Name Key

Graphs of Sine and Cosine Functions

LEARNING TARGETS

I can graph the parent functions for sine and cosine.
I can apply my knowledge of transformations to sine and cosine functions.

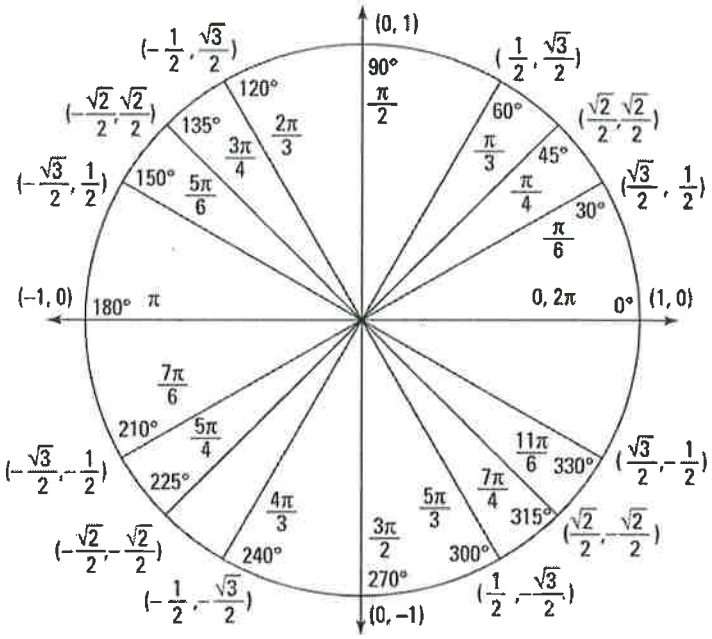
http://www.mathsisfun.com/algebra/trigonometry-index.html

$y = \sin x$

x-axis	y-axis
0	0
$\frac{\pi}{2}$	1
π	0
$\frac{3\pi}{2}$	-1
2π	0

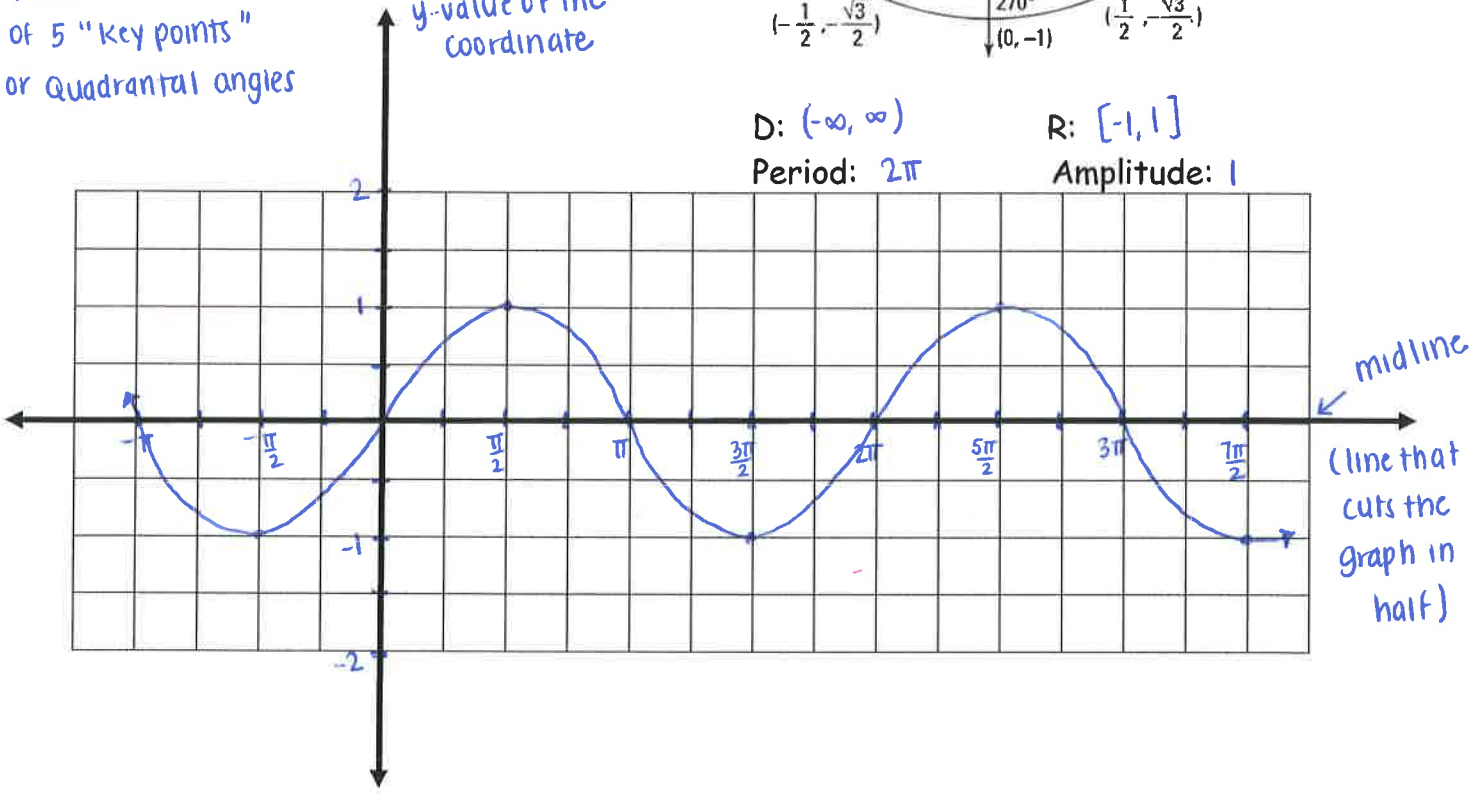
↑ radian measure of 5 "key points" or Quadrantal angles

← y-value of the angle since sine is the y-value of the coordinate



D: $(-\infty, \infty)$ R: $[-1, 1]$

Period: 2π Amplitude: 1



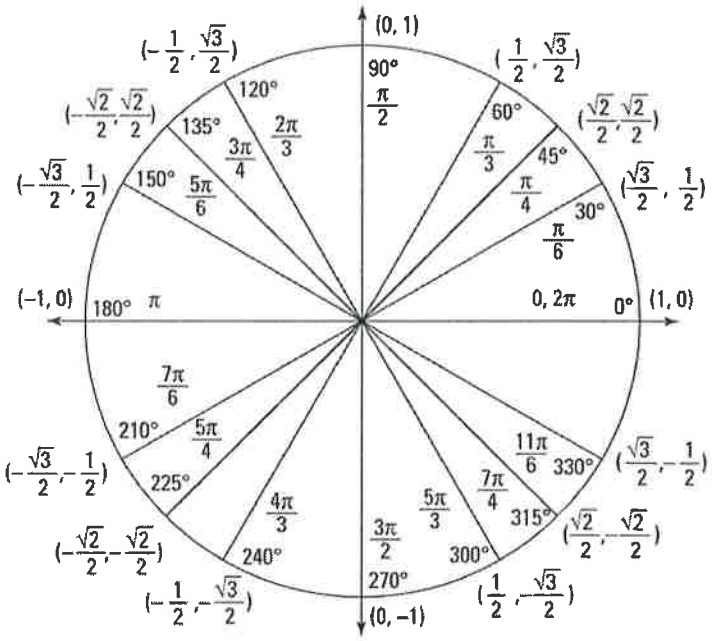
midline (line that cuts the graph in half)

$y = \cos x$

x-axis	y-axis
0	1
$\frac{\pi}{2}$	0
π	-1
$\frac{3\pi}{2}$	0
2π	1

↑ Five key points

↖ x-value of the angle since cosine is the x-value of the coordinate



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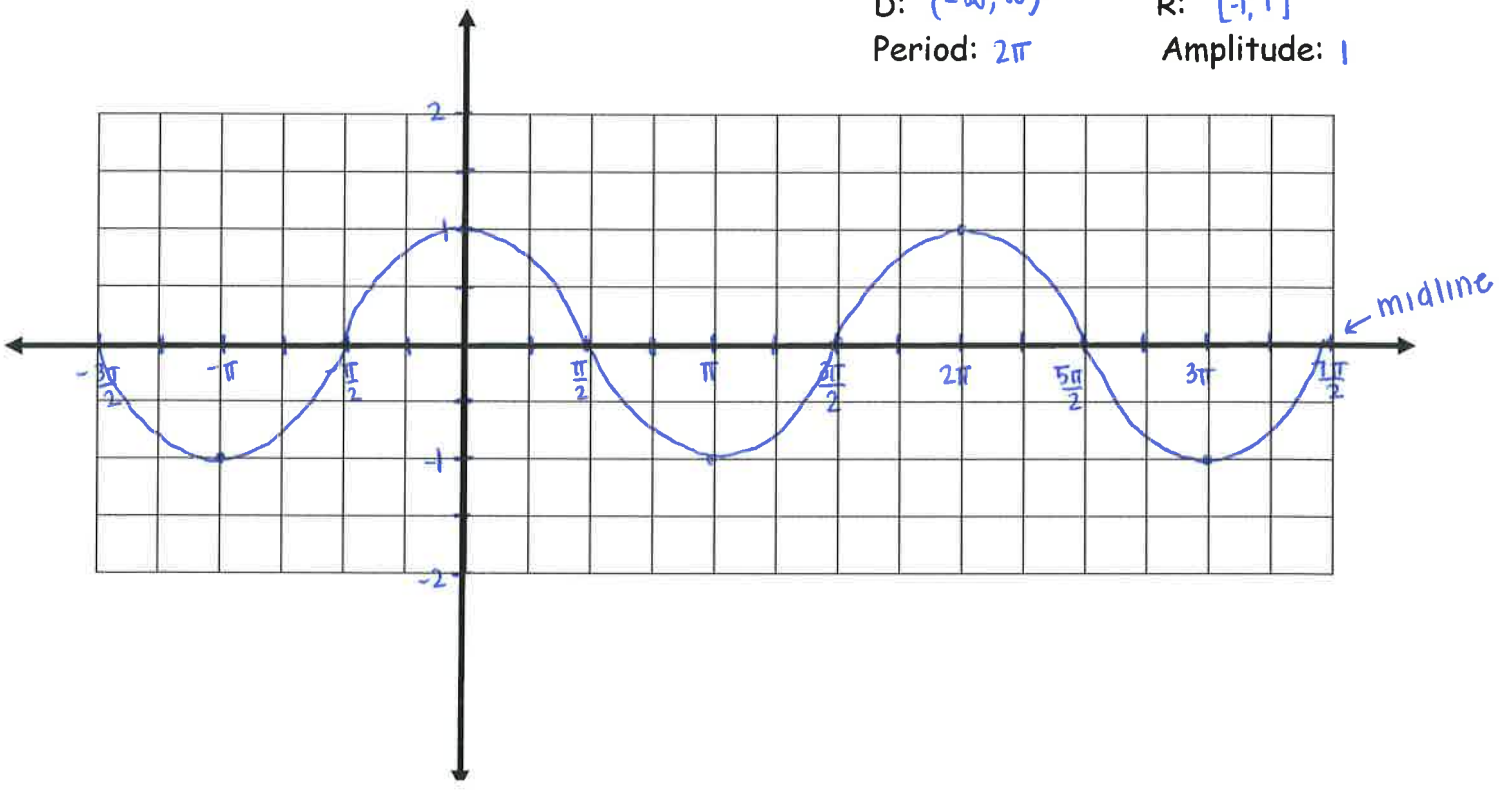
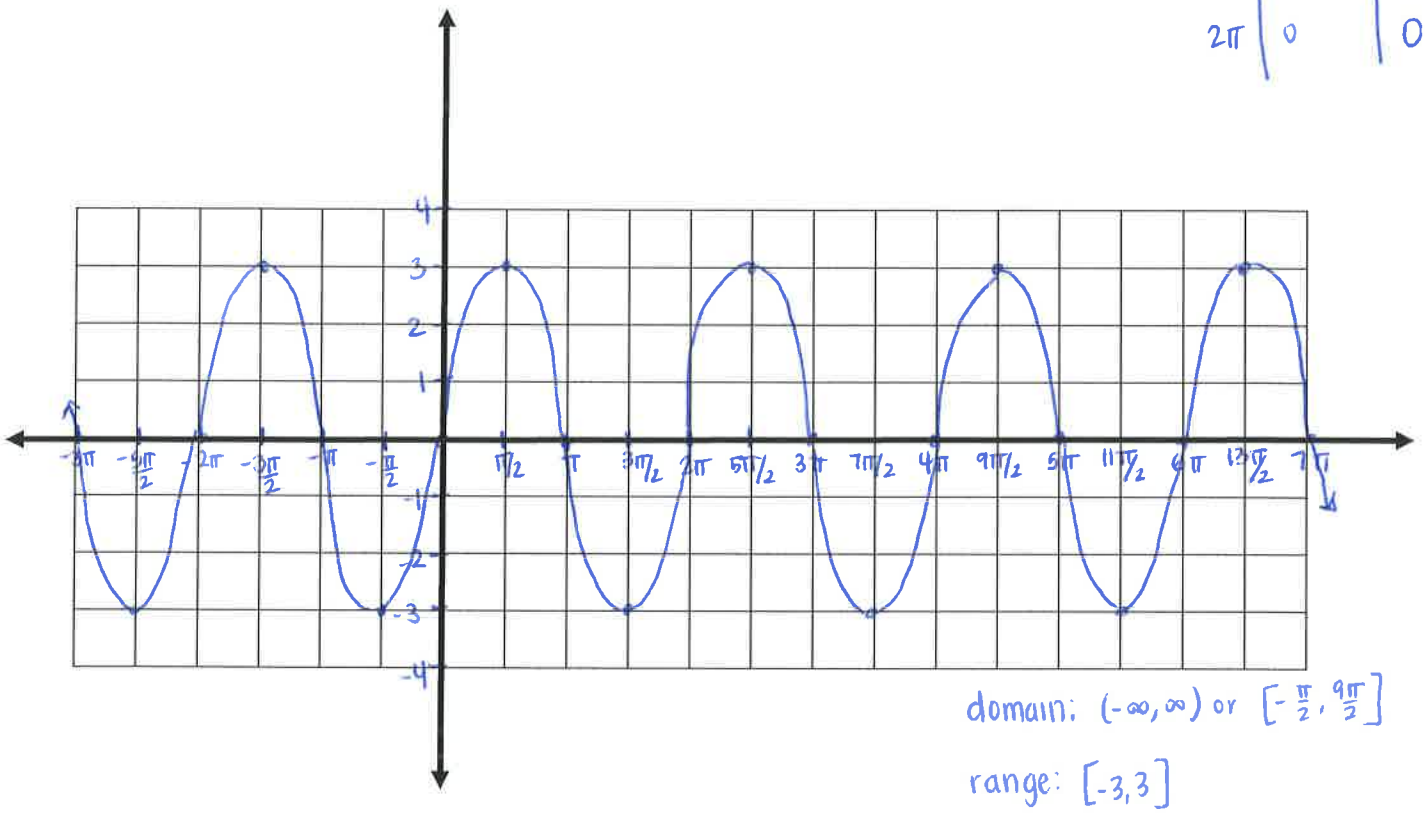


Sketch the graph of $y = 3\sin x$ on the interval $\left[-\frac{\pi}{2}, \frac{9\pi}{2}\right]$.

x-axis	y axis	3·y
0	0	0
$\pi/2$	1	3
π	0	0
$3\pi/2$	-1	-3
2π	0	0



domain: $(-\infty, \infty)$ or $\left[-\frac{\pi}{2}, \frac{9\pi}{2}\right]$

range: $[-3, 3]$

The <u>amplitude</u> of a function is half the distance between the maximum and minimum values of the function.

What is the amplitude of $y = 3\sin x$?

amp: $\frac{1}{2}(\text{MAX-min}) = \frac{1}{2}(3 - -3) = \frac{1}{2}(3+3) = \frac{1}{2}(6) = 3$

How is the amplitude related to the function?

The amplitude is the # being multiplied by the sine or cosine

Now that we have determined how the "a-value" is going to transform our graphs, let's investigate the "d-value". (This can also be called the "k-value", but your authors use *d*.)

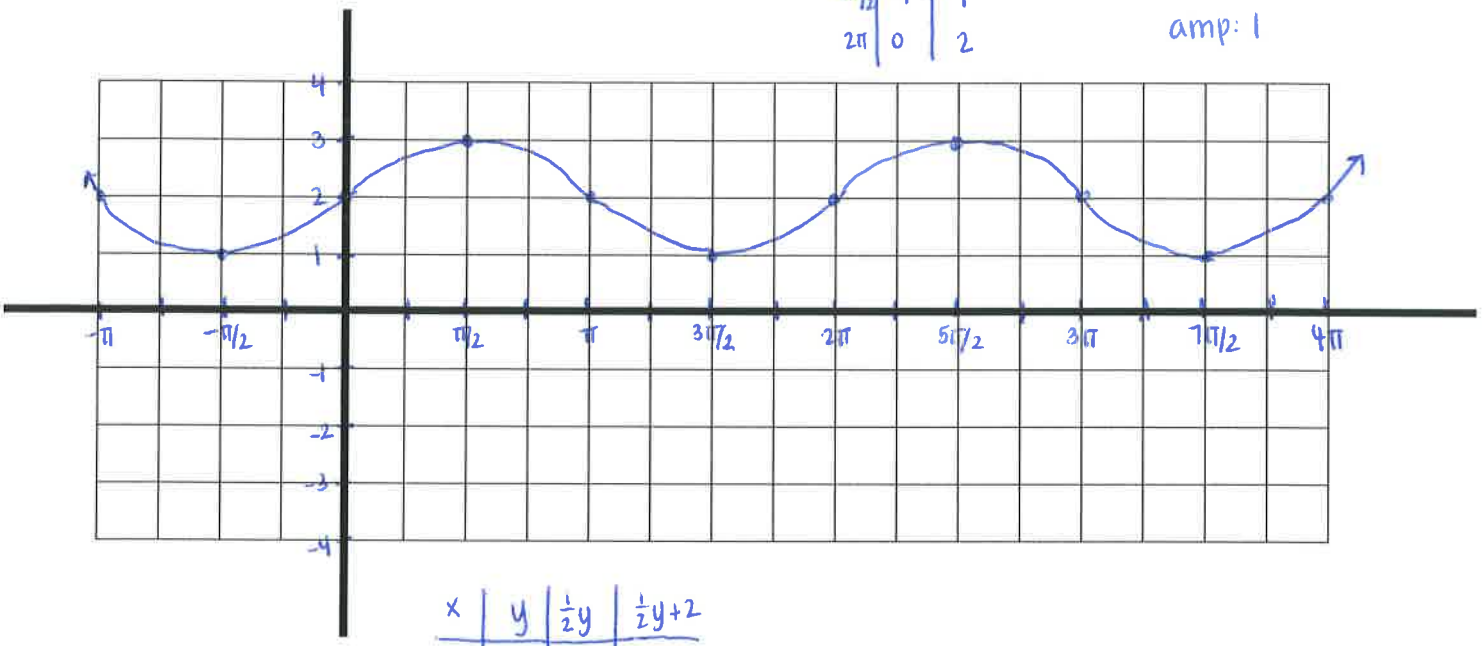
$y = 2 + \sin x$

x	y	y+2
0	0	2
$\pi/2$	1	3
π	0	2
$3\pi/2$	-1	1
2π	0	2

domain: $(-\infty, \infty)$

range: $[1, 3]$

amp: 1



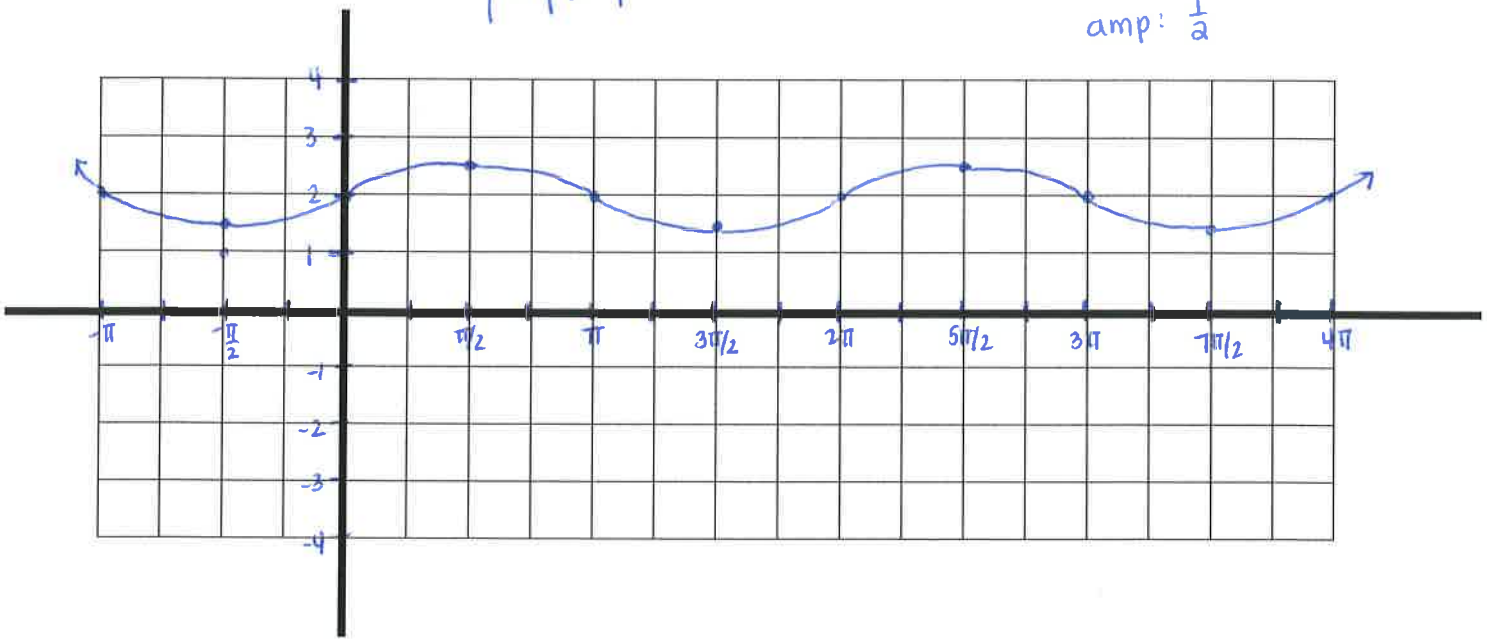
$y = 2 + \frac{1}{2}\sin x$

x	y	$\frac{1}{2}y$	$\frac{1}{2}y+2$
0	0	0	2
$\pi/2$	1	$1/2$	2.5
π	0	0	2
$3\pi/2$	-1	$-1/2$	1.5
2π	0	0	2

domain: $(-\infty, \infty)$

range: $[1.5, 2.5]$

amp: $\frac{1}{2}$

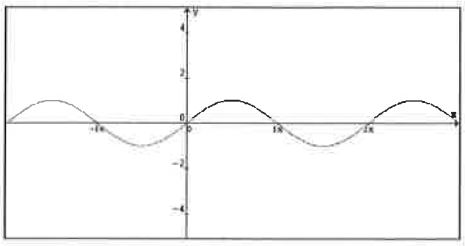


$y = a \cdot \sin(bx - c) + d$

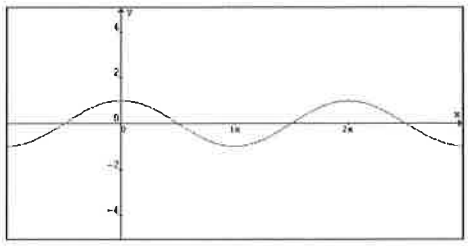
a: amplitude

d: vertical shift

For each of the following equations, identify a and d values. Use these values to describe how the graph of the equation changes from the parent sine or cosine curve, given below.



$y = \sin(x)$



$y = \cos(x)$

1) $y = -3 + \frac{1}{4}\sin(x)$

$d = -3$: down 3 units

$a = \frac{1}{4}$: vertical shrink

2) $y = -2 - 3\sin(x)$

$d = -2$: down 2 units

$a = -3$: negative reflects the graph
vertical stretch

3) $y = -3 + \cos(x)$

$d = -3$: down 3 units

$a = 1$: no vertical stretch / shrink

4) $y = 1 + \frac{1}{2}\cos(x)$

$d = 1$: up 1 unit

$a = \frac{1}{2}$: vertical shrink

5) $y = 3\sin(x) + 2$

$d = 2$: up 2 units

$a = 3$: vertical stretch

6) $y = -2\cos(x+1) \Rightarrow -a\cos(x - -1)$

$a = -2$: negative: reflects graph
vertical stretch

$c = -1$: horizontal shift 1 unit left

Vocabulary Bank: vertical stretch, vertical shrink, multiple of, shift up, shift down, by so many units, reflection