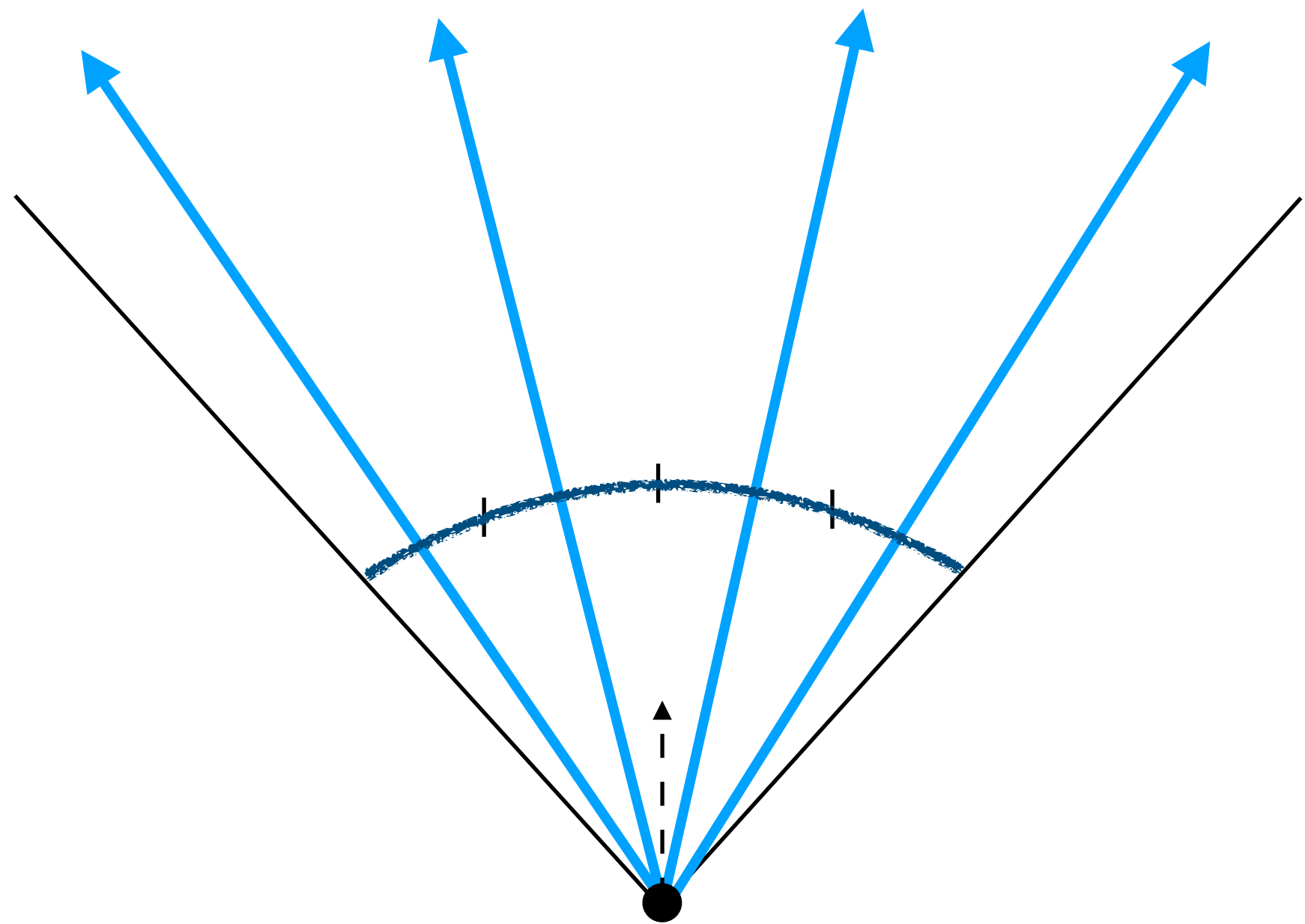
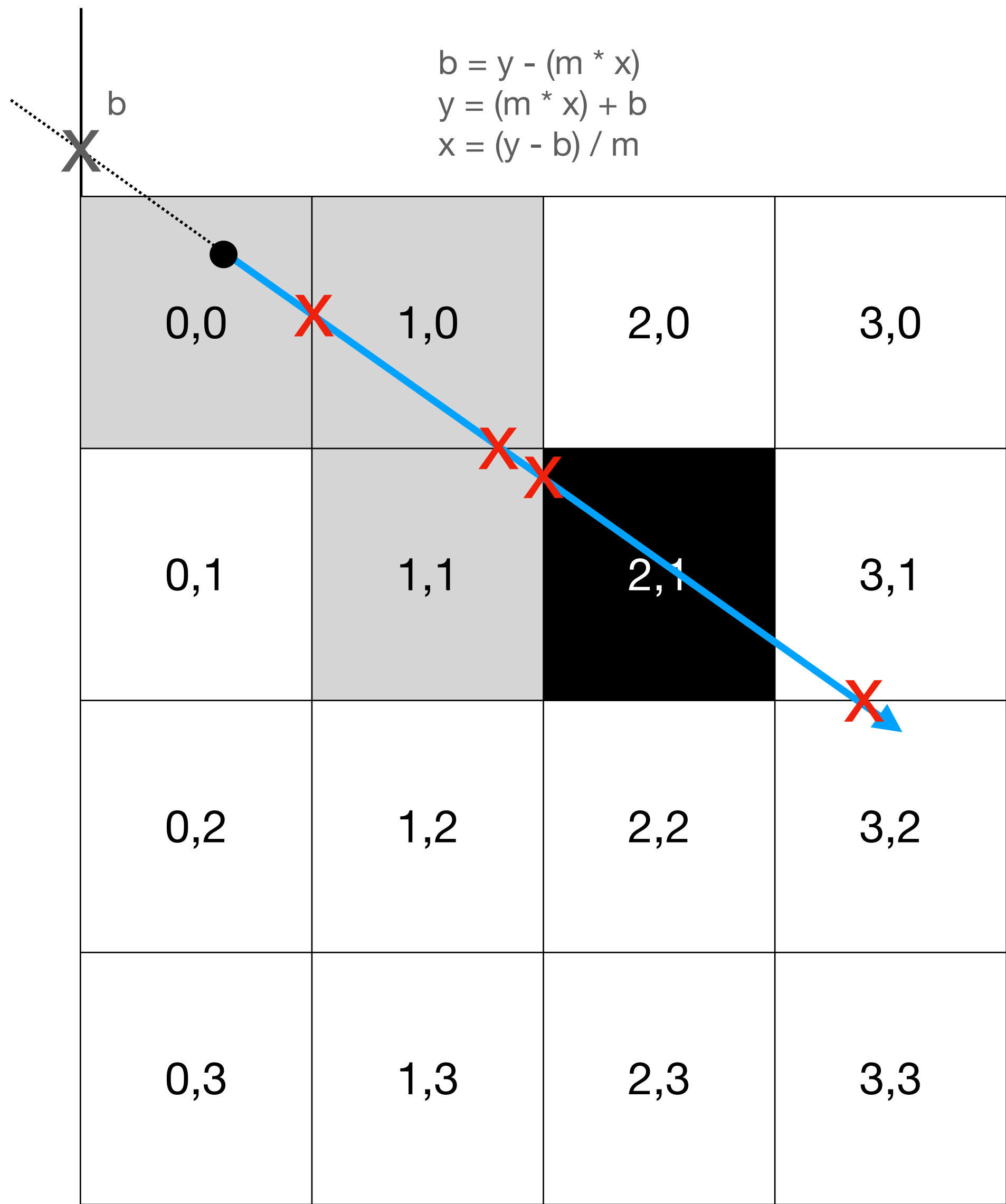


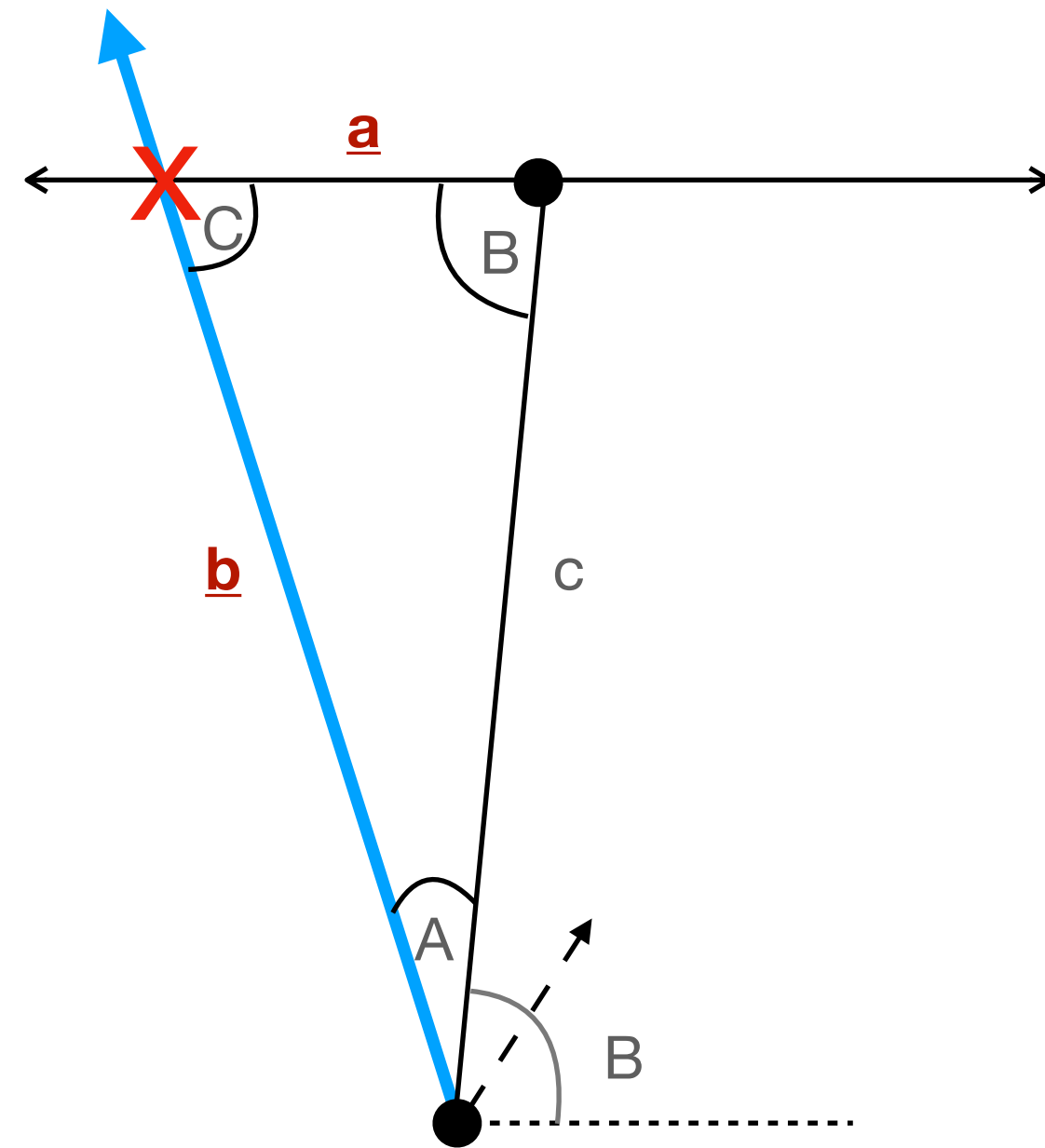
WALL RENDERING



Project cylinder onto flat sheet to correct “fish eye” effect

projected distance = ray hit distance * cos(cast angle)

SPRITE RENDERING



LAW OF SINES

Formula

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

A = angle A

a = length of side a

B = angle B

b = length of side b

C = angle C

c = length side c

SIDES:

a = relative texture coordinate

b = ray length to sprite intersection

c = distance from camera to sprite (known)

ANGLES:

A = ray angle - angle of sprite to camera

B = angle of sprite to camera - sprite orientation

$C = 180 - A - B$

Example (in degrees):

ray angle (camera angle + cast angle) = 250

angle sprite to cam = 275

sprite orientation = 0

$A = -25$

$B = 275 - (0) = 275$

$C = 180 + 25 - 275 = -70$

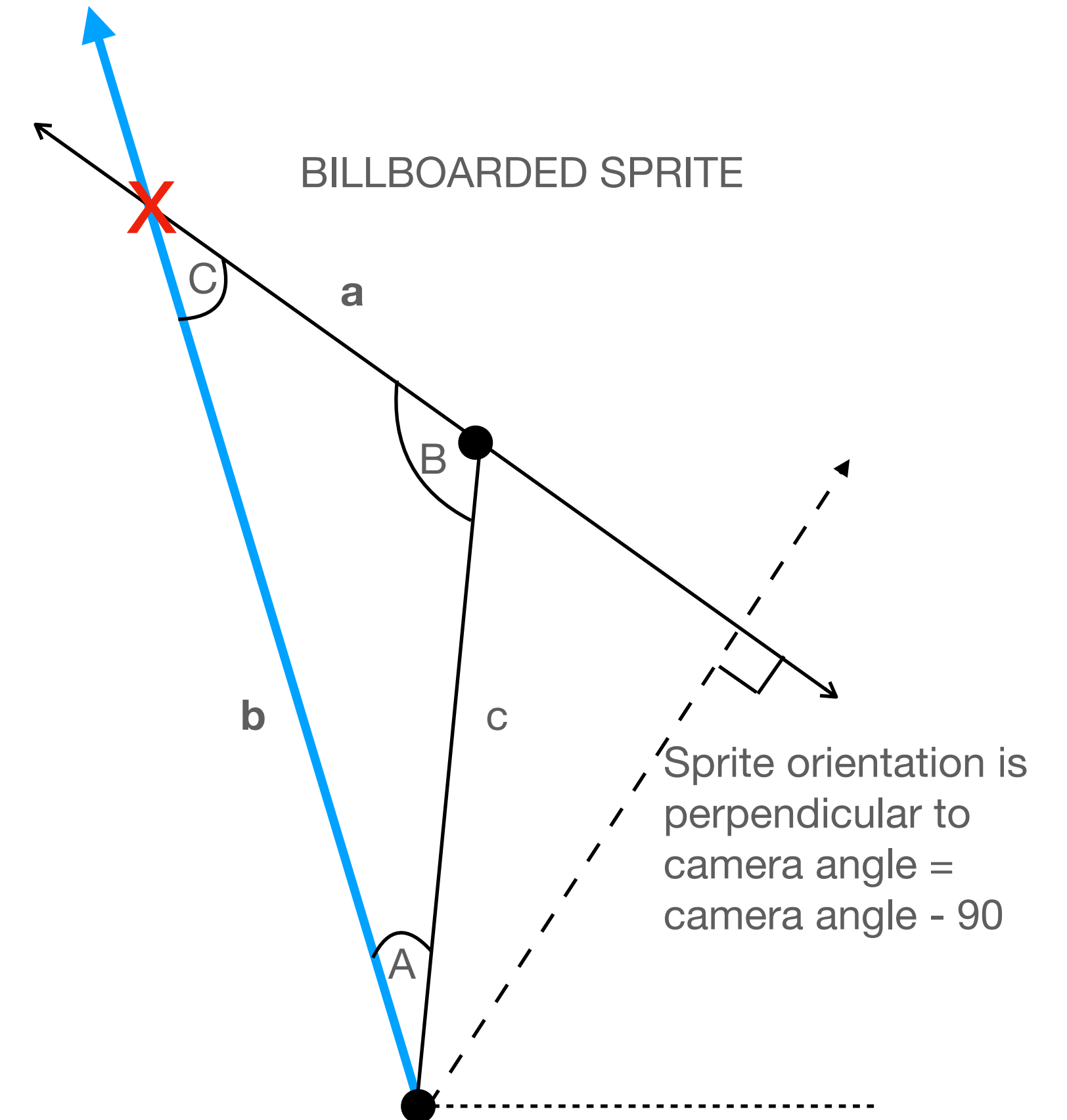
due to negative angles, equivalent triangle is:

$A = 25$, $B = 85$, $C = 70$

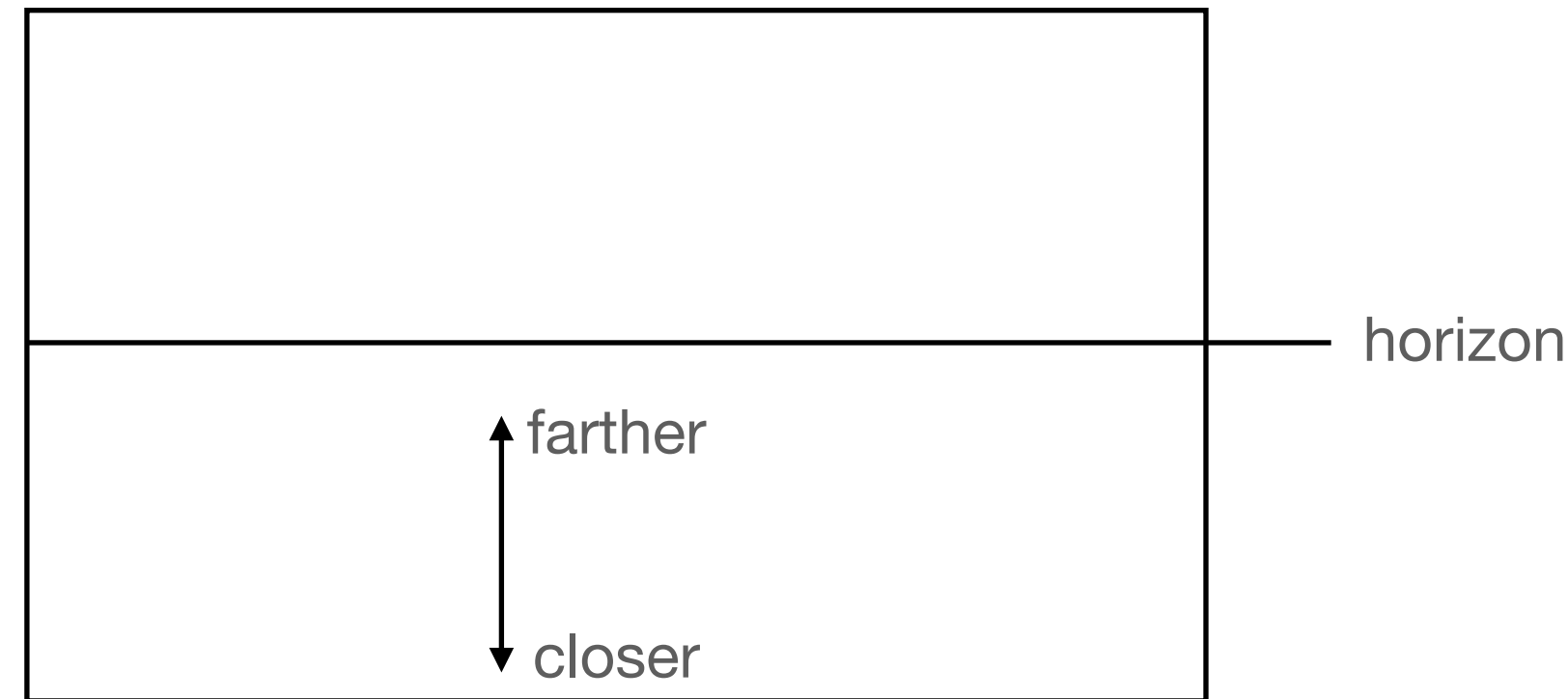
solve for texture coords and ray hit distance:

$a = \sin(A) * c / \sin(C)$

$b = \sin(B) * c / \sin(C)$



FLOOR RENDERING



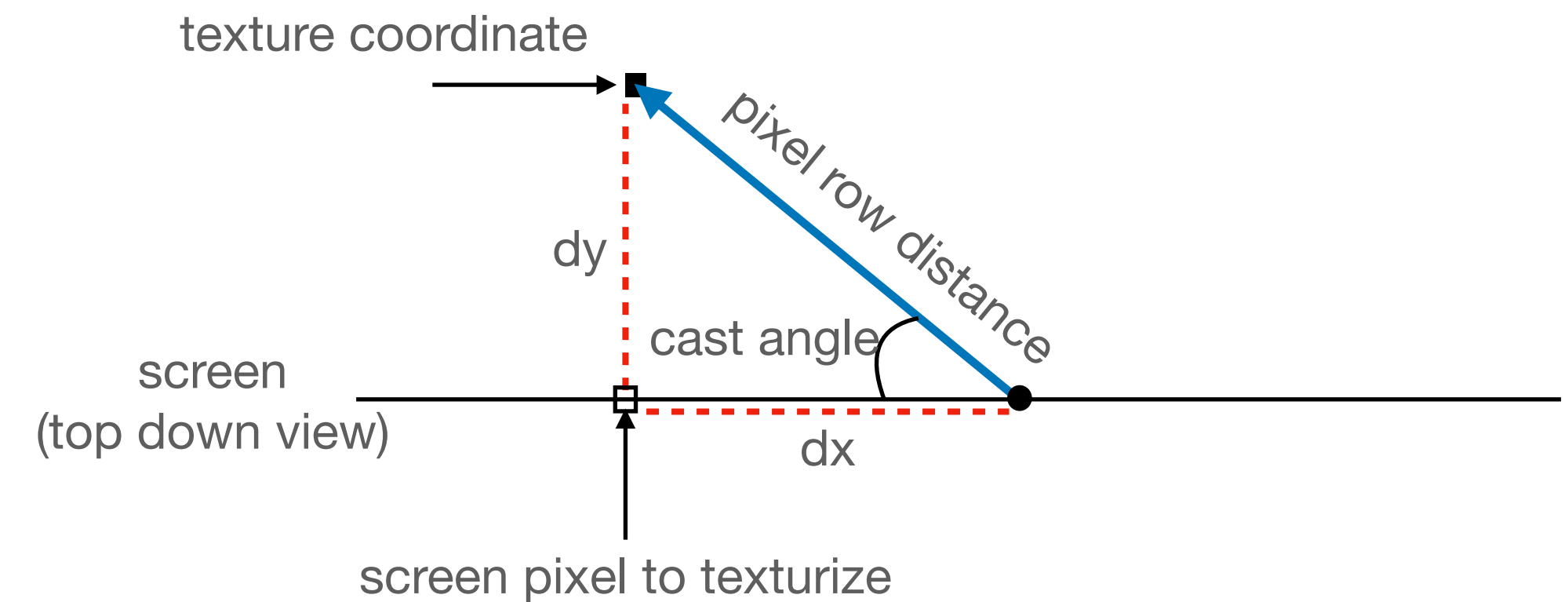
Calculate distance to each row of pixels from middle of screen to top and bottom. the floor and ceiling calculations are mirrored so no need to do them twice.

pixel row distance = screen width / ((2 * **pixel row**) - screen height)

where **pixel row** is the row of pixels from bottom/top (screen height / 2)

to horizon (middle of the screen or row 0)

Calculate texture pixel by calculating the length of the floor ray from the camera to the distance of the pixel row of the pixel to render. Correct for FISH_EYE by dividing by cos(ray angle)



Think of the floor/ceiling as covered by an infinitely repeating tiled texture.

Texture coordinates of the pixel are:

texture x = floor(dx % 64) and texture y = floor(dy % 64)

where 64 x 64 are the texture dimensions

$dx = \text{pixel row distance} * \cos(\text{ray angle})$

$dy = \text{pixel row distance} * \sin(\text{ray angle})$

repeat for every pixel on bottom half of the screen and mirror for calculations for the ceiling texture