

Topic: Slope of a line-教學簡報

作者的話

- 教學簡報製作初衷

本教學簡報為作者自己想教學上使用，因此後續教學設計是針對國中會考數學程度B+的學生所設計。且英文非學生母語，但又希望能讓學生透過英文學習數學，故盡可能使用國中英文內容溝通。

- 教學設計想法

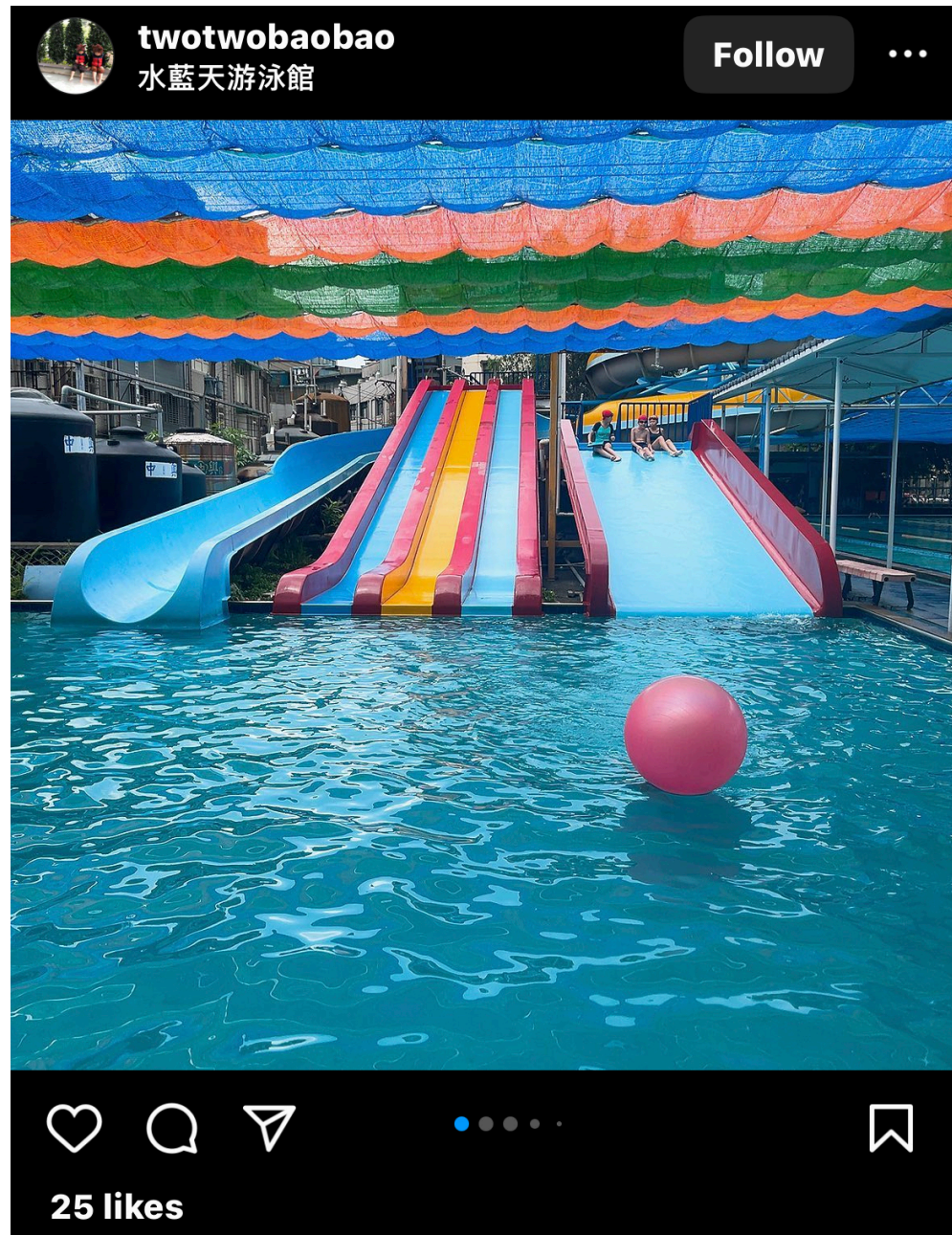
1. 透過生活中的實際例子（滑水道、爬山、爬樓梯..）與學生互動，讓學生去感受並考慮如果在比較或是要建築上要蓋滑水道、樓梯、斜坡的話，數學是如何協助去量化傾斜程度。
2. 美國的教材中對於斜率公式有一個朗朗上口的記法，因此本教材採用這個記法。
3. 教學過程中，如果有新單字，甚至是本單元必要學會的新單字，為免使學生分心查詢影響數學內容理解，會直接提供中文翻譯。

Topic: Slope of a line

單元名稱：直線的斜率

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Do you prefer steeper slides or gentler ones?
What makes them more fun or exciting for you?



steep

adjective

UK /sti:p/ US /sti:p/

steep adjective (NOT GRADUAL)

Add to word list

B1

(of a slope) rising or falling at a sharp angle

(斜坡) 陡的, 陡峭的

- a steep slope
陡坡

A steeper water slide
rises more sharply than a gentler one.

Water slides 滑水道

How can we accurately describe the steepness of the water slides we want to build?

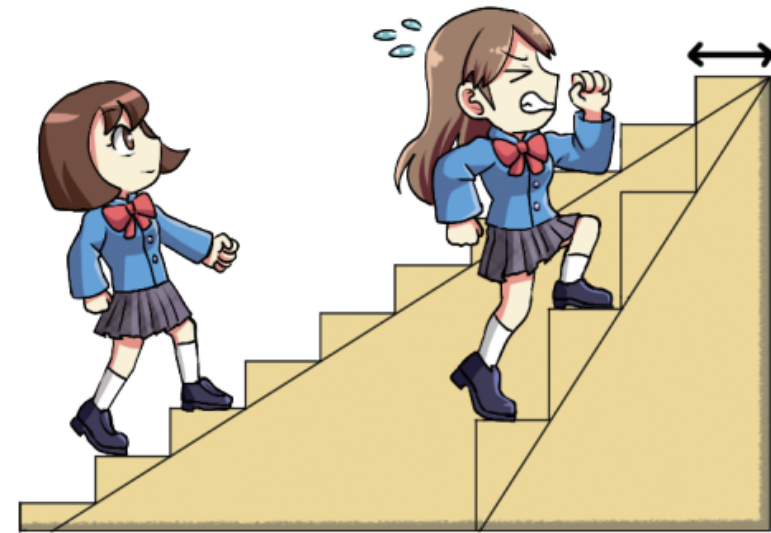
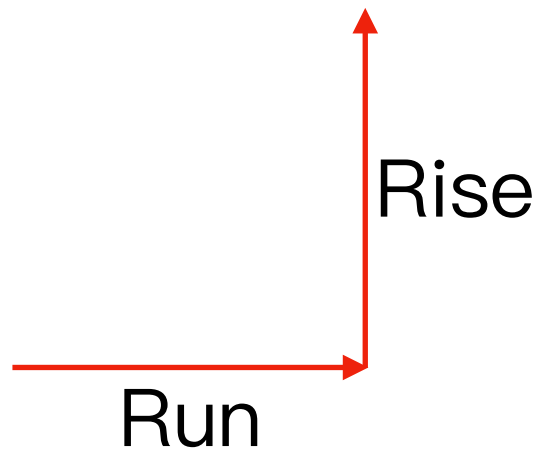


Note: the picture was generated by the copilot.

"In math, how do we express the slope(斜率) of a line?"

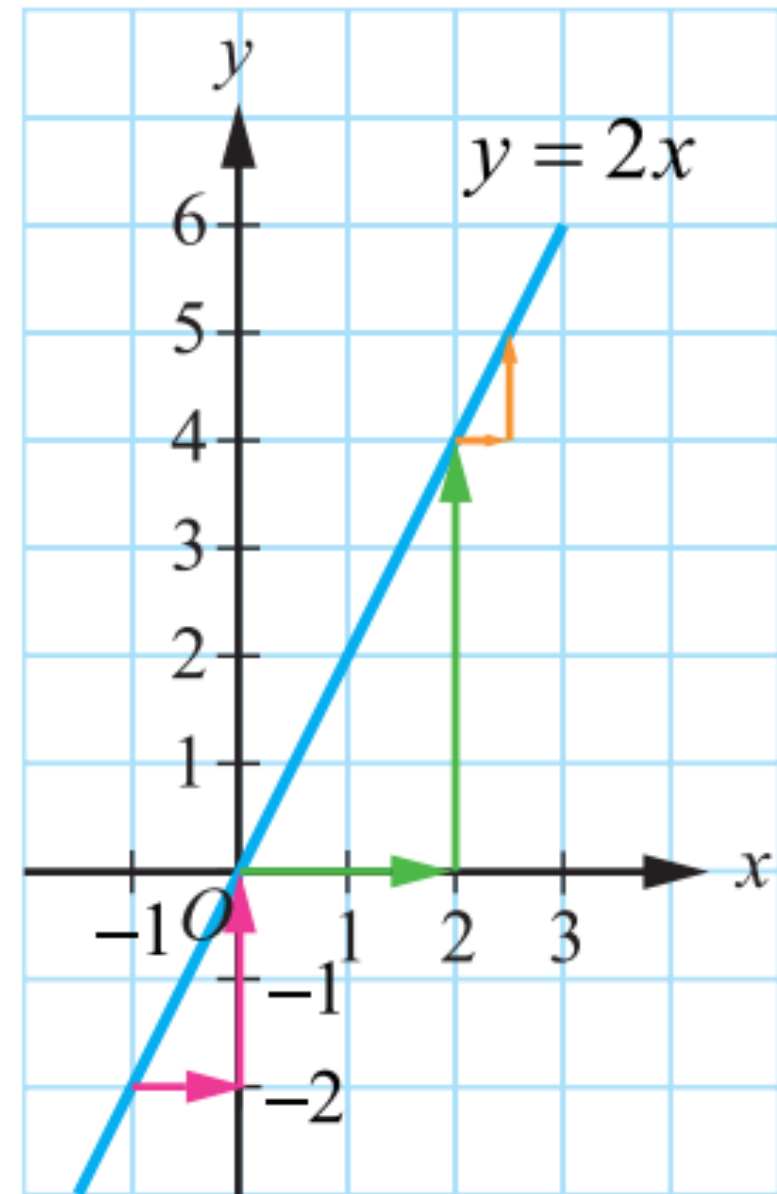
The concept of the slope of a line

- How much do you “rise” your leg for each “run”?



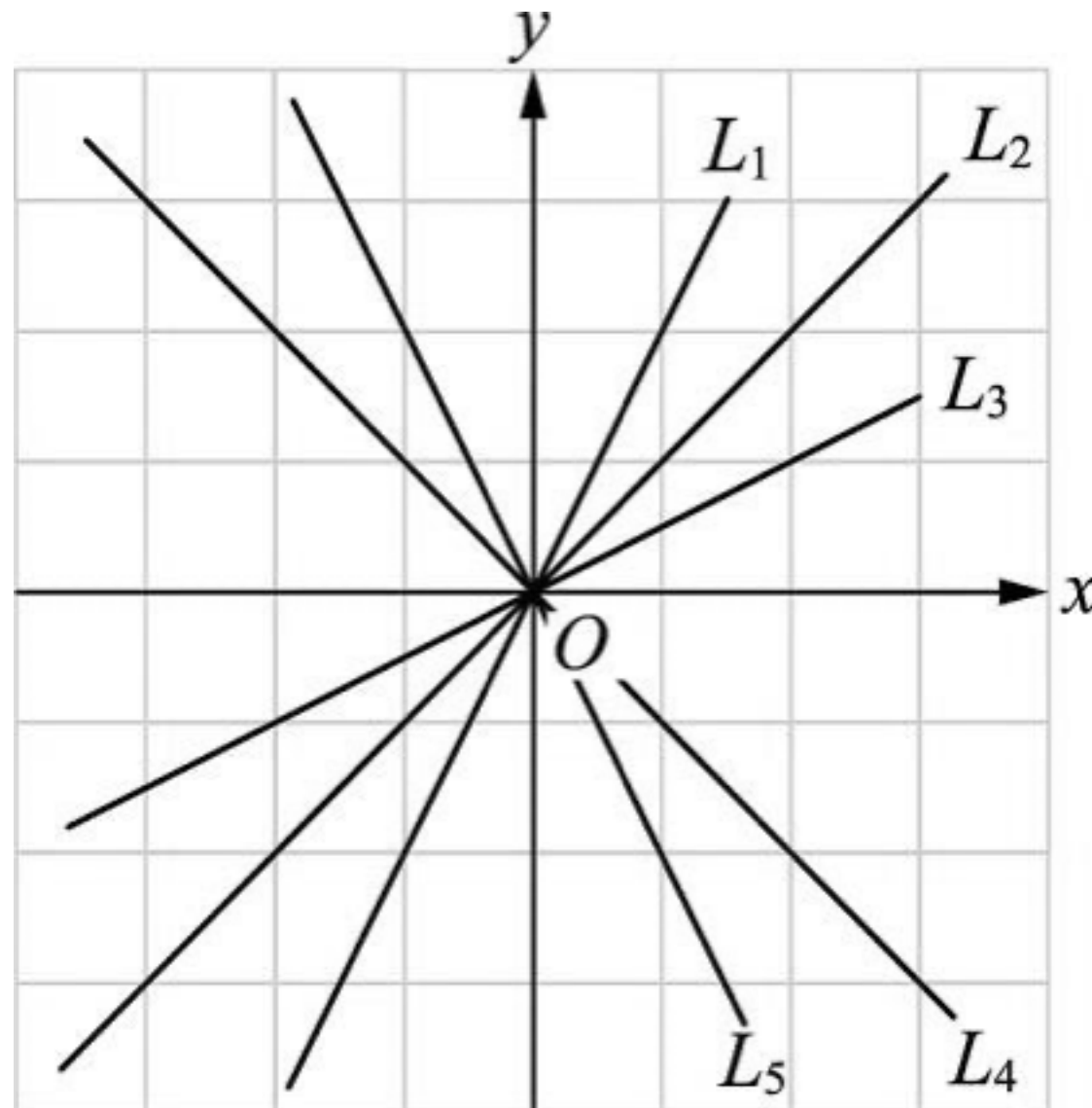
Here is the graph of a linear function $y = 2x$ in the cartesian plane

- What is the ratio of the change in the x -coordinate(run) to the change in the y -coordinate(rise)?
- When running in 1, how much is the rise of $y = 2x$?
- The slope of $y = 2x$ is 2.



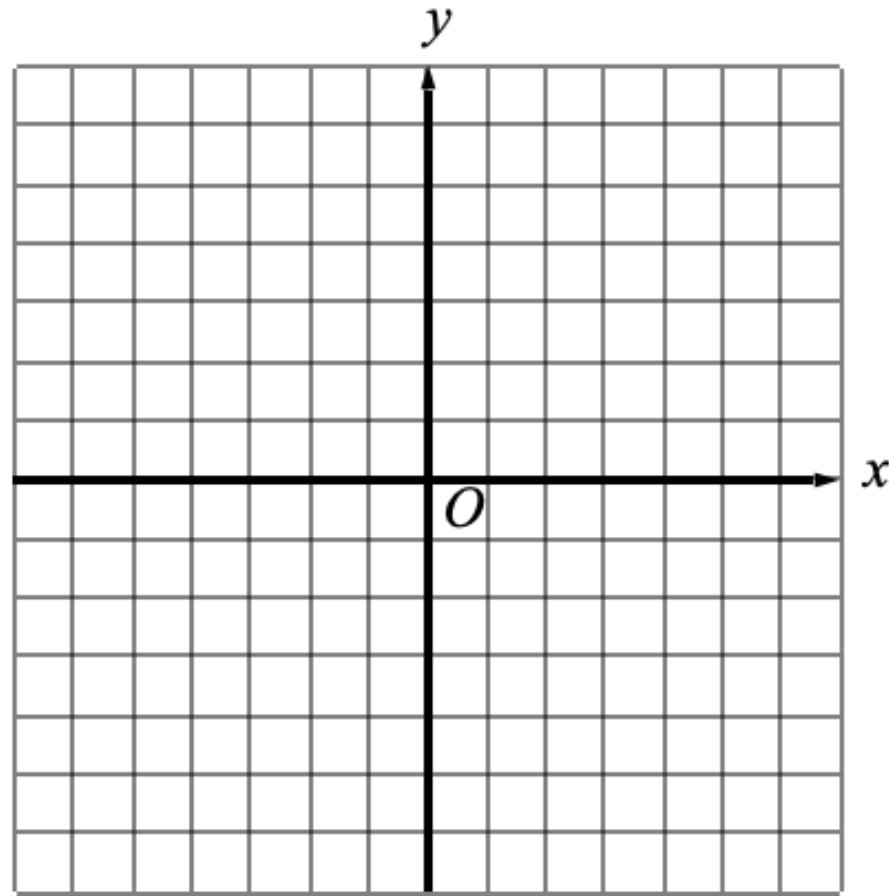
More examples

- a. Find the slopes of the lines.
- b. For the line 4, when the run is one unit, what is the rise?
What are the different slopes of Line 2 and Line 4?

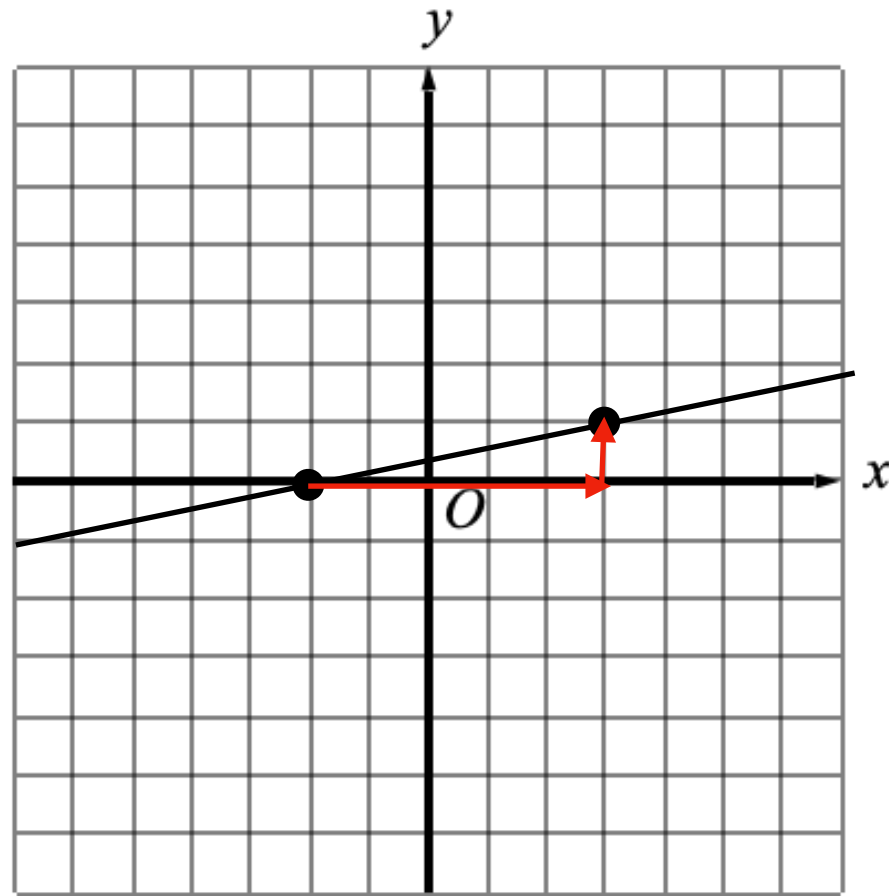


Find the slope of the line passing through each pair of points.

- a. $(-2,0)$ and $(3,1)$
- b. $(-1,2)$ and $(2,2)$
- c. $(0,4)$ and $(1,-1)$
- d. $(3,4)$ and $(3,1)$



Find the slope of the line passing through $(-2,0)$ and $(3,1)$.



Step1. How much is the run?

Step2. How much is the rise?

Step3. When the run is one unit,
how much the rise?

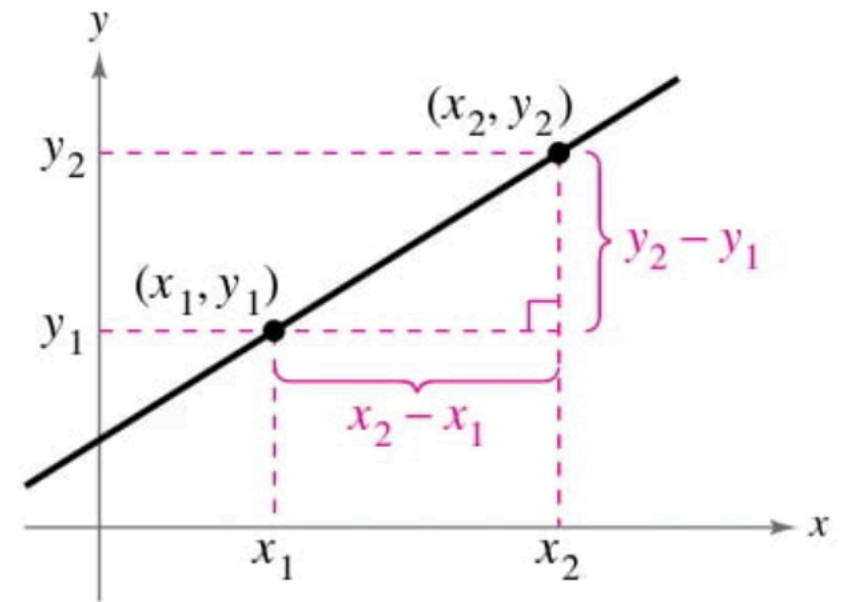
$$\text{Slope} = \frac{\text{rise}}{\text{run}}$$

Finding the slope of a line by using two points.

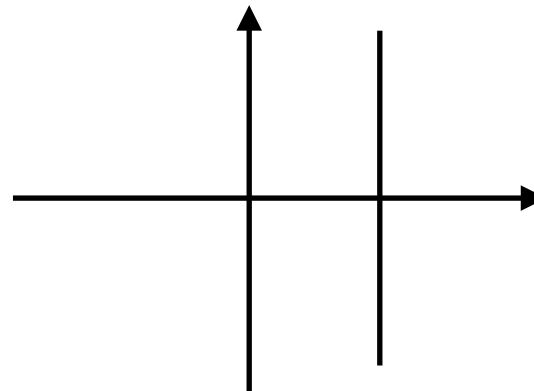
On a line L , choose any two distinct points $A(x_1, y_1)$ and $B(x_2, y_2)$.

If L is not a vertical line, then $x_1 \neq x_2$.

The slope m of L is defined as $m = \frac{y_2 - y_1}{x_2 - x_1}$.

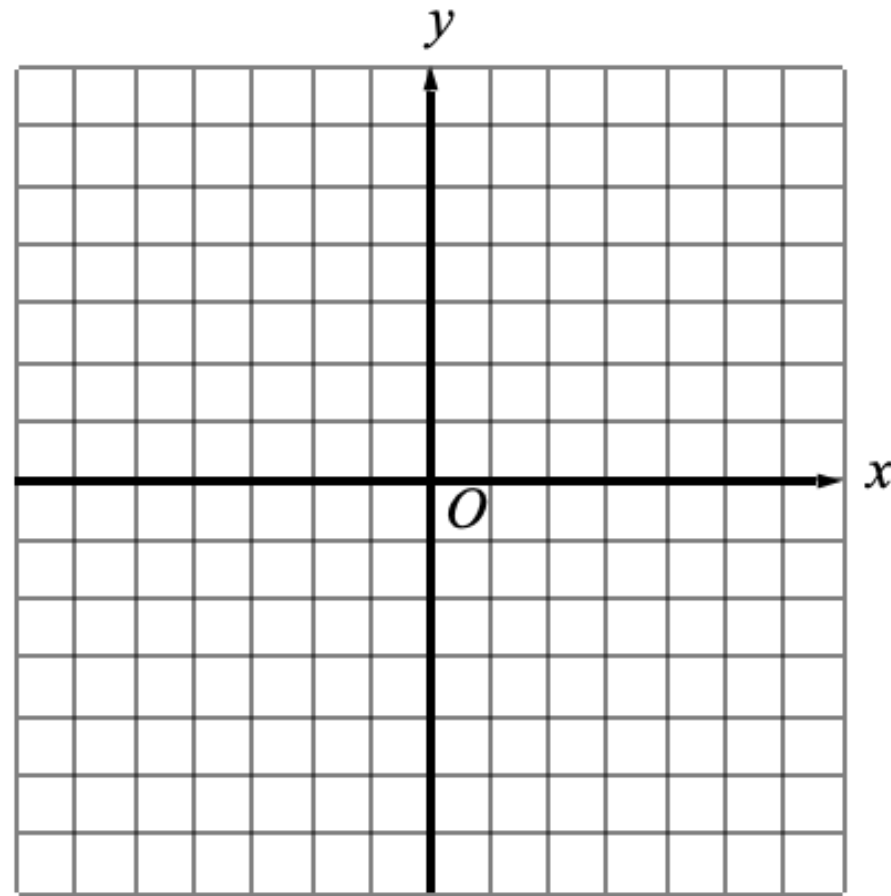


Division by 0 is undefined, so the slopes of vertical lines is undefined.



Find the slope of the line passing through each pair of points.

- a. $(-2,0)$ and $(3,1)$
- b. $(-1,2)$ and $(2,2)$
- c. $(0,4)$ and $(1, -1)$
- d. $(3,4)$ and $(3,1)$



參考資料：

- 1. Ron Larson, Precalculus with limits 4E.**
- 2. 泰宇出版社高中數學第一冊**

使用建議	
教學活動安排	與學生互動，將生活中的經驗轉化成數學需求。
英文提問 / 開場	<p>Has everyone ever played on a water slide?</p> <p>A steeper water slide rises more sharply than a gentler one.</p> <p>Do you prefer steeper slides or gentler ones?</p> <p>What makes them more fun or exciting for you?</p> <p>Then, How can we accurately describe the steepness of the water slides we want to build?</p> <p>This practical question leads us to an important mathematical concept: "In math, how do we express the slope of a line?"</p> <p>Understanding slope helps us design and compare steepness accurately, whether for water slides, roads, or any other inclined surfaces.</p> <p>So, our topic today is the “slope” of a line.</p>

使用建議	
教學活動安排	用爬樓梯及公式會用到的單字rise and run 來說明斜率的概念
英文提問 / 開場	<p>Look at the graph; here are two stairs, one steeper than the other.</p> <p>And you can see that for each run, the girl rises her leg higher for the steeper stairs.</p> <p>Expressing “how much do you rise for each run? ” in numerical terms is the concept of the slope.</p> <p>Let’s explore this concept further by line equations.</p>

使用建議	
教學活動安排	用直線方程式來說明斜率的概念及公式
英文提問 / 開場	<p>In math, the run is the change in the x-coordinate, and the rise is the change in the y-coordinate. With the help of graph paper, we can observe that when we arbitrarily choose two distinct points on a straight line, the ratio of the run to the rise is always 1:2.</p> <p>When we run one step, we rise two on this line.</p> <p>So, in this case, the slope of $y=2x$ is two.</p> <p>Let's explore more examples.</p>

使用建議	
教學活動安排	兩點坐標求直線斜率及更多的例子（水平線斜率0,鉛直線沒有斜率）
英文提問 / 開場	<p>What if we are given two points on a line? How do we calculate the slope of the line?</p> <p>Let's do example a. together.</p> <p>What is the run? What is the rise?</p> <p>So, when the run is one unit, how much the rise?</p> <p>In this process, if we are given two points on a line, we find that the slope is equal to rise over run.</p> <p>So, we have a slope formula for when two points on a line are given.</p>

使用建議	
教學活動安排	讓學生完成剩下三個例子
英文提問 / 開場	<p>Now it's your turn to finish the examples. We'll check-in in five minutes. Go and give it a try.</p>

答案

Solution

a. Letting $(x_1, y_1) = (-2, 0)$ and $(x_2, y_2) = (3, 1)$, you find that the slope is

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 0}{3 - (-2)} = \frac{1}{5}.$$

See Figure 1.21.

b. The slope of the line passing through $(-1, 2)$ and $(2, 2)$ is

$$m = \frac{2 - 2}{2 - (-1)} = \frac{0}{3} = 0.$$

See Figure 1.22.

c. The slope of the line passing through $(0, 4)$ and $(1, -1)$ is

$$m = \frac{-1 - 4}{1 - 0} = \frac{-5}{1} = -5.$$

See Figure 1.23.

d. The slope of the line passing through $(3, 4)$ and $(3, 1)$ is

$$m = \frac{1 - 4}{3 - 3} = \frac{-3}{0}.$$

See Figure 1.24.

Division by 0 is undefined, so the slope is undefined and the line is vertical.

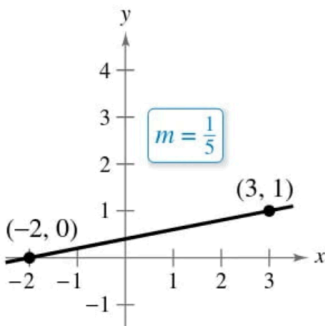


Figure 1.21

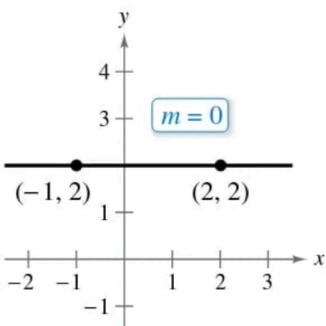


Figure 1.22

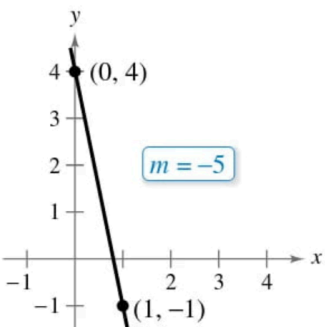


Figure 1.23

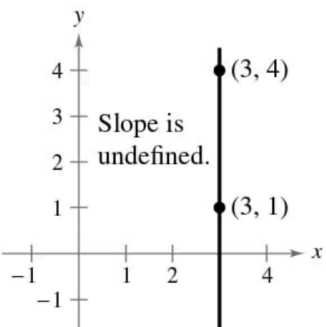


Figure 1.24