



MATH WITH MR DJ

GRADE 8 • GEOMETRY

TRANSFORMATIONS ON COORDINATES

Today's goal: I can describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.



Tan



Digit



Blaze



Pi



Translation: add

1 $(x, y) \rightarrow (x + a, y + b).$

2 Every point moves the same way. Size unchanged.



BIG IDEA 2

Reflection: one sign flips

1 In the x-axis: $(x, y) \rightarrow (x, -y)$.

2 In the y-axis: $(x, y) \rightarrow (-x, y)$.

REMEMBER

The axis you reflect in is the coordinate that SURVIVES.



BIG IDEA 3

Rotation about the origin

1 90° anticlockwise: $(x, y) \rightarrow (-y, x)$.

2 180° : $(x, y) \rightarrow (-x, -y)$.

REMEMBER

Swap AND change a sign. A bare swap is a reflection, not a turn.



BIG IDEA 4

Dilation: MULTIPLY

- 1 Scale factor k about the origin: $(x, y) \rightarrow (kx, ky)$.
- 2 The only one of the four that changes size.

REMEMBER

Multiply. Never add.



BIG IDEA 5

Why adding cannot enlarge

- 1 Add 3 to every coordinate of a 3-4-5 triangle.
- 2 Measure the sides. Still 3, 4 and 5.

REMEMBER

Adding the same amount to every point is a TRANSLATION. It moves the figure and leaves it the same size.



BIG IDEA 6

What a dilation does to lengths and area

1 Every length $\times k$.

2 Area $\times k^2$.

REMEMBER

Scale factor 3: sides 3x longer, area 9x bigger.



Something went wrong here...

THE PROBLEM

Write the coordinate rules for reflecting in the x-axis and in the y-axis.

WHAT A STUDENT DID

Swapped them. The survivor rule is the recovery route when the two blur together.

YOUR MISSION

What went wrong? What's the right answer?



Write the coordinate rules for reflecting in the x-axis and in the y-axis.

- 1 The axis you reflect in is the coordinate that survives.
- 2 So an x-axis reflection keeps x and flips y.

Answer: $x\text{-axis: } (x, y) \rightarrow (x, -y). y\text{-axis: } (x, y) \rightarrow (-x, y)$



Pick your pepper!



MILD

Write the coordinate rule for a translation of a right and b up.

#1 on your practice sheet



MEDIUM

Translate (2,1), (6,1), (2,4) by 3 left and 2 up. Give the corners.

#2 on your practice sheet



SPICY

Priya says rotating 90° means swapping the coordinates, so (2,4) becomes (4,2). What transformation has she actually described?

#6 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



MATH WITH MR DJ

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? Watch "Translations on the Coordinate Plane" on YouTube @MathWithMrDJ

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

