5.1 Slope of Line

Thursday, April 27, 2023 8:55 AM

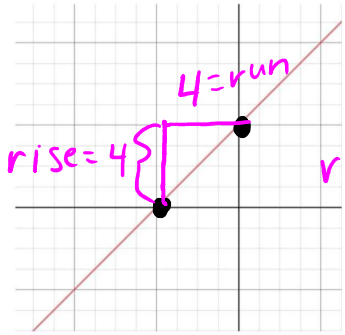
5.1 The Slope of Line

The slope of a line in the Cartesian plane is the measure of the change in dependent variable (y) divided by the change in independent (x).

Rate of change = $\frac{\text{change dependent}}{\text{change independent}}$

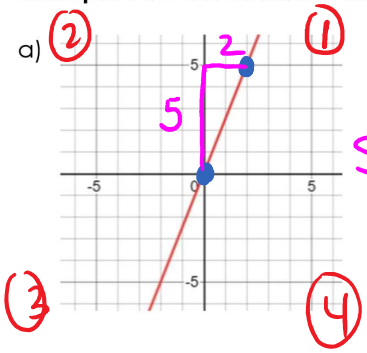
$= \frac{\text{change in y's}}{\text{chang in x's}}$

$\text{Slope} = \frac{\text{rise}}{\text{run}}$



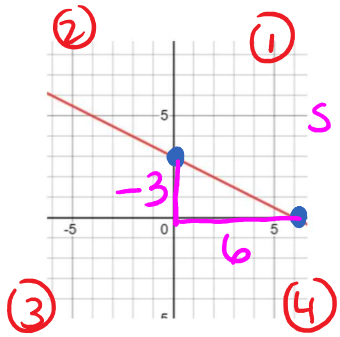
Example 1 : Determines the slope of each line segment.

a)



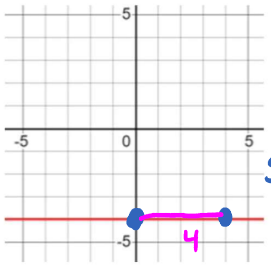
When a line segment goes up to the right (1) the slope is positive

b)



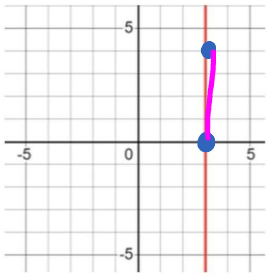
When a line segment goes down to the right (4) the slope is negative

c)



The slope of a horizontal line is zero

d)

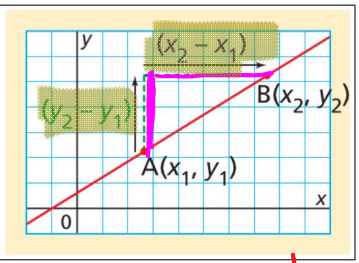


The slope of a vertical line is No slope

Slope of a line

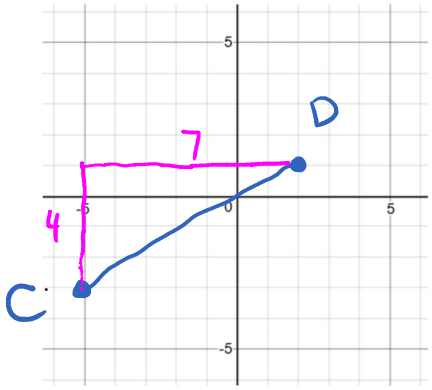
A line goes through the points $A\ (x_1, y_1)$ et $B\ (x_2, y_2)$

Slope of the line $AB = m = \frac{y_2 - y_1}{x_2 - x_1}$



Example 2 : Determine the slope of the line passing through the points $C\ (-5, -3)$ and $D\ (2,1)$.

$x_1\ y_1 \quad x_2\ y_2$



$$\text{slope} = m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{1 - (-3)}{2 - (-5)}$$

$$m = \frac{4}{7}$$

Example 3 : Using the formula, determines the slope of the line that passes through the points

a) $A\ (5, 4)$ and $B\ (2, -5)$

$x_1\ y_1 \quad x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-5 - 4}{2 - 5}$$

$$m = \frac{-9 \div -3}{-3 \div -3}$$

$$m = \frac{3}{1} = 3$$

b) $C\ (-2, 8)$ and $D\ (6, -4)$

$x_1\ y_1 \quad x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

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

$$m = \frac{-12 \div 4}{8 \div 4}$$

$$m = \frac{-3}{2}$$

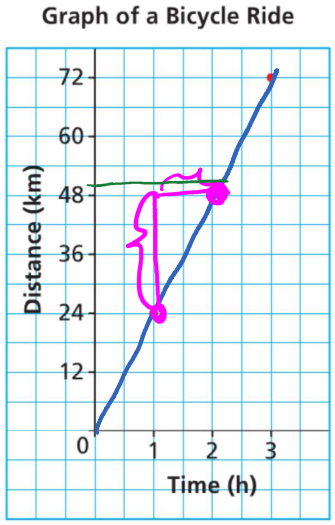
Example 4 : Interpreting the slope of a line

Yvonne took a bicycle ride on the Trans Canada Trail in Manitoba. At various times, she noted the distance she had travelled since she left. She graphed these data in a Cartesian plane.

What is the slope of the line that passes through these points?

rise = 24
run = 1

slope = $\frac{24}{1} = 24$



What does this slope represent?
The values of y *are* distance *in* Km
The values of x *are* time *in* h

So the units of the slope are: Km/h

a) Determine:

i) The distance Yvonne travelled in 1.75 hours.

$\frac{24 \text{ Km}}{1 \text{ hrs}} = \frac{d}{1.75 \text{ hrs}}$

$1.75\left(\frac{24}{1}\right) = \left(\frac{d}{1.75}\right)1.75$

$1.75\left(\frac{24}{1}\right) = d$

$1.75(24) = d$

$42 \text{K} = d$

ii) How long did Yvonne take to travel 55 km?

$\frac{24 \text{ Km}}{1 \text{ hr}} = \frac{55 \text{ Km}}{t}$

$t \cdot 24 = \frac{55}{t} \cdot t$

$\frac{t \cdot 24}{24} = \frac{55}{24}$

$t = \frac{55}{24} = 2.29 \text{ hr}$

Practice : p.339 #5, 6, 11, 13, 17, 18, 19, 23