

A2.A.68: Trigonometric Equations 1: Solve trigonometric equations for all values of the variable from 0° to 360°

- 1 A solution set of the equation $5 \sin \theta + 3 = 3$ contains all multiples of
 - 1) 45°
 - 2) 90°
 - 3) 135°
 - 4) 180°
- 2 If $\cos 2\theta = 1$, a value of θ is
 - 1) 45°
 - 2) 90°
 - 3) 180°
 - 4) 270°
- 3 What is the solution set for $2 \cos \theta - 1 = 0$ in the interval $0^\circ \leq \theta < 360^\circ$?
 - 1) $\{30^\circ, 150^\circ\}$
 - 2) $\{60^\circ, 120^\circ\}$
 - 3) $\{30^\circ, 330^\circ\}$
 - 4) $\{60^\circ, 300^\circ\}$
- 4 If $\sin A = -1$ and $0^\circ \leq A < 360^\circ$, find $m\angle A$.
- 5 Solve the following equation algebraically for all values of θ in the interval $0^\circ \leq \theta \leq 180^\circ$.
$$2 \sin \theta - 1 = 0$$
- 6 Find a value for θ in the interval $90^\circ \leq \theta \leq 270^\circ$ that satisfies the equation $2 \sin \theta + 1 = 0$.
- 7 Find the value of x in the domain $0^\circ \leq x^\circ < 90^\circ$ that satisfies the equation $2 \sin x - \sqrt{2} = 0$.
- 8 Find the number of degrees in the measure of the smallest positive angle that satisfies the equation $2 \cos x + 1 = 0$.
- 9 Find $m\angle \theta$ in the interval $180^\circ \leq \theta \leq 270^\circ$ that satisfies the equation $2 \cos \theta + 1 = 0$.
- 10 If θ is a positive acute angle and $2 \cos \theta + 3 = 4$, find the number of degrees in θ .
- 11 What is the number of degrees in the value of θ that satisfies the equation $2 \cos \theta - 1 = 0$ in the interval $180^\circ \leq \theta \leq 360^\circ$?
- 12 Solve the equation $2 \tan C - 3 = 3 \tan C - 4$ algebraically for all values of C in the interval $0^\circ \leq C < 360^\circ$.

- 13 What are the values of θ in the interval $0^\circ \leq \theta < 360^\circ$ that satisfy the equation $\tan \theta - \sqrt{3} = 0$?
- $60^\circ, 240^\circ$
 - $72^\circ, 252^\circ$
 - $72^\circ, 108^\circ, 252^\circ, 288^\circ$
 - $60^\circ, 120^\circ, 240^\circ, 300^\circ$
- 14 What value of x in the interval $0^\circ \leq x \leq 180^\circ$ satisfies the equation $\sqrt{3} \tan x + 1 = 0$?
- -30°
 - 30°
 - 60°
 - 150°
- 15 Navigators aboard ships and airplanes use nautical miles to measure distance. The length of a nautical mile varies with latitude. The length of a nautical mile, L , in feet, on the latitude line θ is given by the formula $L = 6,077 - 31 \cos 2\theta$. Find, to the *nearest degree*, the angle θ , $0 \leq \theta \leq 90^\circ$, at which the length of a nautical mile is approximately 6,076 feet.
- 16 The horizontal distance, in feet, that a golf ball travels when hit can be determined by the formula $d = \frac{v^2 \sin 2\theta}{g}$, where v equals initial velocity, in feet per second; g equals acceleration due to gravity; θ equals the initial angle, in degrees, that the path of the ball makes with the ground; and d equals the horizontal distance, in feet, that the ball will travel. A golfer hits the ball with an initial velocity of 180 feet per second and it travels a distance of 840 feet. If $g = 32$ feet per second per second, what is the smallest initial angle the path of the ball makes with the ground, to the *nearest degree*?
- 17 An architect is using a computer program to design the entrance of a railroad tunnel. The outline of the opening is modeled by the function $f(x) = 8 \sin x + 2$, in the interval $0 \leq x \leq \pi$, where x is expressed in radians. Solve algebraically for all values of x in the interval $0 \leq x \leq \pi$, where the height of the opening, $f(x)$, is 6. Express your answer in terms of π . If the x -axis represents the base of the tunnel, what is the maximum height of the entrance of the tunnel?

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Answer Section

1 ANS: 4

$$5 \sin \theta + 3 = 3$$

$$5 \sin \theta = 0$$

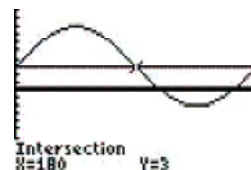
$$\sin \theta = 0$$

$$\theta = \sin^{-1} 0 = 0^\circ, 180^\circ, 360^\circ, \dots$$

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Plot1 Plot2 Plot3
Y1=5sin(X)+3
Y2=3
Y3=
Y4=
Y5=
Y6=
Y7=

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REF: 080610b

2 ANS: 3

$$\cos 2\theta = 1$$

$$2\theta = \cos^{-1} 1$$

$$2\theta = 360$$

$$\theta = 180$$

REF: 011007b

3 ANS: 4

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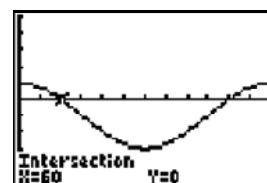
Plot1 Plot2 Plot3
Y1=2cos(X)-1
Y2=0
Y3=
Y4=
Y5=
Y6=
Y7=

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WINDOW
Xmin=0
Xmax=360
Xscl=30
Ymin=-5
Ymax=5
Yscl=1
Xres=1

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$$2 \cos \theta = 1$$

$$\cos \theta = \frac{1}{2}$$

$$\theta = \cos^{-1} \frac{1}{2} = 60, 300$$

REF: 061203a2

4 ANS:
270

REF: 089803siii

5 ANS:

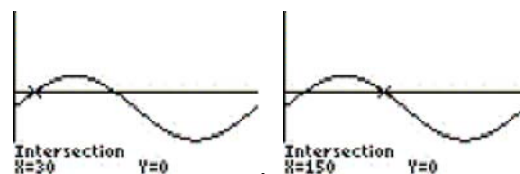
$$2\sin\theta - 1 = 0$$

$$2\sin\theta = 1$$

$$30, 150. \quad \sin\theta = \frac{1}{2}$$

$$\theta = \sin^{-1}\left(\frac{1}{2}\right) = 30^\circ, 150^\circ$$

Plot1 Plot2 Plot3
 $\sqrt{Y_1} = 2\sin(X) - 1$
 $\sqrt{Y_2} = 0$
 $\sqrt{Y_3} =$
 $\sqrt{Y_4} =$
 $\sqrt{Y_5} =$
 $\sqrt{Y_6} =$
 $\sqrt{Y_7} =$



REF: 010523b

6 ANS:

210

REF: 010412siii

7 ANS:

45

REF: 019614siii

8 ANS:

120

REF: 069613siii

9 ANS:

240

REF: 019813siii

10 ANS:

60

REF: 010104siii

11 ANS:

300

REF: 089914siii

12 ANS:

$$45, 225 \quad 2\tan C - 3 = 3\tan C - 4$$

$$1 = \tan C$$

$$\tan^{-1}1 = C$$

$$C = 45, 225$$

REF: 081032a2

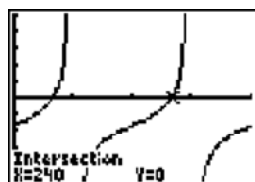
13 ANS: 1

$$\tan \theta - \sqrt{3} = 0$$

$$\tan \theta = \sqrt{3}$$

$$\theta = \tan^{-1} \sqrt{3}$$

$$\theta = 60, 240$$



REF: fall0903a2

14 ANS: 4

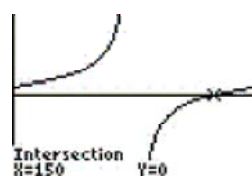
$$\sqrt{3} \tan x + 1 = 0$$

$$\sqrt{3} \tan x = -1$$

$$\tan x = -\frac{1}{\sqrt{3}}$$

$$x = \tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) = 150^\circ$$

Plot1 Plot2 Plot3
 $\sqrt{3} \tan(X) + 1$
 $\sqrt{3} \tan(X)$
 $\sqrt{3} \tan(X)$
 $\sqrt{3} \tan(X)$
 $\sqrt{3} \tan(X)$
 $\sqrt{3} \tan(X)$



REF: 060319b

15 ANS:

$$6076 = 6,077 - 31 \cos 2\theta$$

$$-1 = -31 \cos 2\theta$$

$$\frac{1}{31} = \cos 2\theta$$

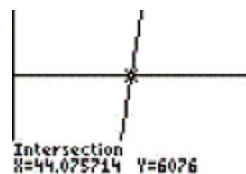
44.

$$\cos^{-1}\left(\frac{1}{31}\right) = 2\theta$$

$$88 \approx 2\theta$$

$$\theta \approx 44$$

Plot1 Plot2 Plot3
 $Y_1 = 6076$
 $Y_2 = 6077 - 31 \cos(2X)$
 $Y_3 =$
 $Y_4 =$
 $Y_5 =$
 $Y_6 =$



REF: 060427b

16 ANS:

$$d = \frac{v^2 \sin 2\theta}{g}$$

$$840 = \frac{180^2 \sin 2\theta}{32}$$

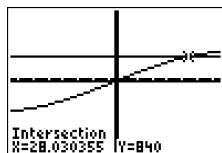
$$\sin 2\theta \approx .8296$$

$$2\theta \approx \sin^{-1}.8296$$

$$2\theta \approx 56$$

$$\theta \approx 28$$

Plot1 Plot2 Plot3
 Y1=840
 Y2=180^2sin(2X)/32
 Y3=
 Y4=
 Y5=
 Y6=



REF: 010832b

17 ANS:

$$8 \sin x + 2 = 6$$

$$8 \sin x = 4$$

$$\sin x = \frac{4}{8}$$

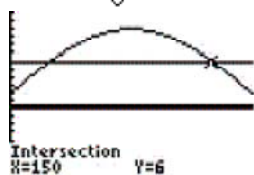
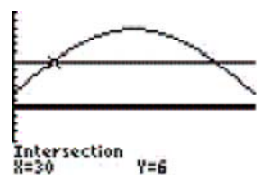
 $\frac{\pi}{6}$ and $\frac{5\pi}{6}$, 10.

$$x = \sin^{-1} \frac{1}{2}$$

$$x = 30^\circ, 150^\circ$$

$$30^\circ = \frac{\pi}{6} \quad 150^\circ = \frac{5\pi}{6}$$

. The sine function has a maximum height of 1. $8(1) + 2 = 10$.



REF: 010630b