MEMORY AID TIPS 2.7

THE STEP FUNCTION

Summary Parameters
"a", "b", "h" & "k"

Parameters		Geometric Transformations	Important Additional Information
a	If |a| > 1	Vertical Stretch	• The value of |a| determines the vertical distance between each step • If the value of |a| is a number other that 1 and it is negative, there are 2 geometric transformations
	If 0 <|a| < 1	Vertical Shrink	
	If a < 0	Reflection off x - axis	
b	If |b| > 1 	Horizontal Shrink	• The horizontal length of each step is |1/b| • If the value of |b| is a number other that 1 and it is negative, there are 2 geometric transformation
	If 0 <|b| < 1 	Horizontal Stretch	
	If b < 0 	Reflection off y - axis	
h	If h > 0	Translation right	Be careful when equation is give. Examples:
	If h < 0	Translation left	$y=\left[x-3\right]+2$ (h, k) = (3, 2)
k	If k > 0	Translation up	
	If k < 0	Translation down	$y=\left[x+3\right]+2$ (h, k) = (-3, 2)

Graphing Step Functions

1. Make sure the form is $f(x) = a[b(x - h)] + k$

2. Identify a, b, h and k

3. Place a black dot at (h, k)

4. Decide whether the step is

   $b > 0$ $b < 0$

5. Determine the length of the step

   Length of step = $|1/b|$

6. Draw your first step

7. Determine vertical distance between each step

   Vertical distance between each step = $|a|$

8. Determine if steps are going up or down

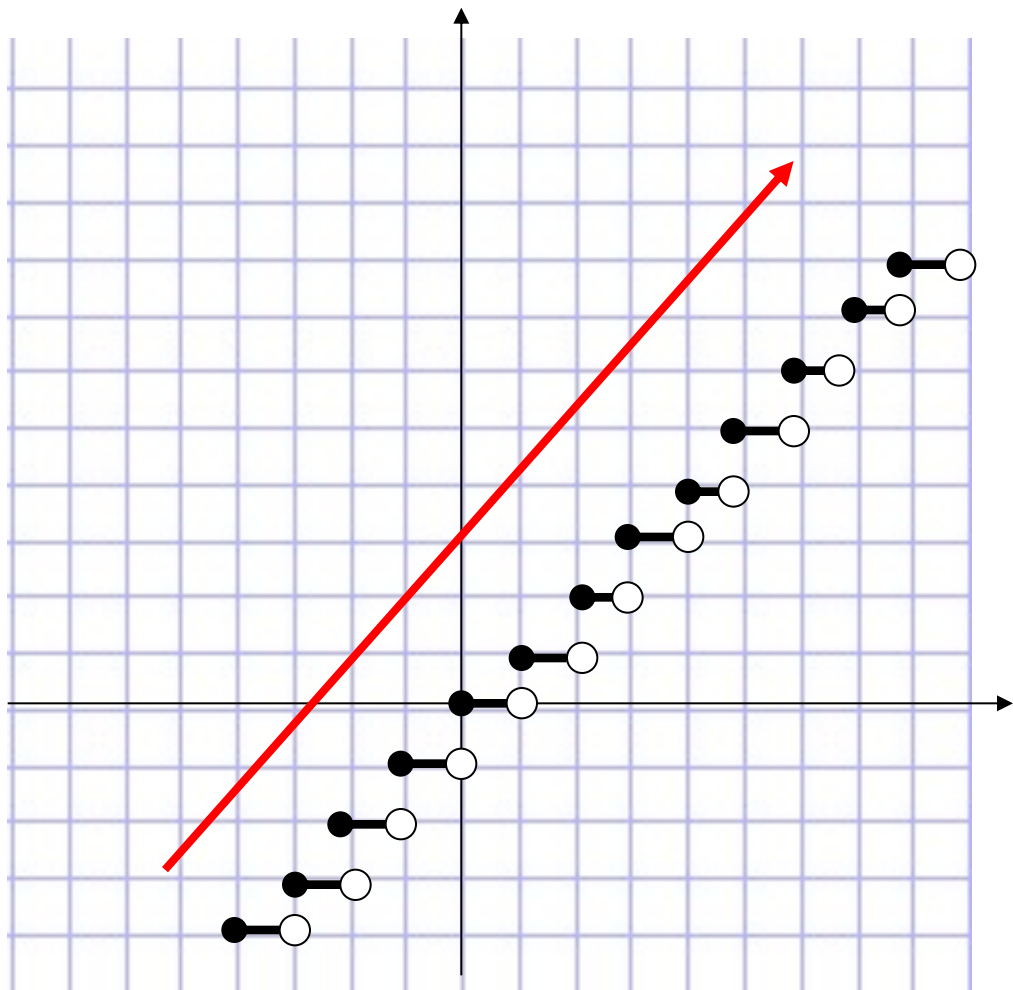$$a \bullet b = +$$
up

$$a \bullet b = -$$
down

$$f(x) = a[bx]$$

a > 0   b > 0

$\bullet$———○

+   x   +   =   +

$a \bullet b = positive\ slope$

$$f(x) = a[bx]$$

a < 0   b > 0

−   x   +   =   −

$a \bullet b = negative\ slope$

$$f(x) = a[bx]$$

a > 0   b < 0

+   x   -   =   -
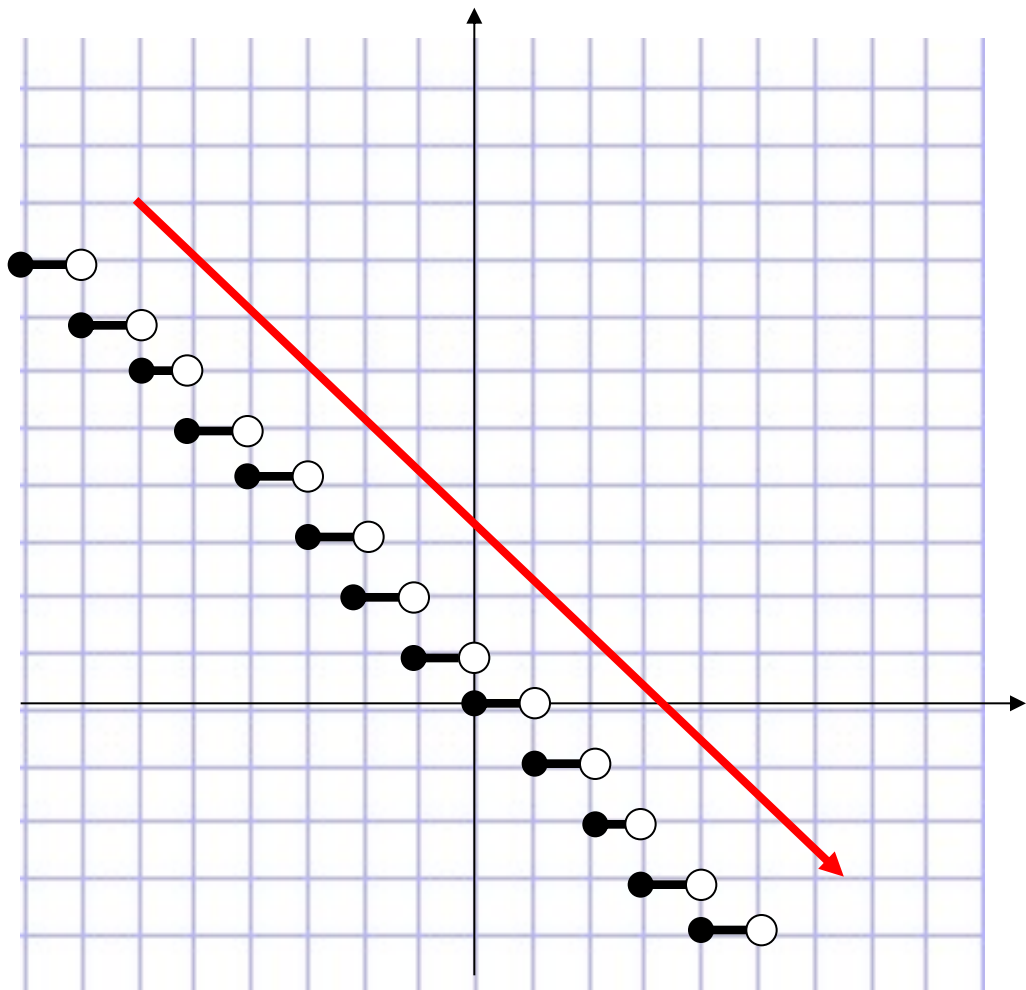
$a \bullet b = negative\ slope$

$$f(x) = a[bx]$$

a < 0   b < 0

○————●

-    x   -   =   +
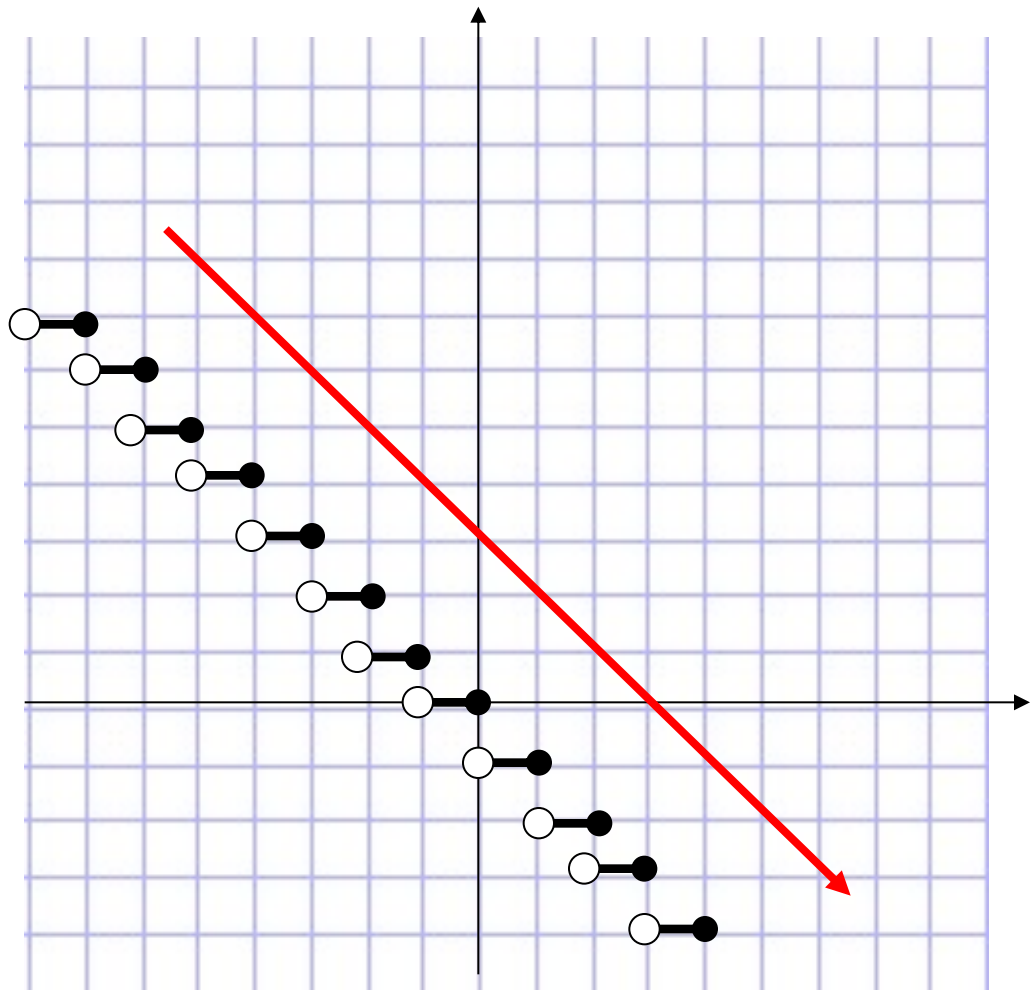
$a \bullet b = positive\ slope$
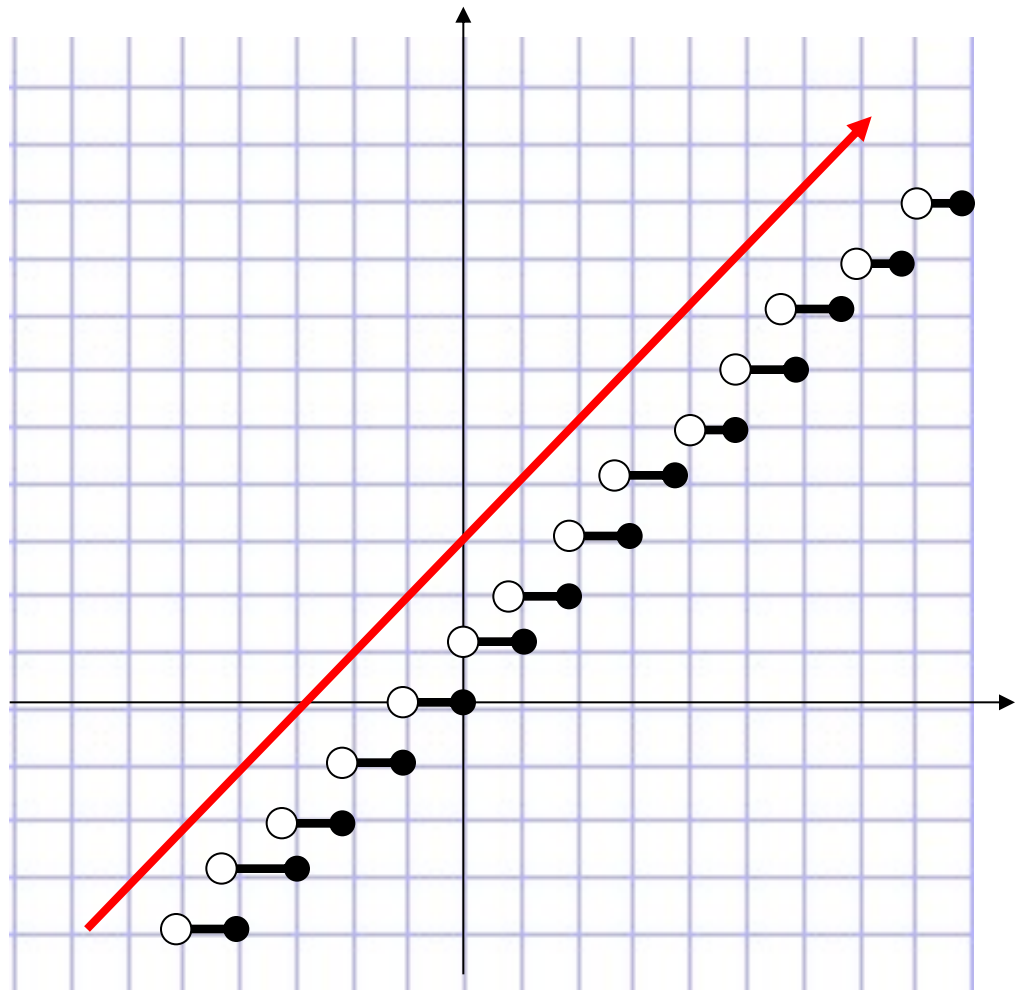
Example

$$f(x) = 2\left[\frac{1}{2}(x-1)\right] - 2$$

Parameters	Geometric Transformation	Important additional Information
a = 2	Vertical stretch	Vertical distance between each step |a|
b = 1/2	Horizontal shrink	Length step = |1/b| = |1/0.5| = 2
h = 1	Translation 1 right	
k = -2	Translation 2 down	
(h, k) = (1, -2)		Starting point
$a \bullet b$ +		

$$f(x) = 2\left[\frac{1}{2}(x-1)\right] - 2$$

2 units

(h, k) (1, -2)

2 units