

**SLOPE
LESSON 1**

Q) What is SLOPE ?

A) Slope Is the Measure of How Steep a Line Is.

It Tells Us How Much a Line Rises or Falls as It Moves Across. If a Line Goes Upward, It Has a Positive Slope. If a Line Goes Downward, It Has a Negative Slope. If It Is Flat, Its Slope Is Zero. A Slope of One Means the Line Rises the Same Amount that It Moves Across. In Simple Words, Slope Tells Us How Steep a Line Is and Which Direction It Is Going.

Rise Over Run Is the Way We Measure Slope. Rise Means How Far a Line Moves Up or Down. Run Means How Far a Line Moves Across. We Compare the Rise to the Run to Find How Steep the Line Is. If the Rise Is Large Compared to the Run, the Line Is Steeper. In Simple Words, Rise Over Run Tells Us How Much a Line Goes Up or Down for Every Step It Moves Across.

Rise Over Run Explains Slope by Using the Coordinate Plane. The Y-axis is the vertical axis, so it measures movement up and down. The X-axis is the horizontal axis, so it measures movement left and right. The Rise Is the Change in Y, Written as Delta Y (Δy), Which Tells How Much the Line Moves Up or Down Between Two Points. The Run Is the Change in X, Written as Delta X (Δx), Which Tells How Much the Line Moves Across.

The Slope Is Found by Comparing These Two Changes. We Divide the Change in Y by the Change in X. This Is Called Rise Over Run.

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

If Delta Y Is Positive, the Line Rises Upward. If Delta Y Is Negative, the Line Falls Downward. Delta X Shows How Far the Line Moves Across. In Simple Words, Rise Over Run Measures How Much a Line Goes Up or Down on the Y-axis for Every Change Across the X-axis.

A Slope of 1 Happens When the Change in Y Is Equal to the Change in X. This Means the Line Rises the Same Amount that It Moves Across. For Every 1 Unit Moved Along the X-Axis, the Line Moves Up 1 Unit Along the Y-Axis. Since Rise and Run Are Equal, Their Ratio Is One.

$$m = \frac{\Delta y}{\Delta x} = \frac{1}{1} = 1$$

In Simple Words, a Slope of 1 Means the Line Goes Up One Unit for Every One Unit It Moves Across.

A Slope of Negative 1 Happens When the Change in Y Is the Opposite of the Change in X. This Means as the Line Moves 1 Unit Across on the X-Axis, It Moves Down 1 Unit on the Y-Axis. The Rise Is Negative While the Run Is Positive, So Their Ratio Is Negative One.

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$$m = \frac{\Delta y}{\Delta x} = \frac{-1}{1} = -1$$

In Simple Words, a Slope of Negative 1 Means the Line Goes Down One Unit for Every One Unit It Moves Across.

If Delta X Is Negative, It Means You Are Moving Left on the X-Axis Instead of Right.

Slope Is Still Found by:

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

What Matters Is the Signs Together:

- **If Delta Y and Delta X Have the Same Sign (Both Positive or Both Negative), the Slope Is Positive.**
- **If Delta Y and Delta X Have Different Signs, the Slope Is Negative.**

Example:

$$\frac{1}{-1} = -1$$

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This Means Moving Up 1 but Left 1, Which Gives a Negative Slope.

Also:

$$\frac{-1}{-1} = 1$$

This Means Moving Down 1 and Left 1, Which Gives a Positive Slope.

In Simple Words, a Negative Delta X Changes Direction, and the Signs Decide Whether the Slope Is Positive or Negative.

A 3–4–5 Triangle Also Connects Directly to The Pythagorean Theorem. The Pythagorean Theorem Says That In a Right Triangle, The Square of The Hypotenuse Equals The Sum of The Squares of The Other Two Sides. So Here, $3^2 + 4^2 = 9 + 16 = 25$, and The Square Root of 25 Is 5, Which Confirms The Triangle Is Correct.

This Same Idea Helps Show Why Slope Works With Geometry. The Slope Tells The Steepness of The Line, While The Pythagorean Theorem Describes The True Distance Between Points. Together, They Connect Direction (Slope) With Distance (Hypotenuse), Showing How Movement in The X and Y Directions Combine Into One Path.

This Also Leads Into The Derivative. The Derivative Measures The Slope of a Curve at a Single Point, Not Just a Straight Line. It Uses Tiny Changes in Y and X, Like Very Small Rise and Run, To Find

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Instant Slope. In That Way, The 3–4–5 Triangle Idea Is a Simple Version of The Same Concept Behind Derivatives, Where Geometry Becomes Continuous Change.

Q) Can The Slope or Rise Over Run Concept be Used Triangles Other than Right Triangles

A) Yes—But Only Indirectly.

Slope (Rise Over Run) is Defined using Horizontal and Vertical Change, Not the Triangle Type. So it does Not Depend on a Right Triangle Existing Physically, but it Always Creates a Right Triangle in the Background when you Measure it.

If you Draw any Triangle on a Coordinate Plane and Pick Two Points, you can form a Right Triangle by Projecting Horizontal (Run) and Vertical (Rise) Lines. That Right Triangle is what gives the Slope:

- **Rise = Vertical leg (Δy)**
- **Run = Horizontal leg (Δx)**

Even if the Original Triangle is Not a Right Triangle (like an Acute or Obtuse Triangle), Slope still works because you are not using the Triangle's Sides—you are using the GRID MOVEMENT Between Points.

So the Key Idea is:

Slope Always Comes from a Right Triangle Formed by Δx and Δy , Even if the Original Shape is Not a Right Triangle.