DATE: ______________

Unit 5 (Chapter 4): Trigonometric Functions **Pre-Calculus**

4.4 Graphs of Sinusoidal Functions

Target 5C: Rigid and non-rigid transformations of sinusoids

Review of Prior Concepts

From the parent function $f(x) = x^2$, describe the transformation of $g(x) = (x-1)^2 + 3$ and give the domain and range of $g(x)$.

More Practice

Transformations

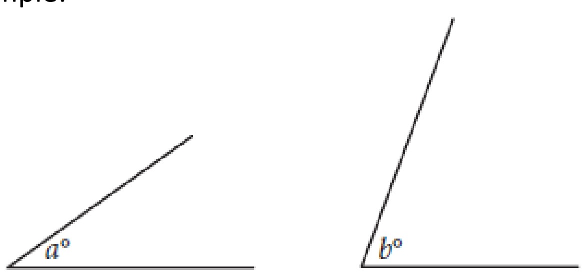
https://www.mathsisfun.com/sets/function-transformations.html
https://www.khanacademy.org/math/algebra2/manipulating-functions/stretching-functions/v/shifting-and-reflecting-functions
https://academics.utep.edu/Portals/1788/CALCULUS%20MATERIAL/1_7%20TRANSFORMATION%20OF%20FNS.pdf
https://www.youtube.com/watch?v=0a-AjP4UdnY
https://www.youtube.com/watch?v=3Q5Sy034fok

SAT Connection

Passport to Advanced Math

14. Use structure to isolate or identify a quantity of interest in an expression

Example:



Note: Figures not drawn to scale.

The angles shown above are acute and $\sin(a°) = \cos(b°)$. If $a = 4k - 22$ and $b = 6k - 13$, what is the value of k ?

A) 4.5

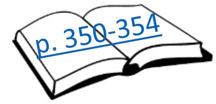
B) 5.5

C) 12.5

D) 21.5

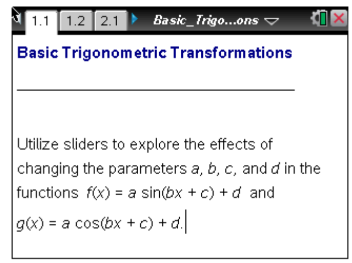
Solution

Vocabulary



- Sinusoidal Functions –
- Amplitude –
- Period –
- Phase Shift –
- Vertical Shift –
- Midline –

TI-Nspire Activity



Open the TI-Nspire document: *Basic_Trigonometric_Transformations.tns*

Move to page 1.2

1. Drag the sliders to change the values of a in the function $f(x) = a\sin(bx)$.

a) How does the value of a affect the shape of the graph?

b) What happens to the graph if a is negative?

c) How does the value of b affect the shape of the graph?

Conclusion:
For $a \neq 0$ and $b \neq 0$, the graph of $f(x) = a\sin(bx)$ has an amplitude of _____ and a period of _____.

Move to page 2.2

2. Drag the sliders to change the value of d in the function of $f(x) = \sin(x) + d$.
How does the value of d affect the shape of the graph?

Conclusion:
The graph of $f(x) = \sin(x) + d$ has a vertical shift of ______.

Move to page 3.2

3. Drag the sliders to change the value of c in the function of $f(x) = \sin(x + c)$.
How does the value of c affect the shape of the graph?

Conclusion:
The graph of $f(x) = \sin(x + c)$ has a phase shift of ______.

Move to page 4.2

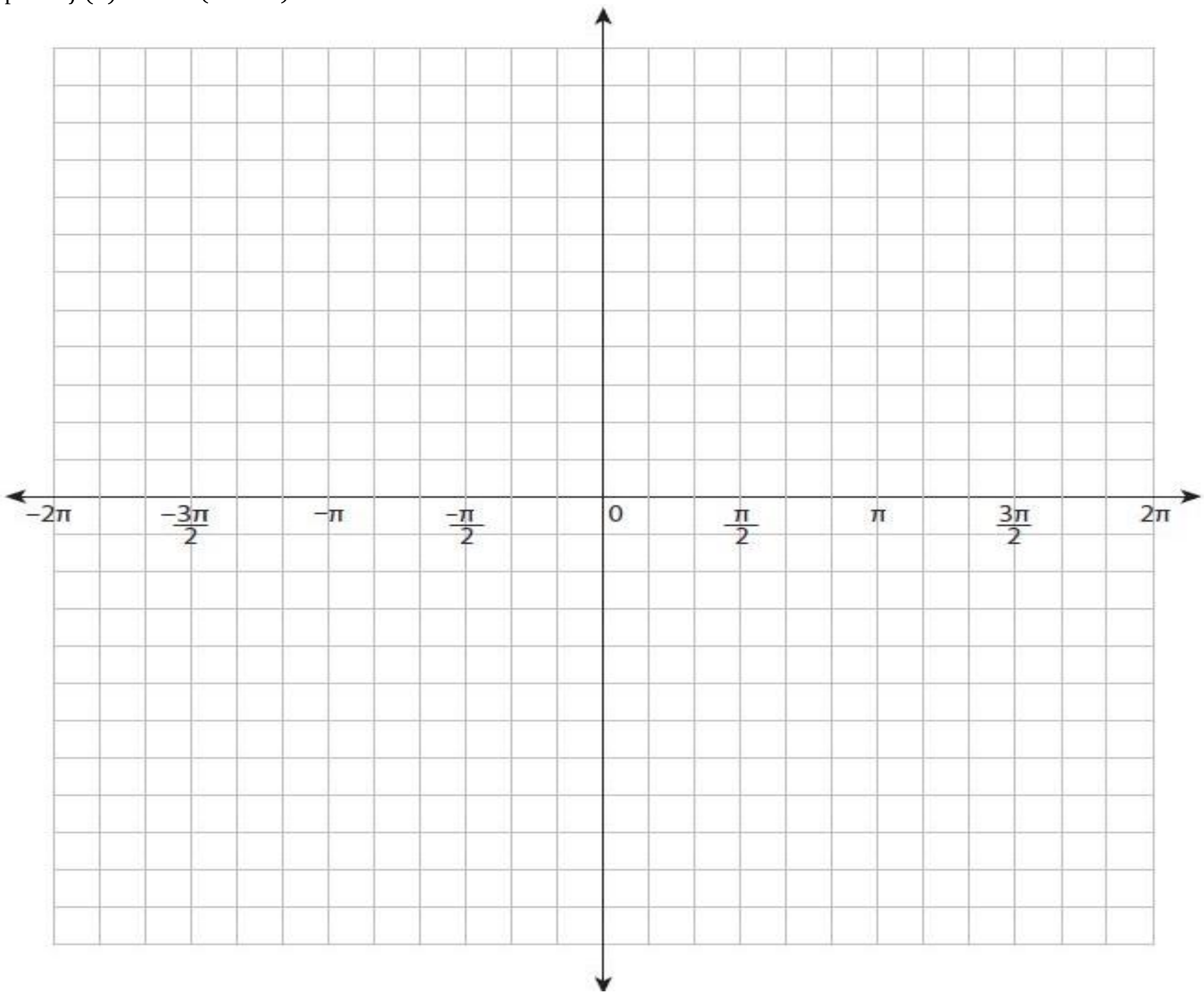
4. Drag the sliders to change the value of *a*, *b*, *c* and d in the function $f(x) = a\sin(bx + c) + d$. Which of the four parameters have an impact on the phase shift of the graph?

Conclusion:
The graph of $f(x) = a\sin(bx + c) + d$ has a phase shift of ______.

Apply Knowledge from Activity

Transformation	**General Form** $f(x) = a\sin(bx + c) + d$ OR $f(x) = a\cos(bx + c) + d$	**Example** $f(x) = 3\sin(2x + \pi) - 4$
Amplitude		
Period		
Phase Shift		
Vertical Shift		

Sketch the graph of: $f(x) = 3\sin(2x + \pi) - 4$



More Practice

Transformations of Sinusoidal Functions

https://www.khanacademy.org/math/trigonometry/trig-function-graphs
http://www.purplemath.com/modules/grphtrig.htm
http://www.algebralab.org/lessons/lesson.aspx?file=Trigonometry_TrigTransformations.xml
https://www.youtube.com/watch?v=iEbF1aa0Qps
https://www.youtube.com/watch?v=s_NI50p-pcg

Homework Assignment

p.357 #3,5,9,11,13,15,21,25

SAT Connection
Solution

Choice C is correct. Since the angles are acute and $\sin(a°) = \cos(b°)$, it follows from the complementary angle property of sines and cosines that $a + b = 90$. Substituting $4k - 22$ for a and $6k - 13$ for b gives $(4k - 22) + (6k - 13) = 90$, which simplifies to $10k - 35 = 90$. Therefore, $10k = 125$, and $k = 12.5$.

Choice A is incorrect and may be the result of mistakenly assuming that $a + b$ and making a sign error. Choices B and D are incorrect because they result in values for a and b such that $\sin(a°) \neq \cos(b°)$.