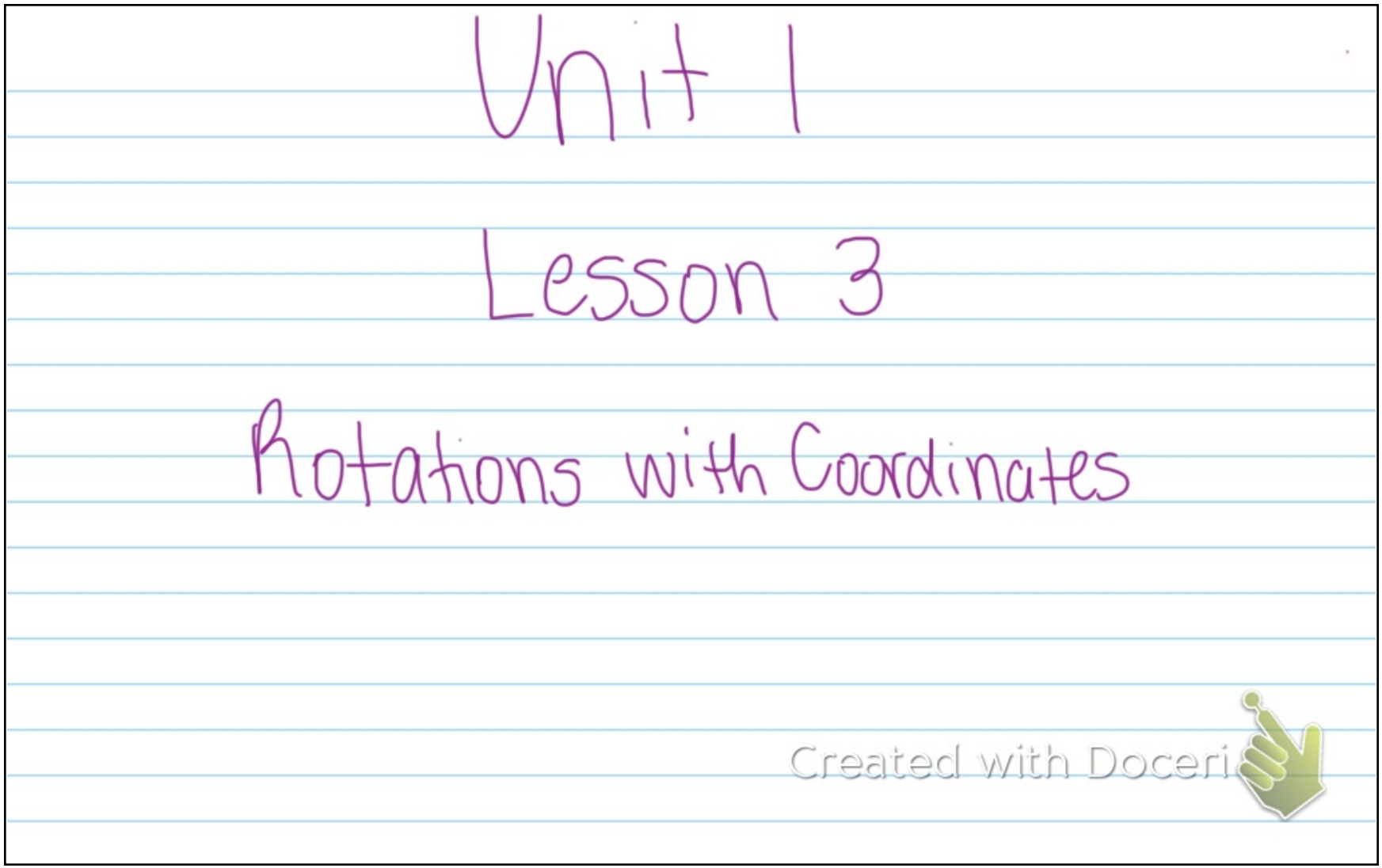
Unit 1

Lesson 3

Rotations with Coordinates



Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 3 – Rotations with Coordinates

Name_____
Date_____ Pd_____

Rotations

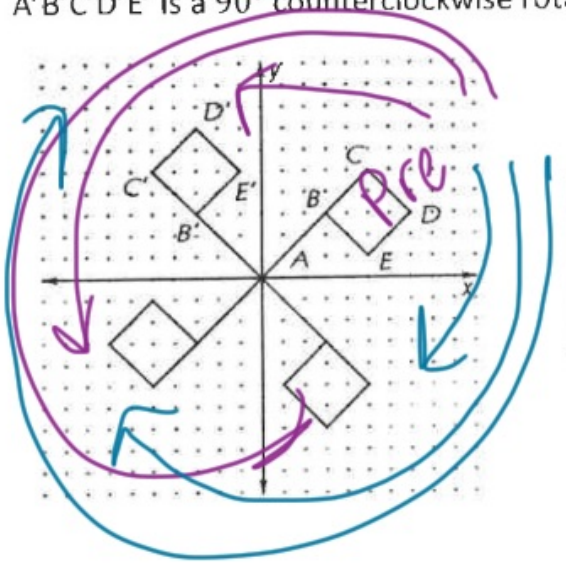
Definition:

A **rotation** is a type of transformation which is a turn in a given direction for a given number of degrees around a fixed point. To rotate an object, you must specify the degree of rotation, the point around which the rotation is to occur, and the direction.

- Rotations can be completed in two directions: counter-clockwise & clockwise
- In Math 3: Negative angle measures will indicate a clockwise rotation.

Rotations with a Coordinate Plane

The flag shown below is rotated about the origin 90°, 180°, and 270°. Flag ABCDE is the **preimage**. Flag A'B'C'D'E' is a 90° counterclockwise rotation of ABCDE.



Counter clockwise
90° Degrees!

Clockwise
270° Degrees!

NOTE: Unless otherwise specified, the standard for rotations is **counterclockwise!**

- **Notation for Rotations:** $\mathcal{R}$ # degrees
- **Examples:** $\mathcal{R}_{90°}$ $\mathcal{R}_{180°}$ $\mathcal{R}_{270°}$ $\mathcal{R}_{270°CW}$ $\mathcal{R}_{180°CW}$ $\mathcal{R}_{90°CW}$

➢ **Rotations on the Coordinate Plane Exploration:** Triangle ABC has coordinates A(2, 0), B(3, 4), C(6, 4).

Trace the triangle and the $x-$ *and* $y-$ *axes* on patty paper.

CCW about origin

1) Rotate *Triangle ABC* 90°, using the axes you traced to help you line it back up. Record the new coordinates.

A'(0 , 2), B'(-4 , 3), C'(-4 , 6)

CCW about origin

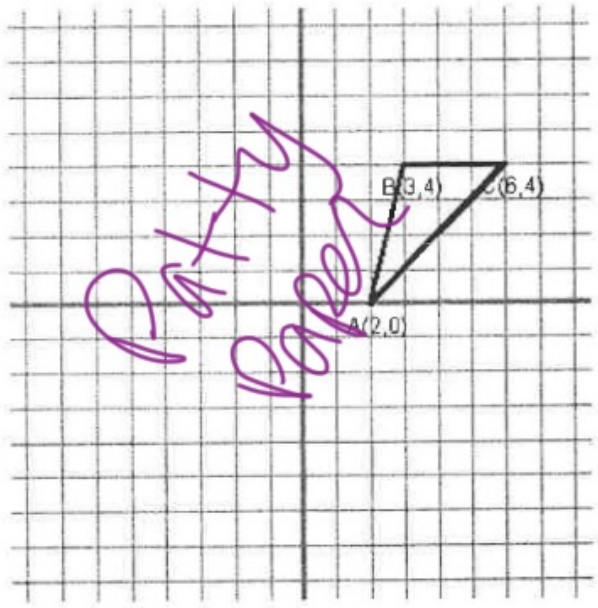
2) Rotate *Triangle ABC* 270°, using the axes you traced to help you line it up. Record the new coordinates.

A'' (0 , -2), B'' (4 , -3), C'' (4 , -6)

CCW

3) Rotate *Triangle ABC* 180°, using the axes you traced to help you line it back up correctly. Record the new coordinates.

A''' (-2 , 0), B''' (-3 , -4), C''' (-6 , -4)



➢ **Rotation Algebraic Rules:**

- ✓ **Look for patterns in the above examples to help complete the following rotation rules.**
- ✓ **Then write the rule using proper notation for 1 – 3.**

1. A 90° counter-clockwise rotation maps $(x, y) \rightarrow$ ($-y$, x). Notation: $R_{90°CCW}$
2. A 270° counter-clockwise rotation maps $(x, y) \rightarrow$ (y, $-x$). Notation: $R_{270°CCW}$
3. A 180° rotation maps $(x, y) \rightarrow$ ($-x$, $-y$). Notation: $R_{180°CCW}$

4. A rotation of 270° **clockwise** is equivalent to a rotation of 90° CCW.
5. A rotation of 270° **counterclockwise** is equivalent to a rotation of 90° CW.
6. A rotation of 180° **counterclockwise** is equivalent to a rotation of 180° CW.

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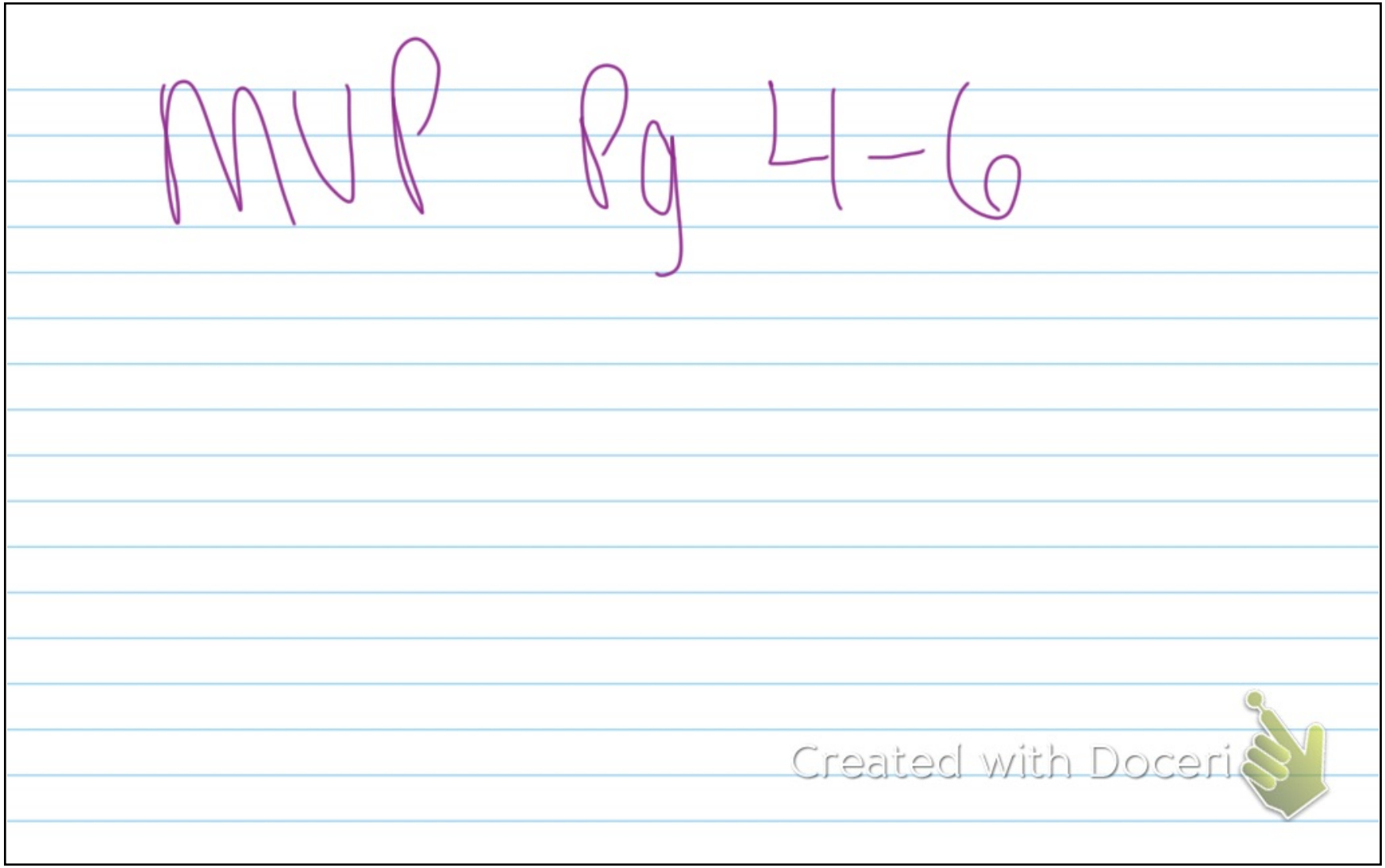
MVP Pg 4-6
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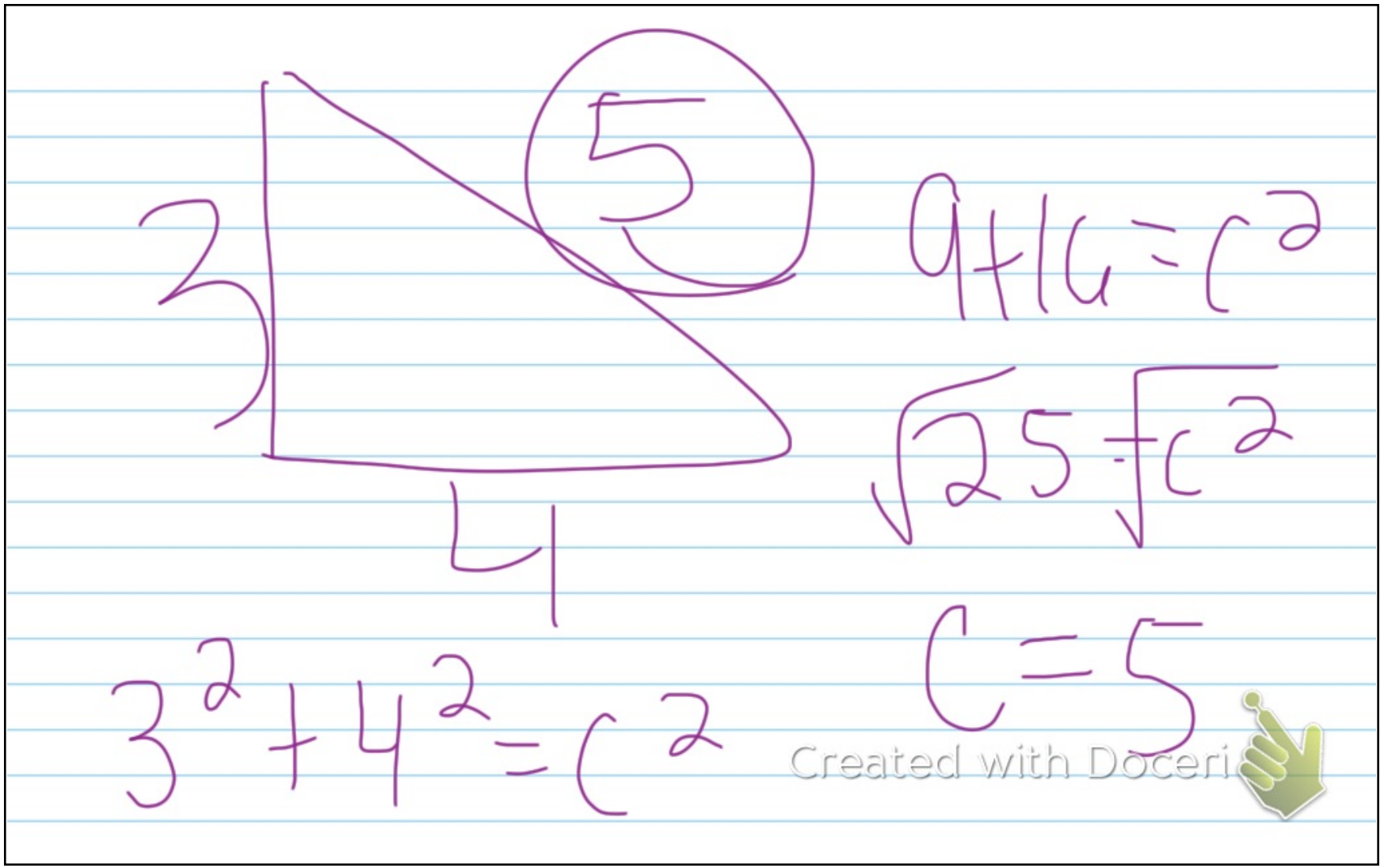
5
3
4
$3^2+4^2=c^2$
$9+16=c^2$
$\sqrt{25}=\sqrt{c^2}$
$c=5$
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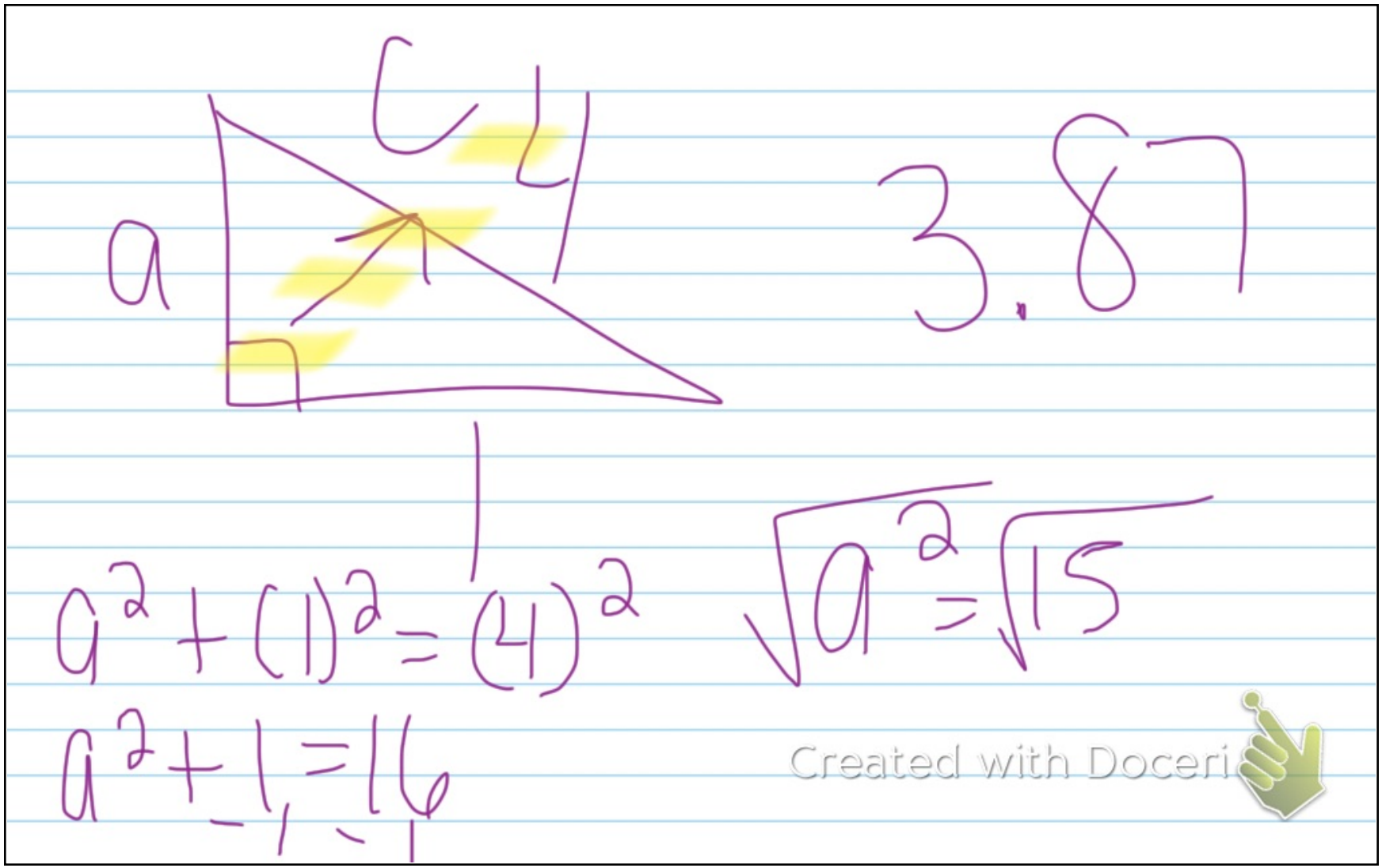
a
4
3.87
1
$a^2 + (1)^2 = (4)^2$
$a^2 + 1 = 16$
$-1 \quad -1$
$\sqrt{a^2} = \sqrt{15}$
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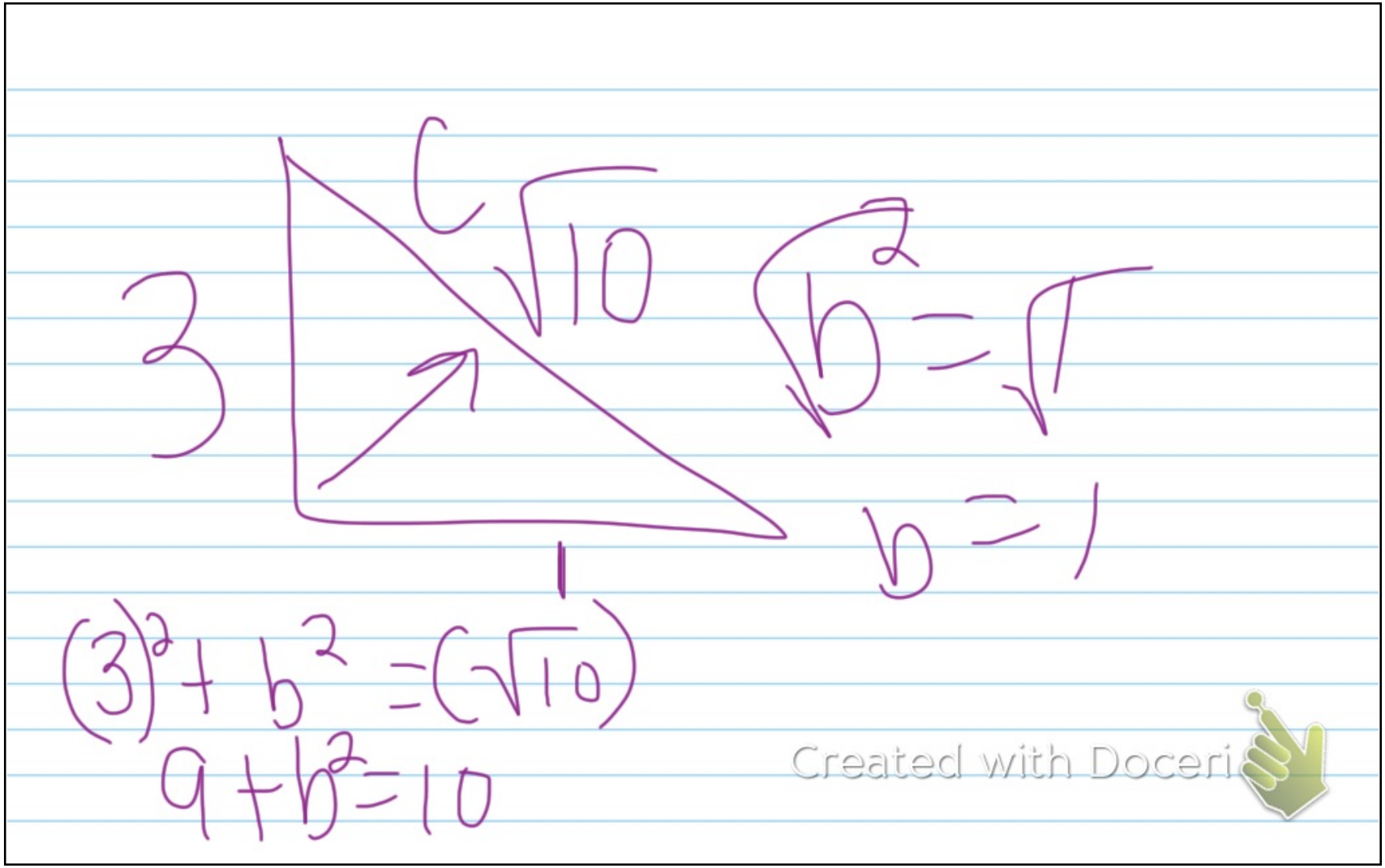
c
√10
3
1
$b^2 = \sqrt{1}$
$b = 1$
$(3)^2 + b^2 = (\sqrt{10})$
$9 + b^2 = 10$
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