E] $1.3 \tan 57°$

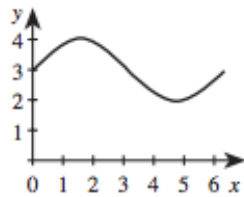38. What is the smallest positive value of x where $y = \sin 2x$ reaches its maximum?

[A] $\dfrac{\pi}{4}$

[B] π

[C] $\dfrac{3\pi}{2}$

[D] 2π

[E] $\dfrac{5\pi}{2}$

39. One of the graphs below is that of $y = A\sin\theta$ for θ between 0 and 6.28 radians, where A is constant. Which one?
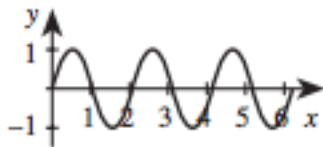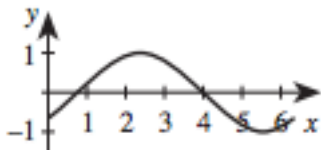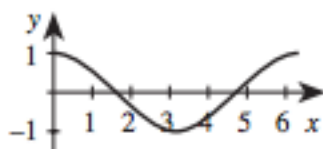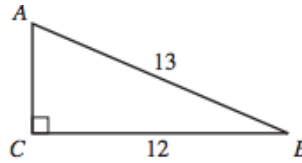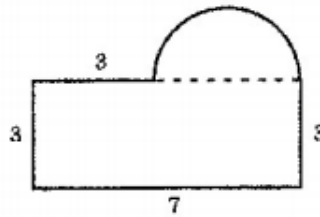
[A]

[B]

[C]

[D]

[E]

40. In the right triangle below, the length of AB is 13 units and the length of CB is 12 units. What is the tangent of A?

[A] $\frac{12}{13}$

[B] $\frac{13}{12}$

[C] $\frac{12}{5}$

[D] $\frac{5}{12}$

[E] $\frac{5}{13}$

41. The perimeter of the figure with the semicircular top is

[A] 21

[B] $16 + 2\pi$

[C] $16 + 4\pi$

[D] $16 + 18\pi$

[E] None of these

42. Evaluate the following expression $\ln[\sin^2\left(\frac{3\pi}{7}\right) + \cos^2\left(\frac{3\pi}{7}\right)]$.

[A] 1

[B] 0

[C] e

[D] $\frac{\sqrt{3}}{2}$

[E] None of the above.

43. Complete the identity: $1 - \cos^2(3x) =$

   [A] $\sin^2(3x)$
   [B] $-\sin^2(3x)$
   [C] $3\sin^2 x$
   [D] $\frac{1}{3}\sin^2(3x)$
   [E] $\sqrt{\sin(3x)}$

44. If $\pi < x < \frac{7\pi}{6}$, then which of the following must be true?

   [A] $\tan x < \sin x$
   [B] $\cos x > \tan x$
   [C] $\cos x < \sin x$
   [D] $\sin x < \cos x$
   [E] $\tan x > 1$

45. Which of the following satisfies the equation $\sin x + 3 \sin x \cos x = 2 \sin x$?

   [A] $x = \sin^{-1}\left(\frac{1}{2}\right)$
   [B] $x = \tan\left(\frac{2}{3}\right)$
   [C] $x = \sec 3$
   [D] $x = \cos^{-1}\left(\frac{1}{3}\right)$
   [E] $x = \frac{2\pi}{3}$

46. Evaluate $\sin^{-1}\left(\frac{1}{2}\right)$.

   [A] $\frac{\pi}{6}, \frac{5\pi}{6}$
   [B] $\frac{\pi}{6}$
   [C] $\frac{\pi}{3}, \frac{4\pi}{3}$
   [D] $\frac{\pi}{3}$
   [E] $\frac{5\pi}{6}$

47. In a right triangle ABC the hypotenuse is AB and it measures 17 cm. The leg AC measures 15 cm. What is $\cos B$ if $\angle C = 90°$?

[A] $\frac{17}{8}$

[B] $\frac{15}{17}$

[C] $\frac{8}{15}$

[D] $\frac{15}{8}$

[E] $\frac{8}{17}$

48. Evaluate $\sin\left(\tan^{-1}\left(-\frac{5}{2}\right)\right)$.

[A] $-\frac{\sqrt{29}}{2}$

[B] $-\frac{5}{\sqrt{29}}$

[C] $-\frac{\sqrt{21}}{5}$

[D] $-\frac{2}{5}$

[E] $-\frac{2}{\sqrt{21}}$

49. Which of the following is equivalent to $\frac{1-\cos^2 x}{\cos^2 x}$?

[A] $\sec^2 x$

[B] $\csc^2 x - 1$

[C] $\tan^2 x$

[D] $\sin^2 x$

[E] $-\frac{1}{\sin^2 x}$

50. Solve for x: $\frac{4}{3}\cos^{-1}\left(\frac{x}{4}\right) = \pi$

[A] $-2\sqrt{2}$

[B] $-\frac{\sqrt{2}}{2}$

[C] $\frac{3\pi}{4}$

[D] $\frac{3\pi}{4}, \frac{5\pi}{4}$

[E] $\pm\frac{\sqrt{2}}{2}$