Name: _____ Date: _____

Modeling Periodic Phenomena – Medium

Find the maximum, minimum, and period of each model.

1. $y = 3\cos((\pi/3)t) + 7$ gives the height of a buoy bobbing on waves, in ft, after t seconds.
2. $y = 4\sin((\pi/4)t) + 9$ gives the height of a buoy bobbing on waves, in ft, after t seconds.
3. $y = \sin((\pi/2)t) + 9$ gives the height of a buoy bobbing on waves, in ft, after t seconds.
4. $y = 10\sin((\pi/12)t) + 67$ gives the temperature in a desert town over a day, in °F, after t hours.
5. $y = \cos((\pi/4)t) + 10$ gives the height of a buoy bobbing on waves, in ft, after t seconds.
6. $y = 21\sin((\pi/12)t) + 63$ gives the temperature in a desert town over a day, in °F, after t hours.

Write a sine or cosine model for each situation.

7. The temperature in a desert town over a day: lowest 69 °F, highest 89 °F, one full cycle every 24 hours, starting at the midline and rising.
8. The height of a buoy bobbing on waves: lowest 8 ft, highest 10 ft, one full cycle every 8 seconds, starting at the highest point.
9. The height of a seat on a Ferris wheel: lowest 2 m, highest 50 m, one full cycle every 10 minutes, starting at the lowest point.
10. The depth of water in a harbor: lowest 15 ft, highest 21 ft, one full cycle every 12 hours, starting at the midline and rising.

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Write a sine or cosine model for each situation.

11. The temperature in a desert town over a day: lowest 48 °F, highest 96 °F, one full cycle every 24 hours, starting at the midline and rising.

12. The temperature in a desert town over a day: lowest 64 °F, highest 96 °F, one full cycle every 24 hours, starting at the midline and rising.

Evaluate the model at the given time. Round to the nearest tenth.

13. $y = 17\cos((\pi/5)t) + 21$ gives the height of a seat on a Ferris wheel, in m, after t minutes. Find y when $t = 13$.

14. $y = 17\cos((\pi/2)t) + 18$ gives the height of a seat on a Ferris wheel, in m, after t minutes. Find y when $t = 6$.

15. $y = 19\sin((\pi/5)t) + 22$ gives the height of a seat on a Ferris wheel, in m, after t minutes. Find y when $t = 15$.

16. $y = \sin((\pi/2)t) + 9$ gives the height of a buoy bobbing on waves, in ft, after t seconds. Find y when $t = 3$.

17. $y = 16\cos((\pi/5)t) + 19$ gives the height of a seat on a Ferris wheel, in m, after t minutes. Find y when $t = 1$.

18. $y = 3\cos((\pi/4)t) + 7$ gives the height of a buoy bobbing on waves, in ft, after t seconds. Find y when $t = 6$.

19. $y = 5\cos((\pi/6)t) + 14$ gives the depth of water in a harbor, in ft, after t hours. Find y when $t = 14$.

20. $y = \sin((\pi/2)t) + 6$ gives the height of a buoy bobbing on waves, in ft, after t seconds. Find y when $t = 1$.

Modeling Periodic Phenomena – Medium – Answer Key

1. $y = 3\cos((\pi/3)t) + 7$ gives the height of a buoy bobbing on waves, in ft, after t seconds.

   maximum 10 ft, minimum 4 ft, period 6 seconds

2. $y = 4\sin((\pi/4)t) + 9$ gives the height of a buoy bobbing on waves, in ft, after t seconds.

   maximum 13 ft, minimum 5 ft, period 8 seconds

3. $y = \sin((\pi/2)t) + 9$ gives the height of a buoy bobbing on waves, in ft, after t seconds.

   maximum 10 ft, minimum 8 ft, period 4 seconds

4. $y = 10\sin((\pi/12)t) + 67$ gives the temperature in a desert town over a day, in °F, after t hours.

   maximum 77 °F, minimum 57 °F, period 24 hours

5. $y = \cos((\pi/4)t) + 10$ gives the height of a buoy bobbing on waves, in ft, after t seconds.

   maximum 11 ft, minimum 9 ft, period 8 seconds

6. $y = 21\sin((\pi/12)t) + 63$ gives the temperature in a desert town over a day, in °F, after t hours.

   maximum 84 °F, minimum 42 °F, period 24 hours

7. The temperature in a desert town over a day: lowest 69 °F, highest 89 °F, one full cycle every 24 hours, starting at the midline and rising.

   $y = 10\sin((\pi/12)t) + 79$ (amplitude 10, midline $y = 79$, period 24)

8. The height of a buoy bobbing on waves: lowest 8 ft, highest 10 ft, one full cycle every 8 seconds, starting at the highest point.

   $y = \cos((\pi/4)t) + 9$ (amplitude 1, midline $y = 9$, period 8)

9. The height of a seat on a Ferris wheel: lowest 2 m, highest 50 m, one full cycle every 10 minutes, starting at the lowest point.

   $y = -24\cos((\pi/5)t) + 26$ (amplitude 24, midline $y = 26$, period 10)

10. The depth of water in a harbor: lowest 15 ft, highest 21 ft, one full cycle every 12 hours, starting at the midline and rising.

    $y = 3\sin((\pi/6)t) + 18$ (amplitude 3, midline $y = 18$, period 12)

Modeling Periodic Phenomena – Medium – Answer Key

11. The temperature in a desert town over a day: lowest 48 °F, highest 96 °F, one full cycle every 24 hours, starting at the midline and rising.

    y = 24 sin((π/12)t) + 72 (amplitude 24, midline y = 72, period 24)

12. The temperature in a desert town over a day: lowest 64 °F, highest 96 °F, one full cycle every 24 hours, starting at the midline and rising.

    y = 16 sin((π/12)t) + 80 (amplitude 16, midline y = 80, period 24)

13. $y = 17\cos((\pi/5)t) + 21$ gives the height of a seat on a Ferris wheel, in m, after t minutes. Find y when t = 13.

    y ≈ 15.7 m

14. $y = 17\cos((\pi/2)t) + 18$ gives the height of a seat on a Ferris wheel, in m, after t minutes. Find y when t = 6.

    y ≈ 1 m

15. $y = 19\sin((\pi/5)t) + 22$ gives the height of a seat on a Ferris wheel, in m, after t minutes. Find y when t = 15.

    y ≈ 22 m

16. $y = \sin((\pi/2)t) + 9$ gives the height of a buoy bobbing on waves, in ft, after t seconds. Find y when t = 3.

    y ≈ 8 ft

17. $y = 16\cos((\pi/5)t) + 19$ gives the height of a seat on a Ferris wheel, in m, after t minutes. Find y when t = 1.

    y ≈ 31.9 m

18. $y = 3\cos((\pi/4)t) + 7$ gives the height of a buoy bobbing on waves, in ft, after t seconds. Find y when t = 6.

    y ≈ 7 ft

19. $y = 5\cos((\pi/6)t) + 14$ gives the depth of water in a harbor, in ft, after t hours. Find y when t = 14.

    y ≈ 16.5 ft

20. $y = \sin((\pi/2)t) + 6$ gives the height of a buoy bobbing on waves, in ft, after t seconds. Find y when t = 1.

    y ≈ 7 ft