

Question 1

Solve the equation

$$\sin(x) = 0.65$$

for all $x \in [0, 2\pi]$, and give your answers rounded to two decimal places.

Question 1 - Solution

Step 1: Isolate the trigonometric function. The equation becomes

$$\sin(1x) = 0.65, \quad u = 1x, \quad 0 \leq u \leq 2\pi.$$

Let $\alpha = \arcsin(0.65)$. All solutions are

$$u = \alpha + 2k\pi \quad \text{or} \quad u = \pi - \alpha + 2k\pi, \quad k \in \mathbb{Z}.$$

Step 2: Restrict and convert. Keep precisely the values of u in $[0, 2\pi]$ and divide by 1. Evaluating the inverse function at full precision and rounding only the final values gives

$$x \approx 0.71, 2.43.$$

These are all 2 solutions in the stated interval, in radians. Substitution of the unrounded values verifies the original equation.

Question 2

Solve the equation

$$\cos(x) = -0.34$$

for all $x \in [0, 2\pi]$, and round your answers to two decimal places.

Question 2 - Solution

Step 1: Isolate the trigonometric function. The equation becomes

$$\cos(1x) = -0.34, \quad u = 1x, \quad 0 \leq u \leq 2\pi.$$

Let $\alpha = \arccos(-0.34)$. All solutions are

$$u = \pm\alpha + 2k\pi, \quad k \in \mathbb{Z}.$$

Step 2: Restrict and convert. Keep precisely the values of u in $[0, 2\pi]$ and divide by 1. Evaluating the inverse function at full precision and rounding only the final values gives

$$x \approx 1.92, 4.37.$$

These are all 2 solutions in the stated interval, in radians. Substitution of the unrounded values verifies the original equation.

Question 3

Solve the equation

$$\tan(x) = 1.8$$

for all $x \in [0, 2\pi]$, and round your answers to two decimal places.

Question 3 - Solution

Step 1: Isolate the trigonometric function. The equation becomes

$$\tan(1x) = 1.8, \quad u = 1x, \quad 0 \leq u \leq 2\pi.$$

Let $\alpha = \arctan(1.8)$. All solutions are

$$u = \alpha + k\pi, \quad k \in \mathbb{Z}.$$

Step 2: Restrict and convert. Keep precisely the values of u in $[0, 2\pi]$ and divide by 1. Evaluating the inverse function at full precision and rounding only the final values gives

$$x \approx 1.06, 4.21.$$

These are all 2 solutions in the stated interval, in radians. Substitution of the unrounded values verifies the original equation.

Question 4

Solve the equation

$$\sin(x) = -0.77$$

for all $x \in [0, 2\pi]$, and round your answers to two decimal places.

Question 4 - Solution

Step 1: Isolate the trigonometric function. The equation becomes

$$\sin(1x) = -0.77, \quad u = 1x, \quad 0 \leq u \leq 2\pi.$$

Let $\alpha = \arcsin(-0.77)$. All solutions are

$$u = \alpha + 2k\pi \quad \text{or} \quad u = \pi - \alpha + 2k\pi, \quad k \in \mathbb{Z}.$$

Step 2: Restrict and convert. Keep precisely the values of u in $[0, 2\pi]$ and divide by 1. Evaluating the inverse function at full precision and rounding only the final values gives

$$x \approx 4.02, 5.40.$$

These are all 2 solutions in the stated interval, in radians. Substitution of the unrounded values verifies the original equation.

Question 5

Solve the equation

$$\cos(x) = 0.29$$

for all $x \in [0, 2\pi]$, and round your answers to two decimal places.

Question 5 - Solution

Step 1: Isolate the trigonometric function. The equation becomes

$$\cos(1x) = 0.29, \quad u = 1x, \quad 0 \leq u \leq 2\pi.$$

Let $\alpha = \arccos(0.29)$. All solutions are

$$u = \pm\alpha + 2k\pi, \quad k \in \mathbb{Z}.$$

Step 2: Restrict and convert. Keep precisely the values of u in $[0, 2\pi]$ and divide by 1. Evaluating the inverse function at full precision and rounding only the final values gives

$$x \approx 1.28, 5.01.$$

These are all 2 solutions in the stated interval, in radians. Substitution of the unrounded values verifies the original equation.

Question 6

Solve the equation

$$\tan(x) = -0.52$$

for all $x \in [0, 2\pi]$, and round your answers to two decimal places.

Question 6 - Solution

Step 1: Isolate the trigonometric function. The equation becomes

$$\tan(1x) = -0.52, \quad u = 1x, \quad 0 \leq u \leq 2\pi.$$

Let $\alpha = \arctan(-0.52)$. All solutions are

$$u = \alpha + k\pi, \quad k \in \mathbb{Z}.$$

Step 2: Restrict and convert. Keep precisely the values of u in $[0, 2\pi]$ and divide by 1.
Evaluating the inverse function at full precision and rounding only the final values gives

$$x \approx 2.66, 5.80.$$

These are all 2 solutions in the stated interval, in radians. Substitution of the unrounded values verifies the original equation.

Question 7

Solve the equation

$$\sin(x) = -0.42$$

for all $x \in [0, 2\pi]$, and round your answers to two decimal places.

Question 7 - Solution

Step 1: Isolate the trigonometric function. The equation becomes

$$\sin(1x) = -0.42, \quad u = 1x, \quad 0 \leq u \leq 2\pi.$$

Let $\alpha = \arcsin(-0.42)$. All solutions are

$$u = \alpha + 2k\pi \quad \text{or} \quad u = \pi - \alpha + 2k\pi, \quad k \in \mathbb{Z}.$$

Step 2: Restrict and convert. Keep precisely the values of u in $[0, 2\pi]$ and divide by 1. Evaluating the inverse function at full precision and rounding only the final values gives

$$x \approx 3.58, 5.85.$$

These are all 2 solutions in the stated interval, in radians. Substitution of the unrounded values verifies the original equation.

Question 8

Solve the equation

$$\cos(x) = -0.91$$

for all $x \in [0, 2\pi]$, and round your answers to two decimal places.

Question 8 - Solution

Step 1: Isolate the trigonometric function. The equation becomes

$$\cos(1x) = -0.91, \quad u = 1x, \quad 0 \leq u \leq 2\pi.$$

Let $\alpha = \arccos(-0.91)$. All solutions are

$$u = \pm\alpha + 2k\pi, \quad k \in \mathbb{Z}.$$

Step 2: Restrict and convert. Keep precisely the values of u in $[0, 2\pi]$ and divide by 1. Evaluating the inverse function at full precision and rounding only the final values gives

$$x \approx 2.71, 3.57.$$

These are all 2 solutions in the stated interval, in radians. Substitution of the unrounded values verifies the original equation.

Question 9

Solve the equation

$$\tan(x) = -1.25$$

for all $x \in [0, 2\pi]$, and round your answers to two decimal places.

Question 9 - Solution

Step 1: Isolate the trigonometric function. The equation becomes

$$\tan(1x) = -1.25, \quad u = 1x, \quad 0 \leq u \leq 2\pi.$$

Let $\alpha = \arctan(-1.25)$. All solutions are

$$u = \alpha + k\pi, \quad k \in \mathbb{Z}.$$

Step 2: Restrict and convert. Keep precisely the values of u in $[0, 2\pi]$ and divide by 1. Evaluating the inverse function at full precision and rounding only the final values gives

$$x \approx 2.25, 5.39.$$

These are all 2 solutions in the stated interval, in radians. Substitution of the unrounded values verifies the original equation.

Question 10

Solve the equation

$$\sin(x) = 0.83$$

for all $x \in [0, 2\pi]$, and round your answers to two decimal places.

Question 10 - Solution

Step 1: Isolate the trigonometric function. The equation becomes

$$\sin(1x) = 0.83, \quad u = 1x, \quad 0 \leq u \leq 2\pi.$$

Let $\alpha = \arcsin(0.83)$. All solutions are

$$u = \alpha + 2k\pi \quad \text{or} \quad u = \pi - \alpha + 2k\pi, \quad k \in \mathbb{Z}.$$

Step 2: Restrict and convert. Keep precisely the values of u in $[0, 2\pi]$ and divide by 1. Evaluating the inverse function at full precision and rounding only the final values gives

$$\boxed{x \approx 0.98, 2.16}.$$

These are all 2 solutions in the stated interval, in radians. Substitution of the unrounded values verifies the original equation.