U6D4 MCR 3UI **Horizontal Stretches of Periodic Functions**

Recall: When a trig function was vertically stretched (or compressed), the key idea was the fact that the function's _____ was altered. Notice that if a graph is stretched/compressed vertically, a measurement on the y-axis is changed.

So, if we stretch/compress a graph horizontally, a measurement on the x-axis is changed.

From the graph of a trig function, what is the key term measured on the x-axis?

In general:

Transformations that applied to f(x), also apply to trig functions:

For functions in the form $y = sinkx \quad or \quad y = coskx$,

- If **k** > 1, the graphs are horizontally compressed by a factor of $\frac{1}{k}$
- If 0 < **k** < 1, the graphs are horizontally stretched by a factor of $\frac{1}{k}$
- *Amplitude* is unchanged
- *Period* becomes $\frac{360°}{k} \quad \Rightarrow \quad k = \frac{360°}{Period}$

Graphing Horizontal stretches/compressions using the 5-Point Graphing Method

When we have a horizontal stretch/compression, the period is altered, therefore our 5 key points will also be altered. Remember that the 5 key points divided our period into quarters…therefore, divide the new period by 4 and you will have the locations of the new 5 key points (the amplitude is unchanged, so our y-values will remain the same)

1. Graph $y = \sin x$ and $y = \sin 3x$ on the grid below.

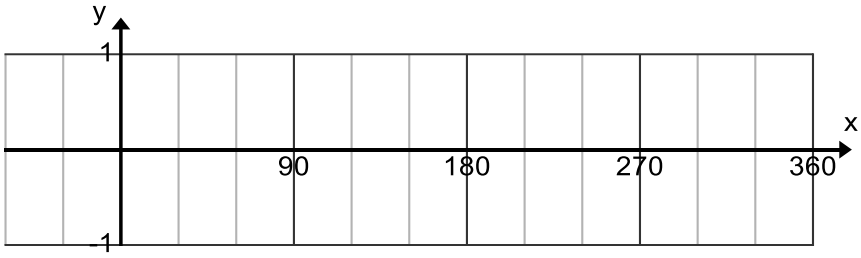
Recall the 5 Key Points of $y = \sin x$

x	sin x

Period of $y = \sin 3x$ is _____

Therefore, our 5 key points will occur every _____.

x	sin 3x

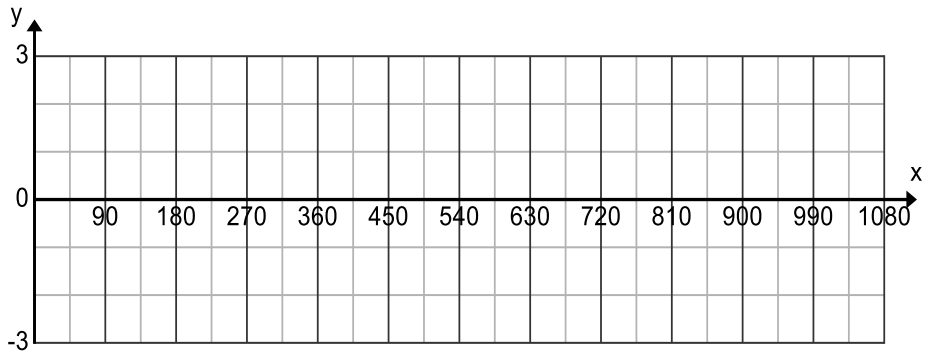


2. Graph $y = \cos x$ and $y = \cos \frac{1}{2} x$ on the grid below:

Period of $y = \cos \frac{1}{2} x$ is: _____. Key points every _____.

x	$\cos x$
0°	
90°	
180°	
270°	
360°	

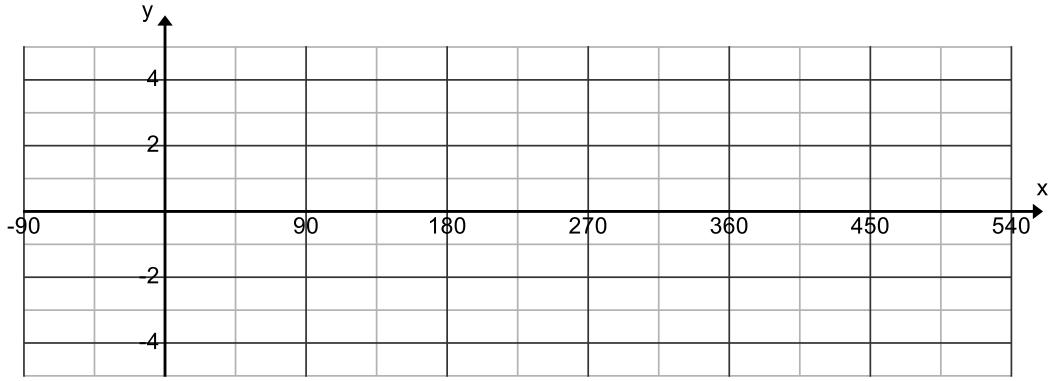
x	$\cos \frac{1}{2} x$



3. Graph $y = 4 \sin 2x$ on the grid below

Amplitude:_____. Period: _____. Key points every: _____.

x					
4sin 2x					



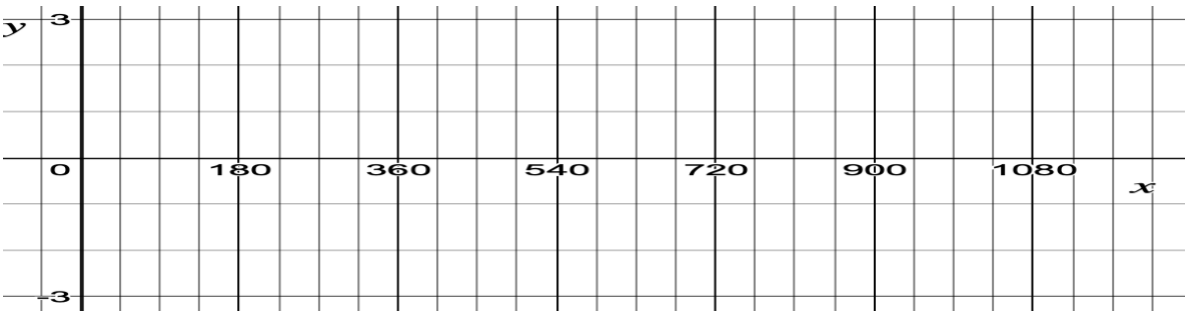
4. A cosine function has an amplitude of 3 and a period of 540°.

a) Determine the equation of the function:

b) Sketch **<u>2 cycles</u>** of this function, beginning with a point at x = 0.

Key points occur every: _____

x					



U6D4 Practice: Page 374 #2 (all – just in degrees, not radians), 3 – 6 (b only), 8b (typo – max is at 3), 10c, 11bc, 12c