Lecture: 7-1

- Prerequisites for this lecture are: 6-1, 6-2 and 6-3.

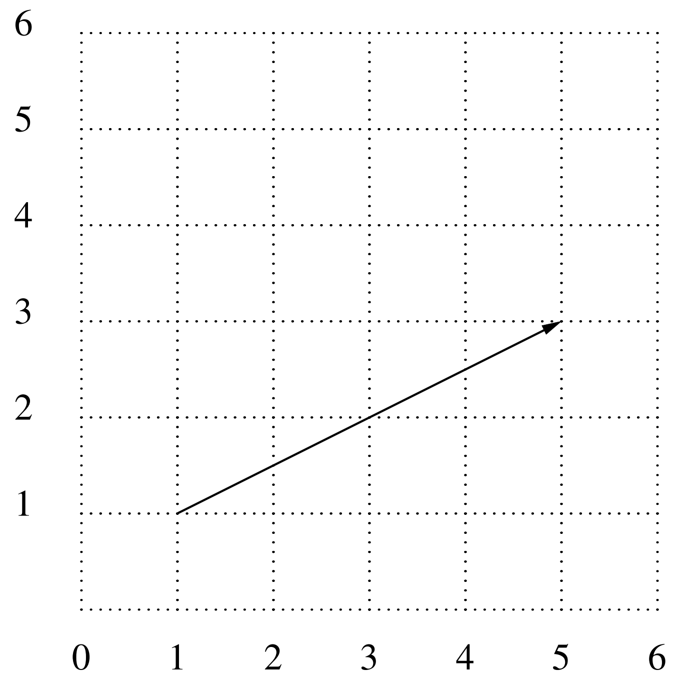
John Romero Programming Proverbs

- 7. “Use a development system that is superior to your target.”

- John Romero, “The Early Days of Id Software - John Romero @ WeAreDevelopers Conference 2017”

Moving along a line

- consider the problem of making a barrels appear to roll across a plank
  - this is complicated by the issue of the ramp gradient



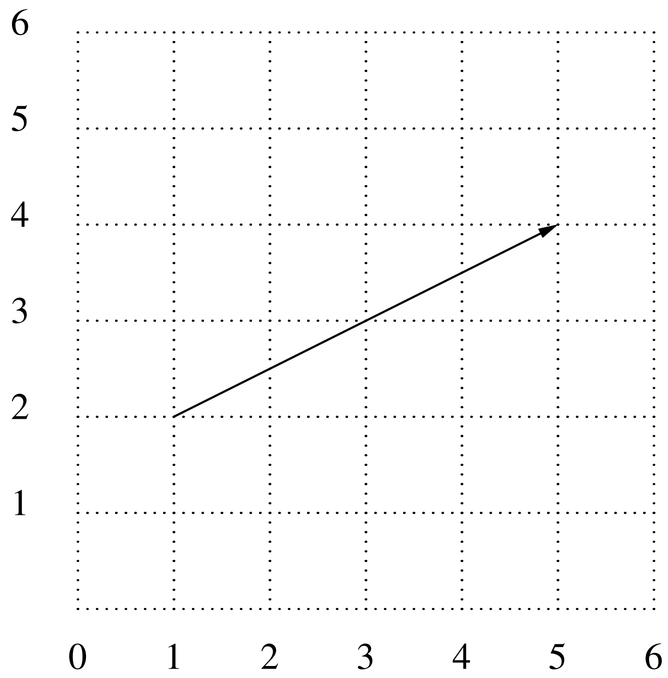
Bresenham’s line algorithm

- fortunately Bresenham discovered an algorithm which given two points
  - determines the elements of a 2-dimensional grid that should be selected to best approximate the line
- Bresenham’s line algorithm also uses integer arithmetic which adds to its complexity

y = mx + c

- returning to the problem of making a barrel roll down a plank
  - we know the x position, but we need to compute the y value

- we know the start and end points of the ramp



y = mx + c

- in the previous slide the start position is (1, 2) and the end position is (5, 4)
- the dx value is 5-1 = 4
- the dy value is 4-2 = 2
- therefore our gradient m is $\frac{dy}{dx}$

y = mx + c

- we need to calculate c
- we know the point (1, 2) exists on the line
- using $y = mx + c$
- $2 = 1m + c$
- $2 = \frac{1}{2} + c$
- $c = 2 - \frac{1}{2} = 1 + \frac{1}{2}$

y = mx + c

- we could use this formula to calculate the y value given an x value

- $m = \frac{2}{4} = \frac{1}{2}$

$y = mx + c$

x	y
1	2
2	2.5
3	3
4	3.5
5	4

y = mx + c

- notice how we need floating point values to compute it
  - also notice how we calculated the gradient

- Bresenham's algorithm hunts for the correct gradient by using integer arithmetic and by manipulating the numerator and denominator of the fractional value of *m*