

3.5 Slope



Slope of a line describes the Steepness of the line.

Given: Two points (x_1, y_1) and (x_2, y_2)

The **rise** is the difference in the y-values of two points on a line.

$$\text{rise} = \frac{y_2 - y_1}{1}$$

Note: If positive, the second point is above the first. If negative, the second point is below the first.

The **run** is the difference in the x-values of the two points on a line.

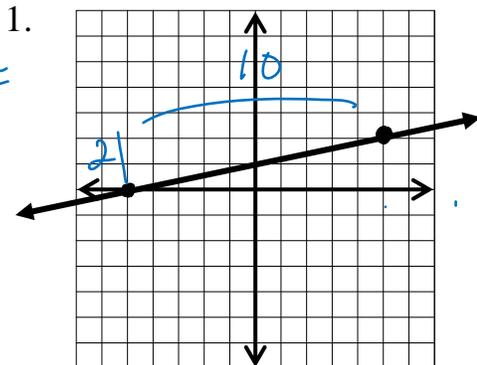
$$\text{run} = \frac{x_2 - x_1}{1}$$

Note: If positive, the second point is to the right of the first. If negative, the second point is to the left of the first.

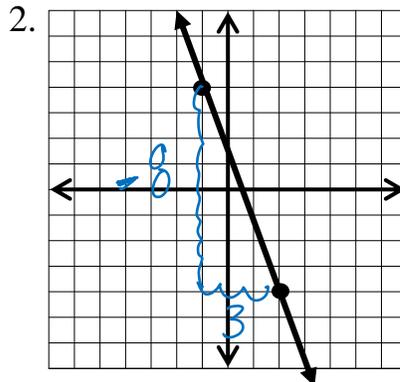
$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\begin{matrix} (x_1, y_1) \\ - \\ (x_2, y_2) \end{matrix}$$

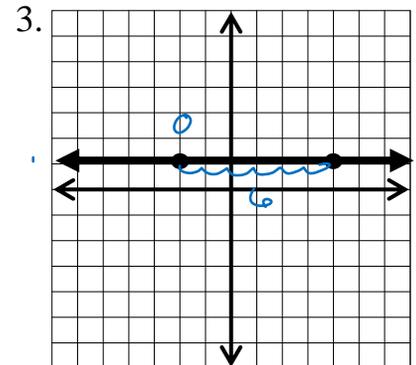
Find the slope of the line by counting:



$$m = \frac{1}{5}$$



$$m = \frac{-8}{3}$$



$$m = \frac{0}{6} = 0$$

Find the slope of the line by using the formula: $\frac{y_2 - y_1}{x_2 - x_1}$ — $\begin{matrix} x_1, y_1 \\ x_2, y_2 \end{matrix}$

4. connecting (3, -4) & (-5, 8)

$$\frac{8 - (-4)}{-5 - 3} = \frac{12}{-8} = \boxed{-\frac{3}{2}}$$

5. connecting the origin and (-7, 4)

$$\frac{4 - 0}{-7 - 0} = \frac{4}{-7} = \boxed{-\frac{4}{7}}$$

6. connecting (-4, -2) & (-4, 6)

$$\frac{6 - (-2)}{-4 - (-4)} = \frac{8}{0}$$

undefined

7. connecting (6, -3) & (1, -3)

$$\frac{-3 - (-3)}{1 - 6} = \frac{0}{-5} = \boxed{0}$$

0

Using the information above, describe the slant of the line if:

positive, then tilt up to the right ↗
 the slope is: negative, then tilt down to the right ↘
 zero, then horizontal ↔
 undefined, then vertical ↕

Meaning of Slope

If a graph has units for the x and y axes, then placing the units for the y-axis over the units for the x-axis will give the meaning for the slope. **Slope is a rate of change.**

$$\frac{\Delta y}{\Delta x}$$

The tortoise and the hare race.

The graph shows their distance in feet from start.

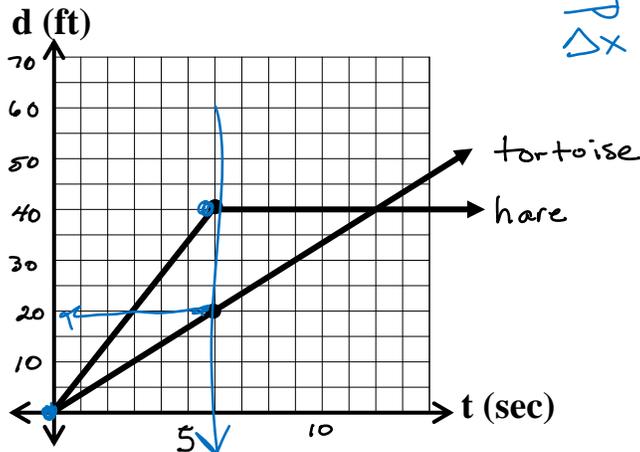
Find the speed of each animal during the first six seconds of the race.

$$\frac{40}{6} \approx 6.\bar{6} \text{ ft/sec}$$

hare

$$\frac{20}{6} \approx 3.\bar{3} \text{ ft/sec}$$

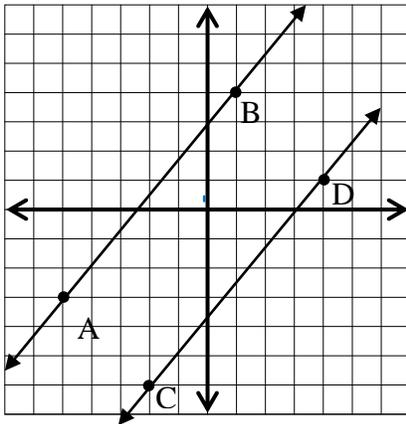
tortoise



8. What are the slopes of these two lines?

$$AB = \frac{7}{6}$$

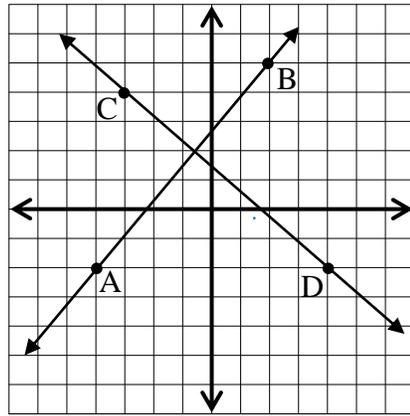
$$CD = \frac{7}{6}$$



9. What are the slopes of these two lines?

$$AB = \frac{7}{6}$$

$$CD = -\frac{6}{7}$$



Conclusion: Parallel lines \rightarrow Same slope

Conclusion: Perpendicular lines \rightarrow Slopes are opposite reciprocal

Slope of line	Slope of any parallel line	Slope of any \perp line
$\frac{1}{2}$	$\frac{1}{2}$	-2
-3	-3	$+\frac{1}{3}$
0	0	Undefined
undefined	undefined	0

10. Determine if the lines are parallel, perpendicular or neither.

Given: \overline{MA} and \overline{TH} M(-2, 8), A(6, 10), T(-7, -6) H(-2, 14)

$$m_A = \frac{10-8}{6-(-2)}$$

$$m_A = \frac{2}{8}$$

$$m_A = \boxed{\frac{1}{4}}$$

$$m_H = \frac{14-(-6)}{-2-(-7)}$$

$$m_H = \frac{20}{5}$$

$$m_H = \boxed{4}$$

Neither