



MATH WITH MR DJ

GRADE 8 · EXPRESSIONS & EQUATIONS

WHY SLOPE IS CONSTANT

Today's goal: I can use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane and derive the equation $y = mx$ for a line through the origin and $y = mx + b$ for a line intercepting the vertical axis at b .



Tan



Digit



Blaze



Pi



A fair question

- 1 Pick two points close together: rise 2, run 1.
- 2 Pick two far apart: rise 20, run 10.

TURN & TALK

Bigger numbers. Is it a bigger slope?



No – same ratio

1 $\frac{2}{1} = 2$ and $\frac{20}{10} = 2$.

REMEMBER

The numbers grew together, so the ratio held.



BIG IDEA 2

Because the triangles are similar

1 Same line $\rightarrow$ same angle $\rightarrow$ same shape.

2 Similar triangles have equal ratios of sides.

REMEMBER

That is WHY, not just that it happens to work.



BIG IDEA 3

Through the origin: $y = mx$

1 Slope m from $(0,0)$ to (x,y) is $\frac{y}{x}$.

2 So $y = mx$.



WATCH OUT!

Not through the origin: $y = mx + b$

- 1 Start at b on the y -axis.
- 2 Then climb at rate m .



BIG IDEA 5

b shifts, m tilts

1 $y = 2x$ and $y = 2x + 1$ are PARALLEL.

2 Same slope, moved up 1.

REMEMBER

Change b and the line slides. Change m and it tips.



SPOT THE SLIP!

Turn & talk

Something went wrong here...

THE PROBLEM

State the slope and y-intercept of $y = -2x + 6$.

WHAT A STUDENT DID

Gave the slope as 2, dropping the sign, or swapped m and b.

YOUR MISSION

What went wrong? What's the right answer?



State the slope and y-intercept of $y = -2x + 6$.

1 $m = -2$, so the line falls.

2 $b = 6$.

Answer: slope -2 , y-intercept 6



Pick your pepper!



☛ MILD

Find the slope of $y = 5x - 2$ using $(0, -2)$ and $(2, 8)$.

#1 on your practice sheet



☛☛ MEDIUM

Now find it using $(1, 3)$ and $(4, 18)$. Should it match?

#2 on your practice sheet



☛☛☛ SPICY

Explain, using similar triangles, why any two points on a line give the same slope.

#5 on your practice sheet

How's it going?



3 • Got it!

I could teach it



2 • Almost

One more example, please



1 • Not yet

I need some help

NOW YOU!

Practice sheet: everyone does Mild & Medium, then climb the peppers.

Stuck? Look back at Mr DJ's example at the top of the sheet.

Need it again? Step-by-step videos on YouTube @MathWithMrDJ

Brain break: 3 new daily puzzles at puzzles.mathwithmrdj.com

