Rocking the Boat … with Waves

Apprentice Difficulty Level

Question Group 1

Question 1

Two boats are anchored in the harbor, separated by a horizontal distance of 12 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are no wave crests between them. Each boat makes exactly 2 complete up-and-down cycles every 10.0 s. The vertical distance between a boat's highest and lowest position is 2.4 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Question 2

Two boats are anchored in the harbor, separated by a horizontal distance of 16 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are no wave crests between them. Each boat makes exactly 3 complete up-and-down cycles every 12.0 s. The vertical distance between a boat's highest and lowest position is 3.2 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Question 3

Two boats are anchored in the harbor, separated by a horizontal distance of 24 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are no wave crests between them. Each boat makes exactly 4 complete up-and-down cycles every 12.0 s. The vertical distance between a boat's highest and lowest position is 3.6 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.
**Question Group 2**

**Question 4**
Two boats are anchored in the harbor, separated by a horizontal distance of 14 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are no wave crests between them. Each boat makes exactly 5 complete up-and-down cycles every 15.0 s. The vertical distance between a boat's highest and lowest position is 2.4 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

**Question 5**
Two boats are anchored in the harbor, separated by a horizontal distance of 18 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are no wave crests between them. Each boat makes exactly 5 complete up-and-down cycles every 10.0 s. The vertical distance between a boat's highest and lowest position is 2.6 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

**Question 6**
Two boats are anchored in the harbor, separated by a horizontal distance of 20 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are no wave crests between them. Each boat makes exactly 5 complete up-and-down cycles every 20.0 s. The vertical distance
between a boat's highest and lowest position is 2.8 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Master Difficulty Level
Question Group 3
Question 7
Two boats are anchored in the harbor, separated by a horizontal distance of 14 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are no wave crests between them. Each boat makes exactly 5 complete up-and-down cycles every 15.0 s. The vertical distance between a boat's highest and lowest position is 2.4 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Question 8
Two boats are anchored in the harbor, separated by a horizontal distance of 18 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are no wave crests between them. Each boat makes exactly 5 complete up-and-down cycles every 10.0 s. The vertical distance between a boat's highest and lowest position is 2.6 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.
**Question 9**

Two boats are anchored in the harbor, separated by a horizontal distance of 20 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are no wave crests between them. Each boat makes exactly 5 complete up-and-down cycles every 20.0 s. The vertical distance between a boat's highest and lowest position is 2.8 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

![Diagram](image)

**Question Group 4**

**Question 10**

Two boats are anchored in the harbor, separated by a horizontal distance of 12 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there is one wave crest between them. Each boat makes exactly 2 complete up-and-down cycles every 12.0 s. The vertical distance between a boat's highest and lowest position is 3.0 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

![Diagram](image)

**Question 11**

Two boats are anchored in the harbor, separated by a horizontal distance of 18 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there is one wave crest between them. Each boat makes exactly 2 complete up-and-down cycles every 16.0 s. The vertical distance between a boat's highest and lowest position is 3.6 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.
Question 12
Two boats are anchored in the harbor, separated by a horizontal distance of 30 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there is one wave crest between them. Each boat makes exactly 3 complete up-and-down cycles every 18.0 s. The vertical distance between a boat's highest and lowest position is 3.8 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Question Group 5
Question 13
Two boats are anchored in the harbor, separated by a horizontal distance of 16 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is also at its highest point and there is one wave crest between them. Each boat makes exactly 5 complete up-and-down cycles every 25.0 s. The vertical distance between a boat's highest and lowest position is 2.0 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Question 14
Two boats are anchored in the harbor, separated by a horizontal distance of 20 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is also at its highest point and there is one wave crest between them. Each boat makes exactly 5 complete up-and-down cycles every 30.0 s. The vertical
distance between a boat's highest and lowest position is 2.2 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Question 15
Two boats are anchored in the harbor, separated by a horizontal distance of 24 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is also at its highest point and there is one wave crest between them. Each boat makes exactly 6 complete up-and-down cycles every 36.0 s. The vertical distance between a boat's highest and lowest position is 2.4 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Wizard Difficulty Level

Question Group 6
Question 16
Two boats are anchored in the harbor, separated by a horizontal distance of 12 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there is one wave crest between them. Each boat makes exactly 2 complete up-and-down cycles every 12.0 s. The vertical distance between a boat's highest and lowest position is 3.0 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.
Question 17
Two boats are anchored in the harbor, separated by a horizontal distance of 18 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there is one wave crest between them. Each boat makes exactly 2 complete up-and-down cycles every 16.0 s. The vertical distance between a boat's highest and lowest position is 3.6 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Question 18
Two boats are anchored in the harbor, separated by a horizontal distance of 30 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there is one wave crest between them. Each boat makes exactly 3 complete up-and-down cycles every 18.0 s. The vertical distance between a boat's highest and lowest position is 3.8 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Question Group 7
Question 19
Two boats are anchored in the harbor, separated by a horizontal distance of 16 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is also at its highest point and there is one wave crest between them. Each boat makes exactly 5 complete up-and-down cycles every 25.0 s. The vertical distance between a boat's highest and lowest position is 2.0 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.
Question 20
Two boats are anchored in the harbor, separated by a horizontal distance of 20 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is also at its highest point and there is one wave crest between them. Each boat makes exactly 5 complete up-and-down cycles every 30.0 s. The vertical distance between a boat's highest and lowest position is 2.2 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Question 21
Two boats are anchored in the harbor, separated by a horizontal distance of 24 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is also at its highest point and there is one wave crest between them. Each boat makes exactly 6 complete up-and-down cycles every 36.0 s. The vertical distance between a boat's highest and lowest position is 2.4 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

Question Group 8
Question 22
Two boats are anchored in the harbor, separated by a horizontal distance of 20 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are two wave crests between them. Each boat makes exactly 4 complete up-and-down cycles every 12.0 s. The vertical distance
between a boat's highest and lowest position is 2.6 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

**Question 23**
Two boats are anchored in the harbor, separated by a horizontal distance of 30 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are two wave crests between them. Each boat makes exactly 3 complete up-and-down cycles every 12.0 s. The vertical distance between a boat's highest and lowest position is 2.8 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

**Question 24**
Two boats are anchored in the harbor, separated by a horizontal distance of 40 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is at its lowest point and there are two wave crests between them. Each boat makes exactly 2 complete up-and-down cycles every 10.0 s. The vertical distance between a boat's highest and lowest position is 3.0 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

**Question Group 9**
**Question 25**
Two boats are anchored in the harbor, separated by a horizontal distance of 18 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is also at its highest point and there are two wave crests between them. Each boat makes exactly 3 complete up-and-down cycles every 15.0 s. The vertical distance between a boat’s highest and lowest position is 3.2 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

**Question 26**
Two boats are anchored in the harbor, separated by a horizontal distance of 24 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is also at its highest point and there are two wave crests between them. Each boat makes exactly 4 complete up-and-down cycles every 20.0 s. The vertical distance between a boat’s highest and lowest position is 3.4 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.

**Question 27**
Two boats are anchored in the harbor, separated by a horizontal distance of 36 m. The boats bob up and down as waves enter the harbor. When one boat is at its highest point, the other is also at its highest point and there are two wave crests between them. Each boat makes exactly 3 complete up-and-down cycles every 24.0 s. The vertical distance between a boat’s highest and lowest position is 3.6 m. Complete the diagram, showing where the second boat is located. Then determine the wavelength (m), frequency (Hz), period (s), amplitude (m), and speed (m/s) of the waves.