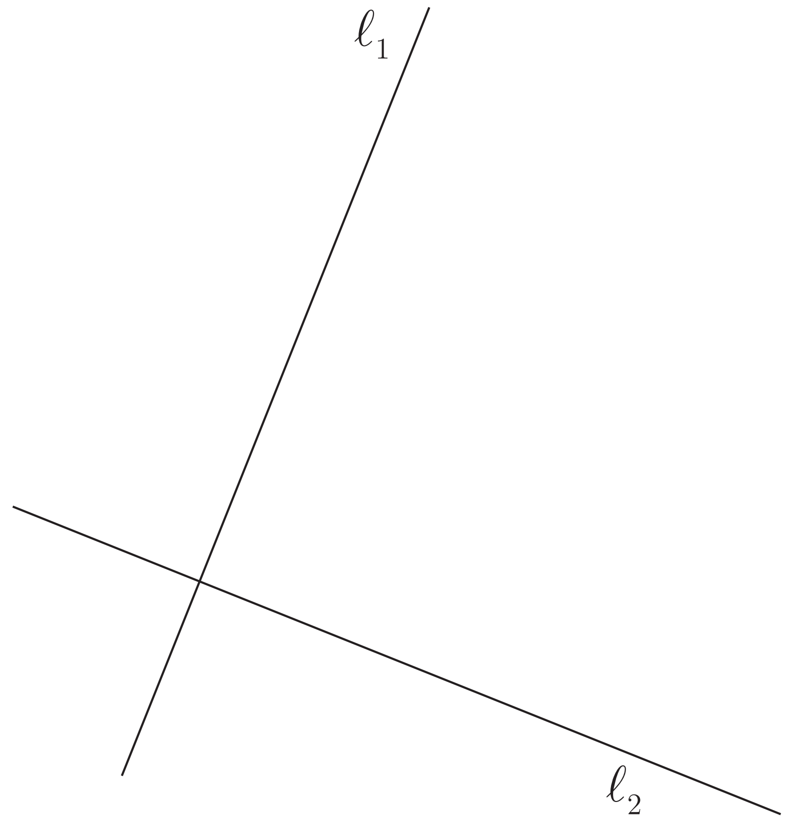
# Linear Functions

## Perpendicular Lines

Observations about slope?

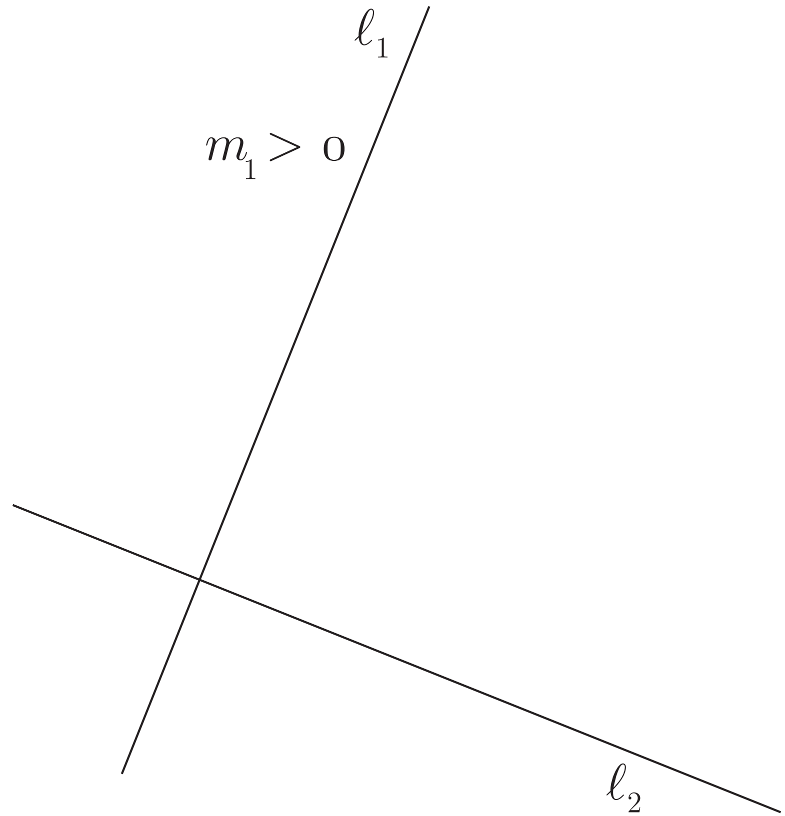


# Linear Functions

## Perpendicular Lines

Observations about slope?

- $m_1 > 0$

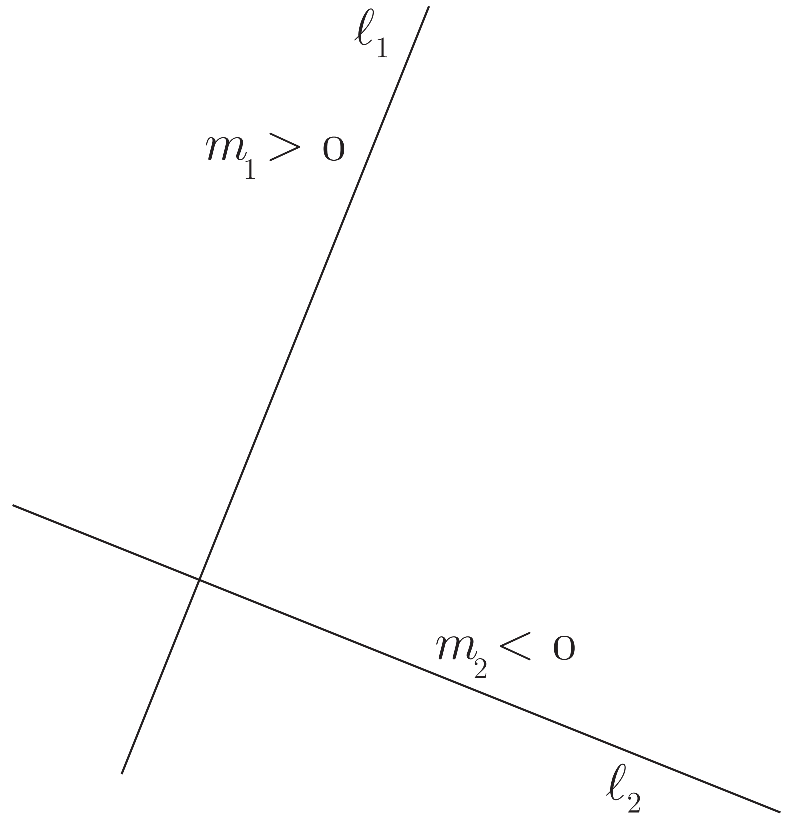


# Linear Functions

## Perpendicular Lines

Observations about slope?

- $m_1 > 0$
- $m_2 < 0$

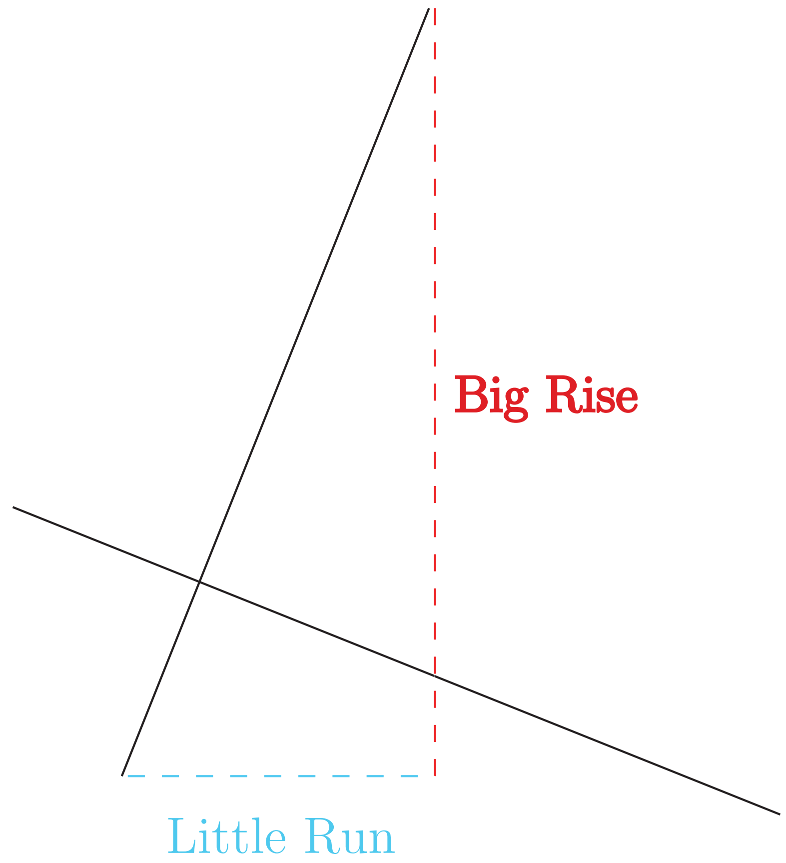


# Linear Functions

## Perpendicular Lines

Observations about slope?

- $m_1 > 0$
- $m_2 < 0$
- One line has a Big rise and a Little run

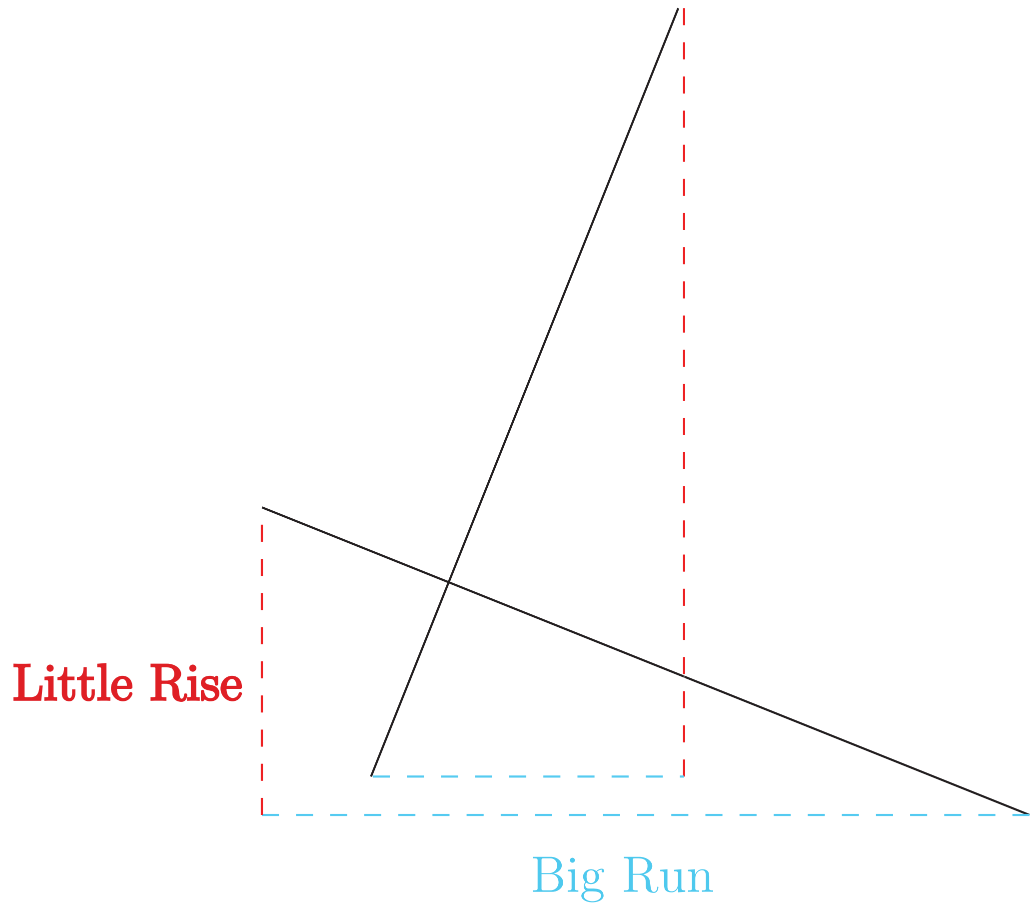


# Linear Functions

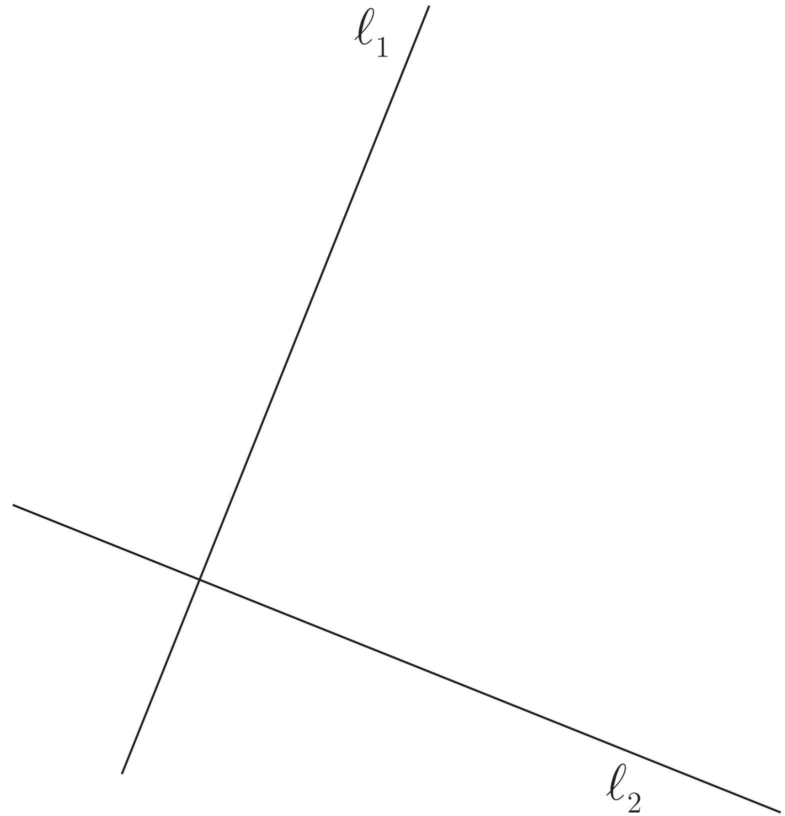
## Perpendicular Lines

Observations about slope?

- $m_1 > 0$
- $m_2 < 0$
- One line has a Big rise and a Little run, while the other has a Little rise and a Big run.



**Perpendicular Lines**




Observations about slope?

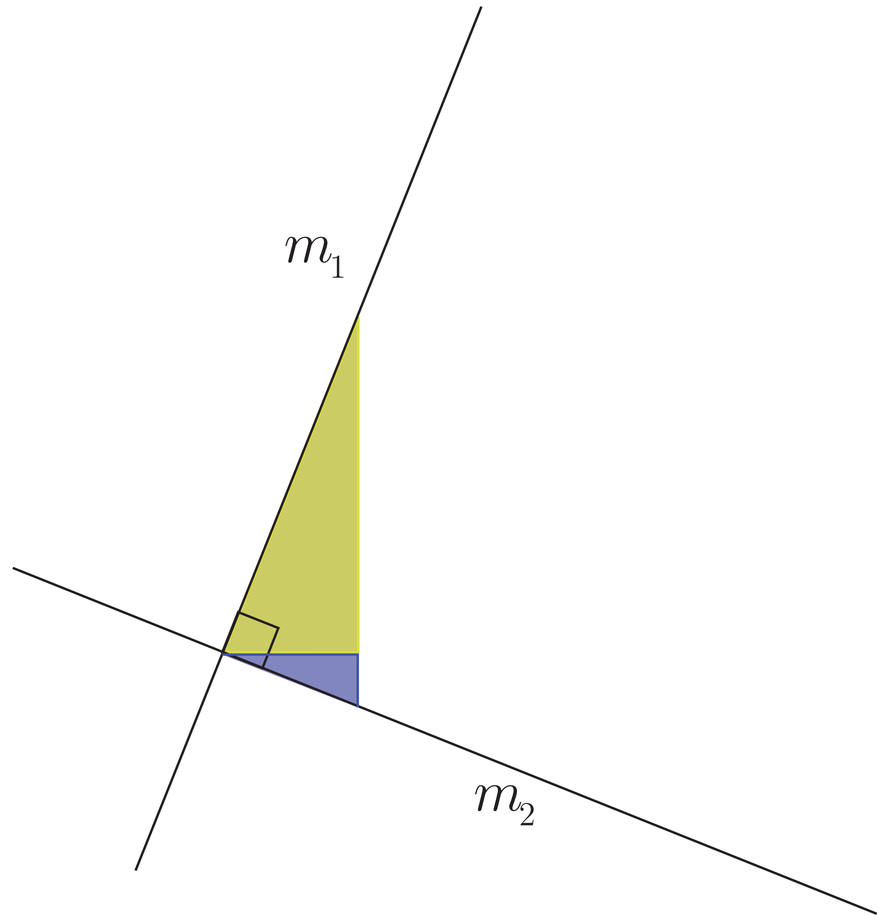
So we have some sense that the slopes of perpendicular lines are

- Opposite in sign
- Reciprocal in rate of change

**Perpendicular Lines**

Slopes of Perpendicular Lines

Proof:
Start with the two right triangles representing the slopes of the two lines.

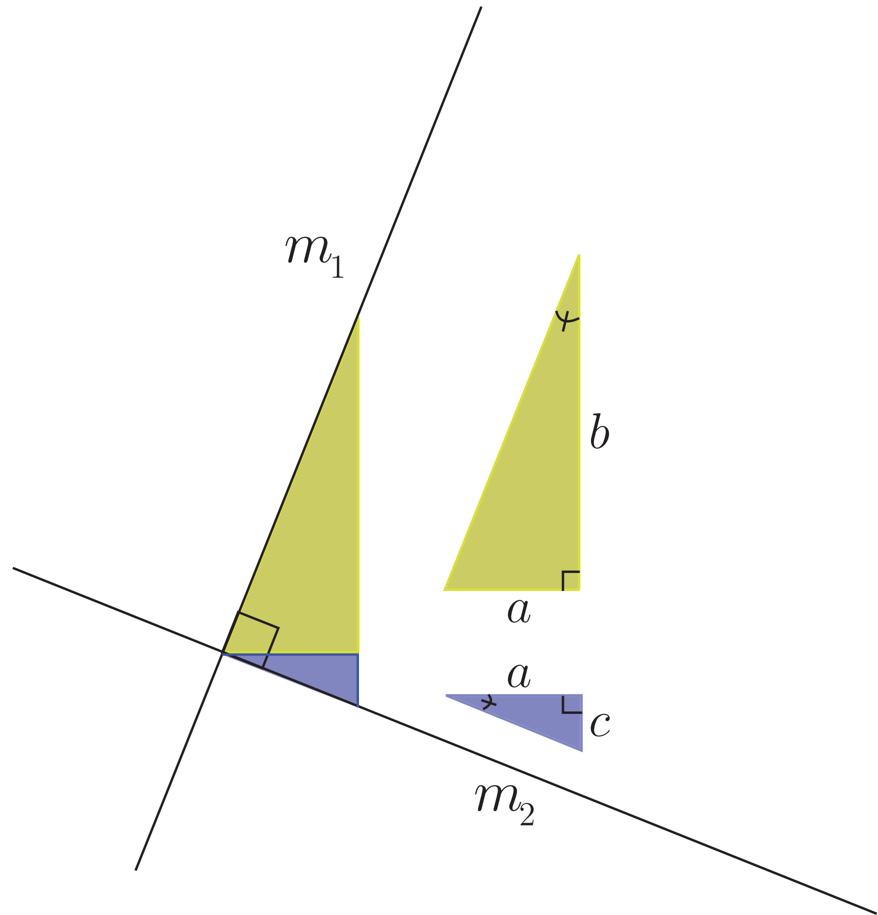


**Perpendicular Lines**

Slopes of Perpendicular Lines

Proof:
Start with the two right triangles representing the slopes of the two lines.

Note the two triangles are similar.
The right angle at the point of intersection is split between the two triangles (the two angles are complementary).
That means the corresponding angles of the two triangles are congruent so the triangles are similar.



**Perpendicular Lines**

Slopes of Perpendicular Lines

Proof:
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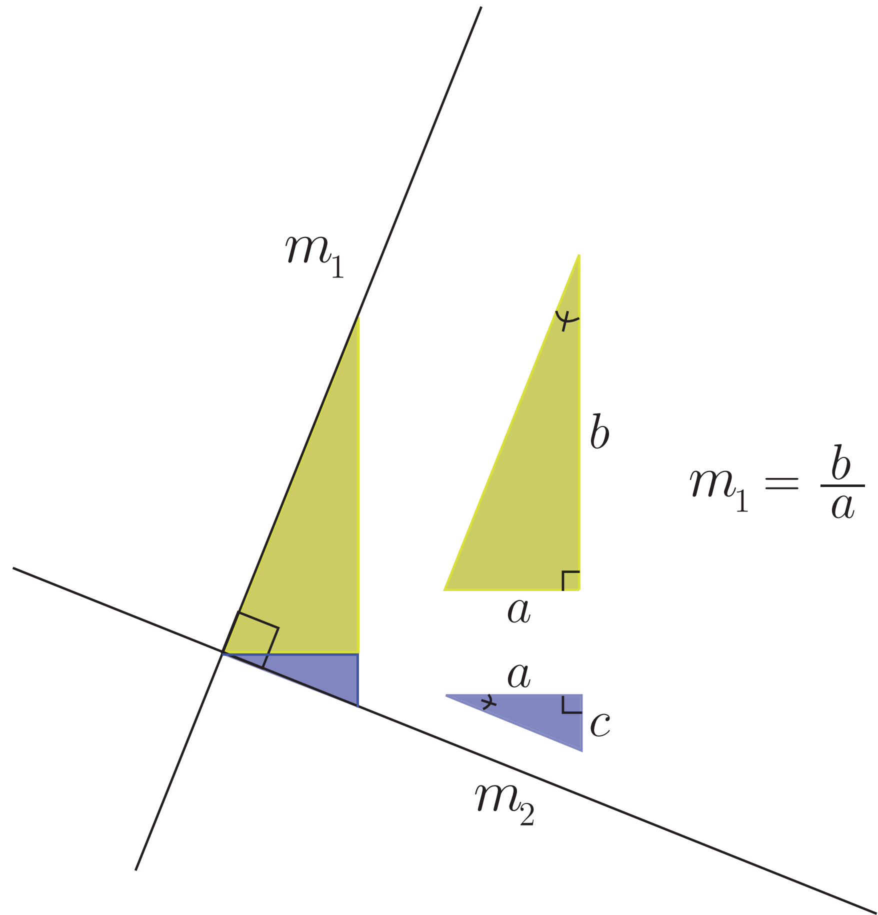


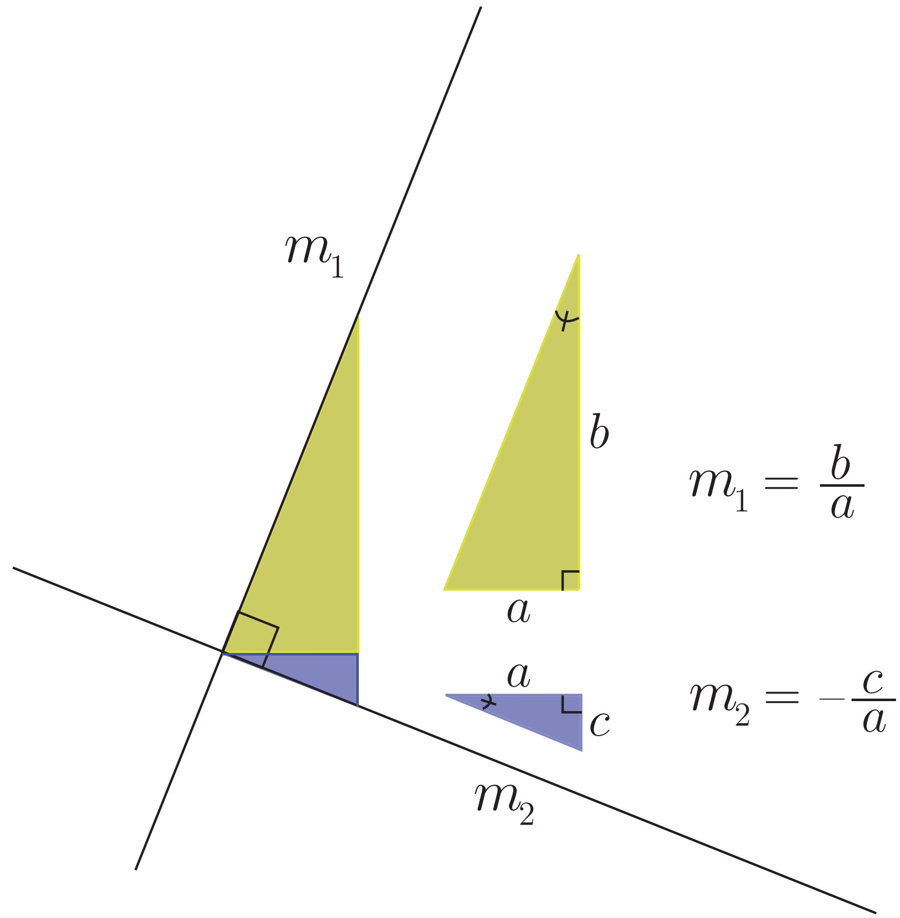

$$m_1 = \frac{b}{a}$$

**Perpendicular Lines**

Slopes of Perpendicular Lines

Proof:
Start with the two right triangles representing the slopes of the two lines.

Note the two triangles are similar.
The right angle at the point of intersection is split between the two triangles (the two angles are complementary).
That means the corresponding angles of the two triangles are congruent so the triangles are similar.
By similarity we have $\frac{c}{a} = \frac{a}{b}$



**Perpendicular Lines**

Slopes of Perpendicular Lines

Proof:
Start with the two right triangles representing the slopes of the two lines.

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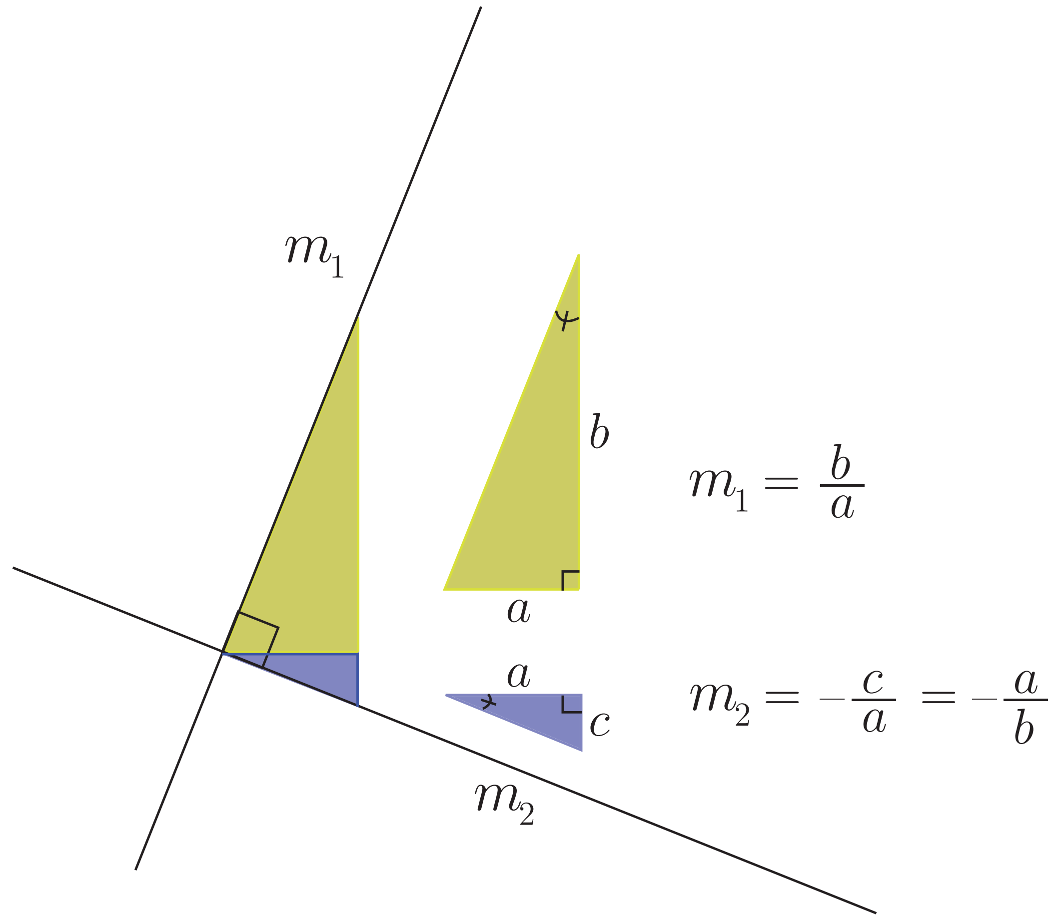
By similarity we have $\frac{c}{a} = \frac{a}{b}$



**Perpendicular Lines**

Slopes of Perpendicular Lines

Proof:
Start with the two right triangles representing the slopes of the two lines.

Note the two triangles are similar.
The right angle at the point of intersection is split between the two triangles (the two angles are complementary).
That means the corresponding angles of the two triangles are congruent so the triangles are similar.
By similarity we have $\frac{c}{a} = \frac{a}{b}$ which is the reciprocal of $m_1$.