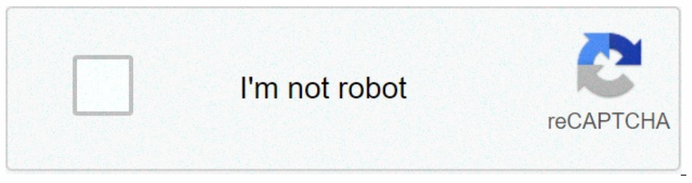

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Children will love the variety of photos. Applications:Class Décor, Label Name, Work/Exhibition Design, Page 19Halloween Bulletin Board Letters, Halloween Classroom DecorHas A to Z, Letters 0 to 9 Digits and Symbols, !, ., , .:, ;, ~, *, -, _, +, =, @, #, $, %, &, ?, /i , . Each letter is on an a4-sized sheet with a beautiful pattern. To print 2 or more letters on one page, please page 20Halloween Bulletin Board Letters, Halloween Classroom DecorHas from A to Z, and to with letters, from 0 to 9 digits and symbols, !, ., , :, ;, , ~, *, -, _, +, =, @, #, $, %, &, ?, and . Each letter is on an a4-sized sheet with a beautiful pattern. To print 2 or more letters on one page, please Page 21Fall, Leaves Bulletin Board Letters, Autumn Classroom DecorHas A to Z letters, and this with letters, 0 to 9 numbers and symbols, !, ., , :, , ;, , ~, *, -, _, +, =, @, #, $, %, &, ?, /i . Each letter is on an a4-sized sheet with a beautiful pattern. To print 2 or more letters on one page, please page 22Christmas Bulletin Board Letters, Christmas Classroom Decor, Christmas Alphabet PostersHas A to Z letters, and this with letters, 0 to 9 numbers and symbols, !, ., , :, , ;, , ~, *, -, _, +, =, @, #, $, %, &, ?, / and , . Each letter is on an a4-sized sheet with a beautiful pattern. To print 2 or more letters of the bulletin board Pages 23Christmas, Christmas Classroom Decor, Christmas Alphabet PostersHas A to Z, letters from a to z, from 0 to 9 digits and symbols, !, ., , :, , ;, , ~, *, -, _, +, =, @, #, $, %, &, ?, and . Each letter is on an a4-sized sheet with a beautiful pattern. To print 2 or more 24PreK pages, Kindergarten, 1, 2, 3, 4, 5, HomeschoolPage 25Ecology Bulletin Board Letters, Ecology Classroom Decor, Ecology Alphabet PostersHas A to Z letters, and this with letters, 0 to 9 numbers and symbols, !, ., , :, , ;, , ~, *, -, _, +, =, @, #, $, %, &, ?, / and , . Each letter is on an a4-sized sheet with a beautiful pattern. To print 2 or more lettersPage 26Lime Green Bulletin Board Letters, Colorful Classroom Decor, Colorful Alphabet PostersHas A to Z letters, and this with letters, 0 to 9 numbers and symbols, !, ., , :, , ;, , ~, *, -, _, +, =, @, #, $, %, &, ?, / and . Each letter is on an a4-sized sheet with a beautiful pattern. print 2 or more l Learning effects Specify amplitude, period, phase shift, and vertical vertical sine wave or cosine chart from its equation. Chart variants y=cos x and y=sin x . Specify a function formula that would have a given sine wave chart. Specify functions that model circular and periodic motion. Recall that the sine and cosine functions refer real-number values to the x and y coordinates of a point per circle of an entity. What do they look like in a chart on a coordinate plane? Let's start with the sine wave function. You can create a table of values and use them to sketch a chart. The following table lists some of the values of the sine wave function in the unit wheel. x 0 [latex]\frac{\pi}{6}[/latex] [latex]\frac{\pi}{4}[/latex] [latex]\frac{\pi}{3}[/latex] [latex]\frac{\pi}{2}[/latex] [latex] [latex]] [latex] [latex]ex]\frac{2\pi}{3}[/latex] [latex]\frac{3\pi}{4}[/latex] [latex]\frac{5\pi}{6}[/latex] [latex]\pi[/latex] [latex]\sin(x)[/latex] 0 [latex]\frac{1}{2}[/latex] [latex]\frac{\sqrt{2}}{2}[/latex] [latex]\frac{\sqrt{3}}{2}[/latex] 1 [latex]\frac{\sqrt{3}}{2}[/latex] [latex]\frac{\sqrt{2}}{2}[/latex] [latex]\frac{1}{2}[/latex] 0 Plotting points from a table and continuing along the x-axis gives shape to the sine wave function. See Figure 2. Figure 2. Sine wave function Notice how the sine wave values are positive between 0 and π, which correspond to the values of the sine wave function in quadrants I and II in the unit wheel, and the sine wave values are negative between π and 2π, which corresponds to the values of the sine wave function in quadrants III and IV in the unit circle. See Figure 3. Figure 3. Plotting the value of the sine function now let's look at the cosine function. Again, you can create a table of values and use them to sketch a chart. The following table lists some of the values of the cosine function in the unit wheel. x 0 [lateks]\frac{\pi}{6}[/lateks] [lateks]\frac{\pi}{4}[/lateks] [lateks]\frac{\pi}{3}[/lateks] [lateks]\frac{\pi}{2}[/lateks] [lateks][/lateks]\frac{2\pi}{3}[/lateks] [lateks]\frac{3\pi}{4}[/lateks] [lateks]\frac{5\pi}{6}[/lateks] [lateks]\pi[/lateks] [lateks]\cos(x)[/latex] 1 [lateks]\frac{\sqrt{3}}{2}[/lateks] [lateks]\frac{\sqrt{2}}{2}[/lateks] [lateks]\frac{1}{2}[/lateks] 0 [lateks]-\frac{1}{2}[/latex] [lateks]-\frac{\sqrt{2}}{2}[/lateks] [lateks]-\frac{\sqrt{3}}{2}[/lateks] −1 Podobnie jak w odniesieniu do funkcji sinusoidy, możemy wykreślać punkty, aby utworzyć wykres funkcji cosine, jak na rysunku 4. Figure 4. Cosine function Because we can evaluate the sine and cosine of any real number, both of these functions are defined for all real numbers. When thinking of sine and cosine values as coordinates of points in a unit wheel, it becomes clear that the range of both functions must be an interval [−1,1]. In both graphs, the shape of the chart is repeated at 2π,which means that the functions are periodic with a period of [latex]2π[/latex]. A periodic function is a function for which a specified horizontal shift, P, causes [latex]f (x + P) = f(x)[/latex] for all x values in domain f. When this happens, we call the smallest horizontal offset with [latex]P > 0[/latex] function period. Figure 5 shows several periods of sine and cosine functions. Figure 5 A re-look at the sine and cosine functions in the y-axis domain helps to reveal symmetry. As you can see in Figure 6, the sine wave function is symmetrical as to origin. Recall from other trigonometric functions that we determined from the unit wheel that the sine wave function is odd because [latex]\sin(−x)=−\sin x[/latex]. Now we can clearly see this property from the chart. Fig. 6. Odd symmetry of the sine function Figure 7 shows that the cosine function is symmetrical relative to the y-axis. Again, we have determined that the cosine function is an equal function. Now we see in the chart that [latex]\cos(−x)=\cos x[/latex]. Figure 7. Even the symmetry of cosine functions sine and cosine functions have several distinct characteristics: These are periodic functions with a period of 2π. The domain of each function is [latex]\left(-\infty,\infty\right)[/latex], and the range is [latex]\left[−1,1\right][/latex]. The [latex]y=\sin x[/latex] chart is symmetrical relative to origin because it is odd. The [latex]y=\cos x[/latex] chart is symmetrical relative to the y-axis because it is an even function. Study of sinusoidal functions As you can see, sinusoidal and cosine functions have a regular period and range. If we look at ocean waves or waves on a pond, we will see that they resemble the functions of a sine wave or cosine. However, they are not necessarily identical. Some are higher or longer than others. A function that has the same general shape as the sine or cosine function is known as a sine function. General forms of sinusoidal functions are [latex]y = A\sin (Bx−C) + D[/latex] and [latex]y = A\cos (Bx−C) + D[/latex] Looking at the forms of sinusoidal functions, we can see that these are transformations of sinusoidal and cosine functions. We can use what we know about transformations to determine the period. In the generic formula, B is bound to the period by [latex]P=\frac{2π}{| B|} [/latex]. If [latex]| B| > 1[/latex], the period is less than [latex]2π[/latex] and the function undergoes horizontal compression, whereas if [latex]| B| < 1[/latex], then the period is greater than [latex]2π[/latex] and the function passes the horizontal section. For example, [latex]f(x) = \sin(x), B= 1[/latex], so the period is [latex]2π[/latex] that we knew. If [latex]f(x) =\sin (2x)[/latex], then [latex]B= 2[/latex], so the period is [latex]π[/latex] and the chart is compressed. If [latex]f(x) = \sin\left(\frac{x}{2} \right)[/latex], then [latex]B=\frac{1}{2}[/latex], so the dot is [latex]4π[/latex] and the chart is stretched. The information in Figure 8, as well as the period is indirectly related to [latex]| B| [/latex]. Figure 8 If we allow C=0 and D=0 in the general equations of sinusoidal forms and cosine functions, we obtain the forms [latex]y=A\sin\left(Bx\right)[/latex] [latex]y=A\cos\left(Bx\right)[/latex] The period is [latex]\frac{2π{}} B|} [/latex]. Specify the period of [latex]f(x) = \sin\left(\frac{π}{6}x\right)[/latex]. Specify the period of [latex]g(x)=\cos\left(\frac{x}{3}\right)[/latex]. Determining amplitude Returning to the general formula for a sine wave function, we analyzed how variable B refers to the period. Now let's go to variable A so that we can analyze how it is related to amplitude or the greatest distance from rest. A represents the vertical tensile coefficient and its absolute value | A| is an amplitude. Local maxima will be at a distance | A| above the vertical centerline of the chart, which is the line x = D; because D = 0 in this case, the centerline is the x axis. Local minima will be the same distance below the centerline. If | A| > 1 function is stretched. For example, the amplitude of [latex]f(x)=4\sin\left(x\right)[/latex] is twice as large as [latex]f(x)=2\sin\left(x\right)[/latex] If [latex]| A| < 1[/latex], the function is compressed. Figure 9 compares several sinusoidal functions with different amplitudes. Figure 9 If we allow C = 0 and D = 0 in the general equations of sinusoidal forms and cosine functions, we obtain the forms [latex]y =A\sin(Bx)[/latex] and [latex]y=A\cos(Bx)[/latex] Amplitude is A and the vertical height from the centerline is | A|. In addition, the example notes that [latex]| A|=\text{amplitude}=\frac{1}{2}|\text{maximum}−\text{minimum}| [/latex] What is the sine wave amplitude of [latex]f(x)=−4\sin(x)[/latex]? Is the function stretched or vertically compressed? What is the sine wave amplitude of [latex]f(x)=12\sin (x)[/latex]? Is the function stretched or vertically compressed? By analyzing the variation graphs y = sin x and y = cos x Now that we understand how A and B refer to the general form equation for sine and cosine functions, we will examine the variables C and D. Recall the general form: [latex]y = A \sin(Bx−C)+D[/latex] and [latex]y=A\cos(Bx−C)+D[/latex] or [latex]y=A\sin(B(x−\frac{C}{B}))+D[/latex] and [latex]y=A\cos(B(x−\frac{C}{B})+D[/latex] The value of [latex]\frac{C}{B}[/latex] for a sine function is called a phase shift, or a horizontal displacement of the underlying function of a sine or cosine. If C > 0, the chart moves to the right. If C<0, the chart moves to the left. The higher the value | C|, the more the chart is shifted. Figure 11 shows that the [latex]f(x)=\sin(x−π)[/latex] chart moves to the right by π units, which is more than we see in the [latex]f(x)=\sin(x−\frac{π}{4})[/latex] chart that right to the right Figure 11 While C refers to a horizontal offset, D indicates a vertical offset from the centerline in the general formula for the sine wave function. The [latex]y=\cos(x)+D[/latex] function has its midline on [latex]y=D[/latex]. Figure 12 Any D value other than zero moves the chart up or down. Figure 13 compares [latex]f(x)=\sin x[/latex] with [latex]f(x)=\sin (x)+2[/latex], which is moved up 2 units in the chart. Figure 13 Taking into account the equation in the form of [latex]f(x)=A\sin(Bx−C)+D[/latex] or [latex]f(x)=A\cos(Bx−C)+D[/latex], [latex]\frac{C}{B}[/latex]is a phase shift, and D is a vertical offset. Specify the direction and magnitude of the phase offset for [latex]f(x)=\sin(x+\frac{π}{6})−2[/latex]. Specify the direction and magnitude of the phase offset for [latex]f(x)=3\cos(x−\frac{\pi}{2})[/latex]. Specify the direction and magnitude of the vertical offset for [latex]f(x)=\cos(x)−3[/latex]. Specify the direction and size of the vertical offset for [latex]f(x)=3\sin(x)+2[/latex]. How to: Given the sinusoidal function in the form of [latex]f(x)=A\sin(Bx−C)+D[/latex], identify the midline, amplitude, period, and phase shift. Mark amplitude as | A|. Specify period as [latex]P=\frac{2π}{| B|} [/latex]. Specify the phase offset as [latex]\frac{C}{B}[/latex]. Specify the centerline as y = D. Specify the centerline, amplitude, period, and phase shift of [latex]y=3\sin(2x)+1[/latex]. Specify the midline, amplitude, period, and phase offset of [latex]y=\frac{1}{2}\cos(\frac{x}{3}−\frac{π}{3})[/latex]. Specify a formula for the cosine function in Figure 15. Figure 15 Specify a formula for the sine wave function in Figure 16. Figure 16 Specify the equation for the sine wave function in Figure 17. Figure 17 Write a formula for a function in Figure 18. Figure 18 Throughout this section, we learned about the types of variations of the sine and cosine functions and used this information to record equations from charts. Now we can use the same information to create charts from equations. Instead of focusing on the general character equations [latex]y=A\sin(Bx−C)+D[/latex] and [latex]y=A\cos(Bx−C)+D[/latex], we will allow C=0 and D=0 and work with the simplified form of equations in the following examples. How to: Consider [latex]y=Asin(Bx)[/latex], sketch your chart. Identify amplitude,| A|. Identify [latex]P=\frac{2π}{| B|} [/latex]. Start over, with the function increasing on the right, if A is positive or decreases if A is negative. W : [latex]x=\frac{π}{2| B|} [/latex] is the local maximum for A > 0 or minimum for A < 0, with y = A. Curve returns to x axis in [latex]x=\frac{π}{| B|} [/latex]. There is a local minimum for A > 0 (maximum for A < 0) in [latex]x=\frac{3π}{2| B|} [/latex] of y = –A. Curve returns to x axis again [latex]x=\frac{π}{2| B|} [/latex]. Sketch [latex]f(x)=−2\sin(\frac{πx}{2})[/latex]. Sketch [latex]g(x)=−0.8\cos(2x)[/latex]. Specify the centerline, amplitude, period, and phase offset. How to: Given the sine wave function with phase shift and vertical offset, sketch a chart. Express the function as generic [latex]y=A\sin(Bx−C)+D[/latex] or [latex]y=A\cos(Bx−C)+D[/latex]. Determination of amplitude, | A|. Identify period [latex]P=2π| B| [/latex]. Identify the phase offset[latex]\frac{C}{B}[/latex]. Draw [latex]f(x)=A\sin(Bx)[/latex] moved to the right or left by [latex]\frac{C}{B}[/latex] and up or down by D. Sketch [latex]f(x)=3\sin\left(\frac{π}{4}x−\frac{π}{4}\right)[/latex]. Draw [latex]g(x)=−2\cos(\frac{\pi}{3}x+\frac{\pi}{6})[/latex]. Specify the centerline, amplitude, period, and phase offset. Given [latex]y=−2\cos\left(\frac{\pi}{2}x+\pi\right)+3[/latex], specify amplitude, period, phase offset, and horizontal offset. Then chart the function. Using sine and cosine function transformations we can use sine transformations and cosine functions in many applications. As mentioned at the beginning of the chapter, circular motion can be modeled using the sine or cosine function. The point rotates around a circle with a radius of 3 centered at the beginning of the coordinate system. Sketch a point y coordinate chart as a function of the rotation angle. What is the amplitude of [latex]f(x)=7\cos(x)[/latex]? Sketch a graph of this feature. A circle with a radius of 3 feet is mounted from its center 4 feet from the ground. The point closest to the ground is marked as P, as shown in Figure

23. Sketch a graph of the height above the p-point substrate when rotating a circle; then find a function that gives you height in terms of angle of rotation. Figure 23 The balance is attached to the spring, which is then suspended on the board, as shown in Figure 25. When the spring oscillates up and down, the position of the weight relative to the plate ranges from –1 inch (in time x = 0) to –7in. (at time x = π) below the board. Take y is given as a sinusoidal function x. Sketch a function graph, and then find the cosine function that gives you a y-position in the x. Figure 25 London Eye is a huge Ferris wheel with a diameter of 135 meters. Completes one turn every 30 minutes. Riders board from the platform 2 meters above the ground. Express the driver's altitude above the ground as a function of time in minutes. Key equations Sinusoidal functions [latex]f(x)=A\sin(Bx−C)+D[/latex] [latex]f(x)=A\cos(Bx−C)+D[/latex] Periodic functions are repeated after a given value. The smallest such value is the period. The basic functions of sine and cosine have a period of 2π. The sin x function is odd, so its graph is symmetrical at the beginning. cos x is even, so its graph is symmetrical relative to the y-axis. The sine function graph has the same overall shape as the sine or cosine function. In the general formula of the sine wave function, the dot is [latex]\text{P}=\frac{2\pi}{| B|} [/latex]. In the general formula for sine wave function, | A|represents amplitude. If | A| > 1 function is stretched, while if| A| < 1 function is compressed. The value [latex]\frac{C}{B}[/latex] in the general formula for the sine function indicates a phase offset. The D value in the general formula for the sine wave function indicates the vertical offset from the centerline. Combinations of variations of sinusoidal functions can be detected from the equation. You can specify a sine-oid equation in a chart. The function can be graphed by identifying its amplitudes and dots. The function can also be graphed by identifying its amplitude, period, phase offset, and horizontal offset. Sine functions can be used to solve real problems. amplitude of the vertical height of the function; constant A appearing in the definition of the sine wave function of the horizontal line y = D, where D appears in the general form of the sine function of the periodic function of function f(x), which meets [latex]f(x+P)=f(x)[/latex] for the specified constant P and any x phase value move the horizontal displacement horizontally to the basic function of sinusine or cosine; constant [latex]\frac{C}{B}[/latex] sine function of any function, which can be expressed as [latex]f(x)=A\sin(Bx−C)+D[//latex] or [latex]f(x)=A\cos(Bx−C)+D[/latex] [latex]f(x)=A\cos(Bx−C)+D[/latex]