



**THIRD SPACE
LEARNING**

Math Intervention Pack

Understanding translations

Grade 8

How To Use This Resource

1. Title Slide

Use this slide to activate prior knowledge needed for lesson. Students should be encouraged to initially attempt the question presented independently.

2. Prior Learning

Use this slide to review the knowledge that will be required to be successful in this lesson. If students feel confident on the prior learning section of the Title Slide then this slide can be skipped

3. Let's Learn

Use this slide to introduce the concept. Tutors should work with the student to explore the concept together, usually using diagrams to support understanding.

4. Follow Me + Your Turn

The tutor should work through the follow me slide, modeling the process and explaining their thinking out loud.

Students should use the your turn slide as an opportunity to work through a question similar to the follow me questions. They should apply the method modeled by the tutor in the follow me slide. Students should be encouraged to explain their thinking out loud.

5. You Do

Students should work through a range of questions that build in complexity.

Tutors can offer support but students should initially be encouraged to attempt these questions independently.

6. Go Further

Use this slide to allow students to apply their understanding to a more challenging question in an unfamiliar context.

How To Use This Resource

7. Support for Slides

The support slide is used to support students during the lesson. In the tutor notes, there will be guidance as to when to use the support slide.

8. Check Your Understanding

Tutors should use this slide to assess the student's knowledge and whether or not they have mastered the concept within the lesson.

Standard

8.G.A.1 - Verify experimentally the properties of rotations, reflections, and translations.

- Lines are taken to lines, and line segments to line segments of the same length.
- Angles are taken to angles of the same measure.
- Parallel lines are taken to parallel lines.

8.G.A.3 - Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Key Mathematical Ideas

- Given the pre-image and image, describe the effect of translations on figures using coordinates.
- Given only the pre-image, describe the effect of translations on figures using coordinates, with and without a given coordinate plane.

Overview

Terminology

- **Axis:** A reference line; in a coordinate plane there are two that cross, forming a right angle.
- **Coordinates:** Set of numbers, or single number, that locates a point on a line, on a plane, or in space.
- **Ordered pair:** A pair of numbers used to show the position on a graph, where the “*x*” (horizontal) value is first and the “*y*” (vertical) value is second.
- **Pre-image:** The original figure.
- **Image:** A figure that has undergone a transformation.

Sentence Stems

- The shape ___ was translated ___ units (up/down).
- The shape ___ was translated ___ units (left/right).

Overview

Common Misconceptions

Common Misconceptions	Tutoring Strategies	Checks for Understanding
Students who confuse x and y coordinates.	Always clearly indicate which coordinate is changing given a vertical or horizontal translation.	Ask students to describe how the translation impacted the x and y coordinates.
Students who confuse the image and the pre-image; particularly when the image is in the first quadrant.	Before discussing the translation, always identify the pre-image and image, and explain their notation. Highlight cases where the pre-image is not in the first quadrant.	Ask students to identify the pre-image and image in the coordinate plane before solving.

Title Slide

If students...

- get both sections correct:
 - start at You do
- miss the learning goal section only:
 - start at Let's Learn
- miss the prior learning section:
 - start at Prior Learning

Prior Learning

If stuck

- Model finding and labeling additional coordinates on the grid.
- Draw a line from point to point when measuring distance.

Answers

- coordinate, x , y , Count
- a) W(-4, -2), R(-4, 5), E(4, -2)
- b) W to R = 7, E to W = 8

Let's Learn

If stuck

- Draw another translation for each shape, showing students how to count and move each point.

Questions

- a) How did the coordinates change from point A to point A'? (The y coordinate decreased by 4. The x coordinate stayed the same.)
- Note: Ask this again for the other points.
- a) What patterns do you notice between the pre-image coordinates and the image coordinates? (The y coordinates all decreased by 4. The x coordinates stayed the same.)
- b) How does shape a compare to shape a' ? (Shape a and shape a' are congruent. The translation does not change the form of the shape.)
- c) How did the coordinates change from point K to point K'? (The x coordinate increased by 5. The y coordinate stayed the same.)
Note: Ask this again for the other points.
- d) What patterns do you notice between the pre-image coordinates and the image coordinates? (The x coordinates all increased by 5. The y coordinates stayed the same.)
- d) How does shape K compare to shape K'? (Shape K and shape K' are congruent. The translation does not change the form of the shape.)

Watch out for

- Students who try to use the rule for translations without being able to explain what is happening on the coordinate plane.
- Students who confuse x and y coordinates.

Answers

- a) A(-5, 1), D'(-3, -2)
- b) 4 units down
- c) K(1, 4), L'(5.5, 2)
- d) 5 units right

Follow me

Modeling prompts

- Identify the coordinates of point G.
- Count the translation down.
- Count the translation right.
- Draw arrows to show this translation on the other vertices.

Answers

- a) $G(-7, 0)$
- b) 11 units right
- c) 7 units down
- d) Each vertex has been translated 11 units right and 7 units down.
- e) Shape a was translated 11 units right and 7 units down.

Your turn

If stuck

- Prompt students to draw the lines showing the horizontal and vertical translations.
- Use similar guidance given in the Modeling prompts.

Questions

- a) Where is the pre-image located? (In quadrant 4.)
- a) Where is the image located? (In quadrant 2.)
- b) How does the x coordinate change from T to T''? (T is at $x = -10$ and T'' is at $x = -4$, so it decreases by 14.)
- c) How does the y coordinate change from T to T''? (T is at $y = -6$ and T'' is at $y = 3$, so it increases by 9.)
- d) Is the y coordinate translation true for the other vertices? (Yes, one point has the exact same y coordinates as T and the other is $y = -3$ in k and then $y = 6$ in k'', which is also an increase of 9.)
- d) Is the x coordinate translation true for the other vertices? (Yes, they both are at $x = 7$ in k and then $x = -7$ in k'', which is also a decrease of 14.)
- e) How does shape k compare to shape k''? (Shape k and shape k'' are congruent. The translation does not change the form of the shape.)

Watch out for

- Students who try to use the rule for translations without being able to explain what is happening on the coordinate plane.
- Students who confuse x and y coordinates.
- Students who confuse the image and the pre-image.

Answers

- a) T(10, -6)
- b) 14 units left
- c) 9 units up
- d) Each vertex has been translated 14 units left and 9 units up.
- e) Shape k was translated 14 units left and 9 units up.

You do

If stuck

- Prompt students to draw the lines showing the horizontal and vertical translations.
- Use the Support slide for question 3.

Questions: First slide

- 1a) How did the coordinates change from point n to point n' ? (The x coordinate decreased by 7. The y coordinate stayed the same.)
Note: Ask this again for the other points.
- 1b) What patterns do you notice between the pre-image coordinates and the image coordinates? (The x coordinates all decreased by 7. The y coordinates stayed the same.)
- 1b) How does shape n compare to shape n' ? (Shape n and shape n' are congruent. The translation does not change the form of the shape.)
- 2a) How does the y coordinate change from L to L'' ? (L is at $y=2$ and L'' is at $y=5$, so it increases by 3.)
- 2a) Is the y coordinate translation true for the other vertices? (Yes, one point has the exact same y coordinates as L and the other two are $y=3$ in s and then $y=6$ in s'' , which is also an increase of 3.)
- 2b) How does the x coordinate change from L to L'' ? (L is at $x = -5$ and L'' is at $x=3$, so it increases by 8.)
- 2b) Is the x coordinate translation true for the other vertices? (Yes, one point has the exact same x coordinates as L and the other two are at $x = -2$ in s and then $x = 6$ in s'' , which is also an increase of 8.)
- 2c) How does shape s compare to shape s'' ? (Shape s and shape s'' are congruent. The translation does not change the form of the shape.)

Watch out for

- Students who try to use the rule for translations without being able to explain what is happening on the coordinate plane.
- Students who confuse x and y coordinates.
- Students who confuse the image and the pre-image.

Answers

- a) $S(2, -2)$, $T'(-3, -5)$
- b) 7 units left
- 2a) 8 units right
- b) 3 units up
- c) 8 units right and 3 units up
- 3) $E''(0,7)$, $F''(-7,9)$, $C''(-1,12)$

Go further

If stuck

Encourage student to draw the image on the coordinate plane.

Questions

- How did you solve for the coordinates of the pre-image? (Answers will vary.)
- How do you know your pre-image is correct? (Answers will vary.)
- Where is the pre-image in relation to the image? (It is 3 units down and 2.5 units left, which is the opposite of the translation movements.)

Watch out for

- Students who treat the image like the pre-image.
- Students who struggle with decimal coordinates.

Answers

- $E''(5.5, -1)$, $B''(-0.5, -3)$, $C''(-3.5, 1)$

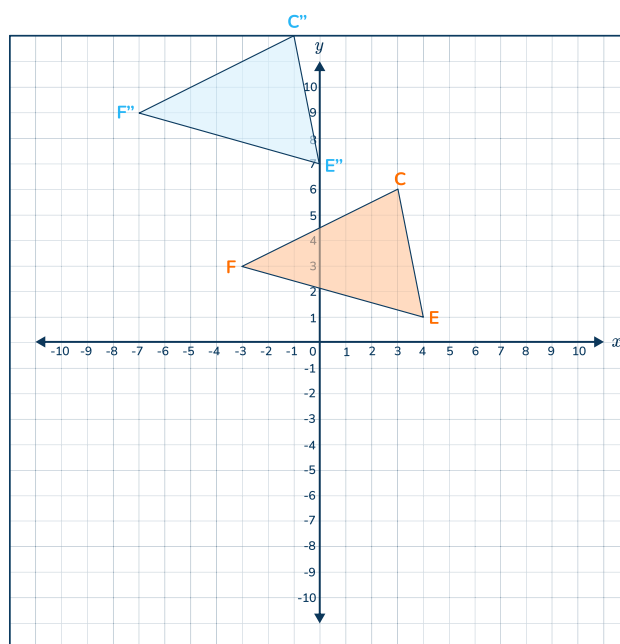
Support for Slide(s)

Questions

- b) Describe about where the shape will be after translating 4 units left. (It will be more to the left on the coordinate plane, more in the 2nd quadrant than 1st.)
- c) Describe about where the shape will be after translating 6 units up. (It will be further up on the coordinate plane, still in the 1st and 2nd quadrant.)
- d) What is the x coordinate after E is translated 4 units left? (E is at 4, so -4 units is 0.)
- d) What is the y coordinate after E is translated 6 units up? (E is at 1, so $+6$ units is 7.)
- d) What is the x coordinate after C is translated 4 units left? (C is at 3, so -4 units is -1 .)
- d) What is the y coordinate after C is translated 6 units up? (C is at 6, so $+6$ units is 12.)
- d) What is the x coordinate after F is translated 4 units left? (F is at -3 , so -4 units is -7 .)
- d) What is the y coordinate after F is translated 6 units up? (F is at 3, so $+6$ units is 9.)

Answers

- a)
- b) ... decrease the x coordinate by 4
- c) ... increase the y coordinate by 6
- d) $E''(0, 7)$, $F''(-7, 9)$, $C''(-1, 12)$



Check your Understanding

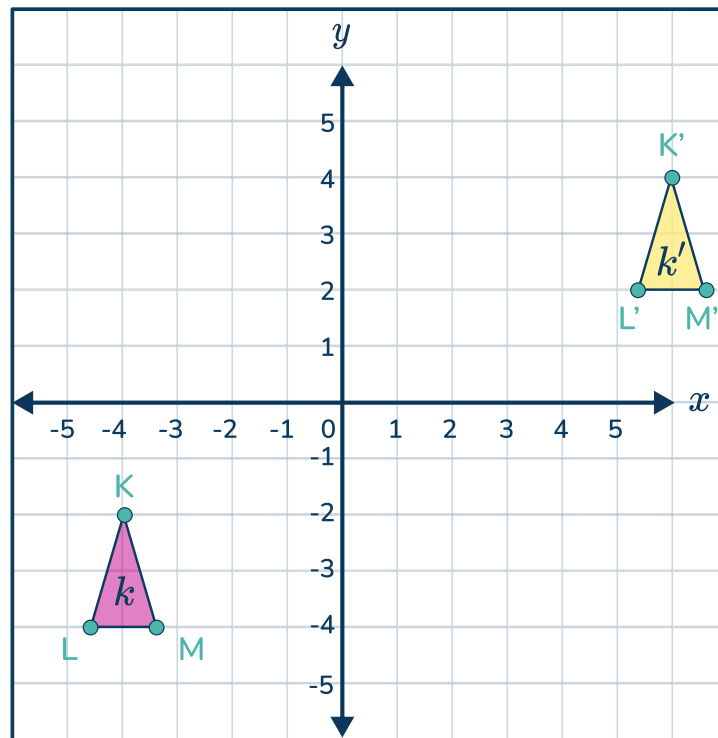
Correct answer:

Translated left 4 and up 10

Today you will learn about

Understanding translations

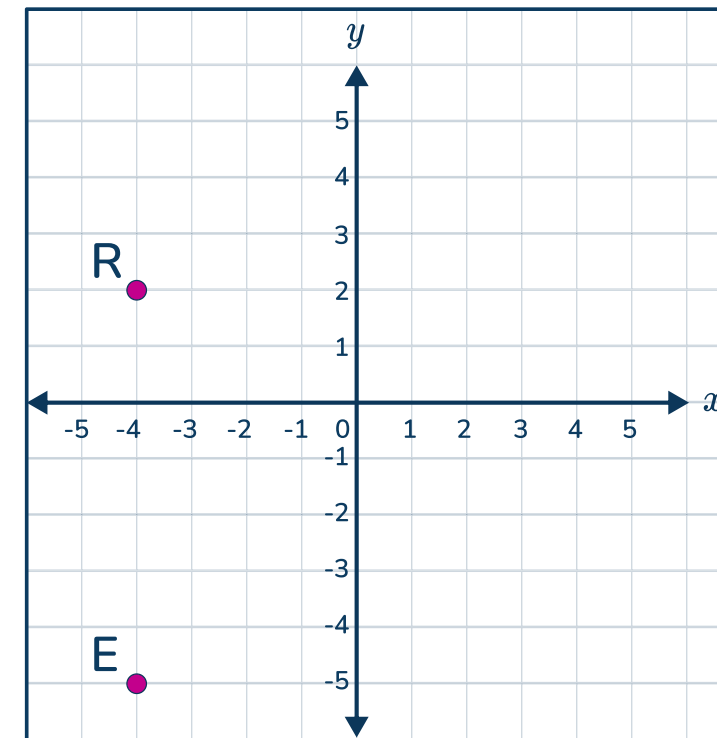
Learning Goal



Describe the translation
from k to k' .

.....
.....
.....

Prior Learning



Identify the coordinates
and calculate the
distance.

R (..... ,)

E (..... ,)

From R to E is units.

Prior learning

Before understanding translations, we need to know how to **locate coordinates** and **calculate vertical and horizontal distance** on the coordinate plane.

The coordinate plane is created by the intersection of two number lines.

A identifies a location on the coordinate plane.

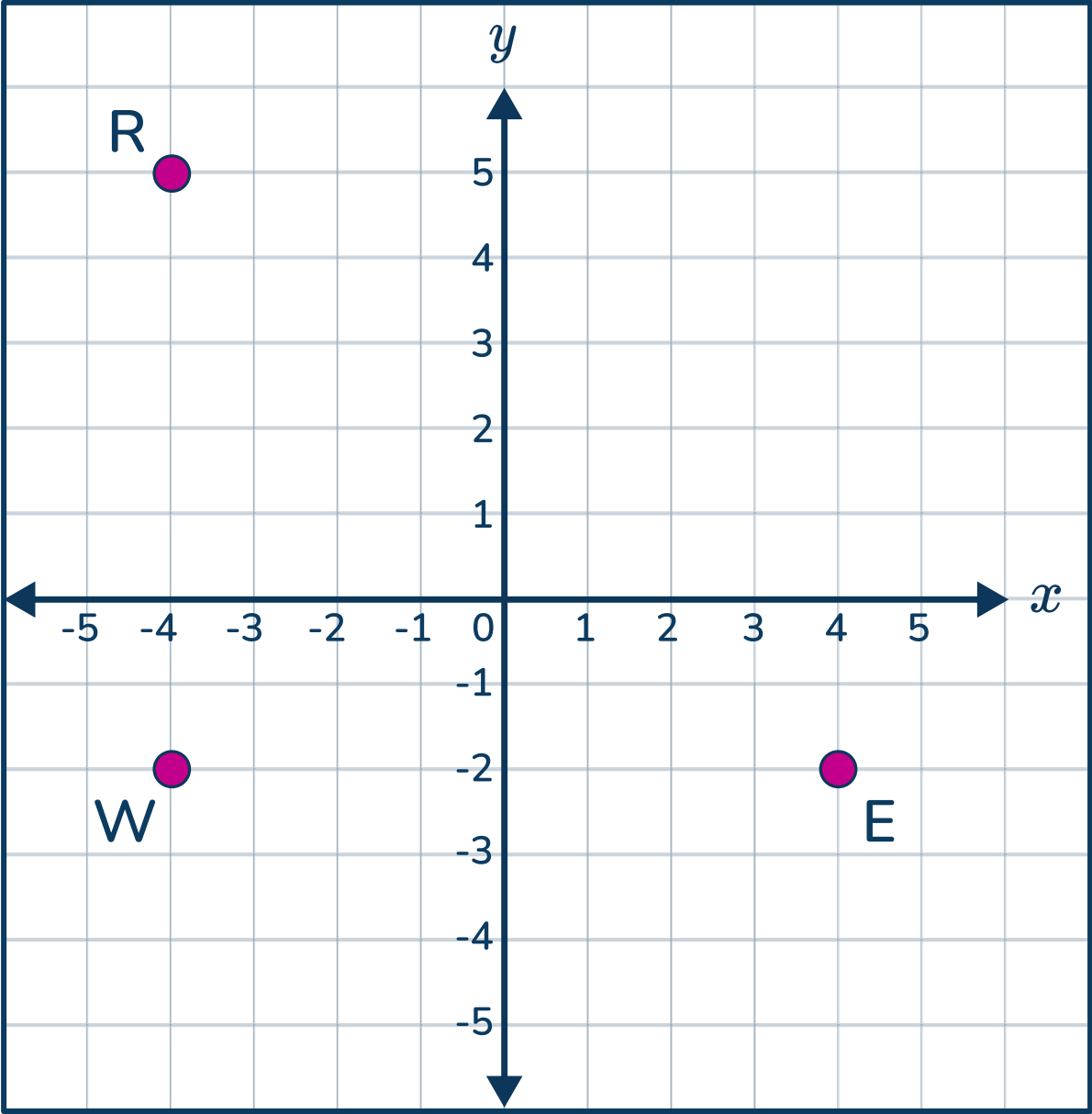
The first number is the coordinate and the second is the coordinate.

..... to find the distance between the coordinates (horizontal or vertical).

Let's practice!

a W (..... ,) R (..... ,) E (..... ,)

b The distance from W to R is The distance from E to W is



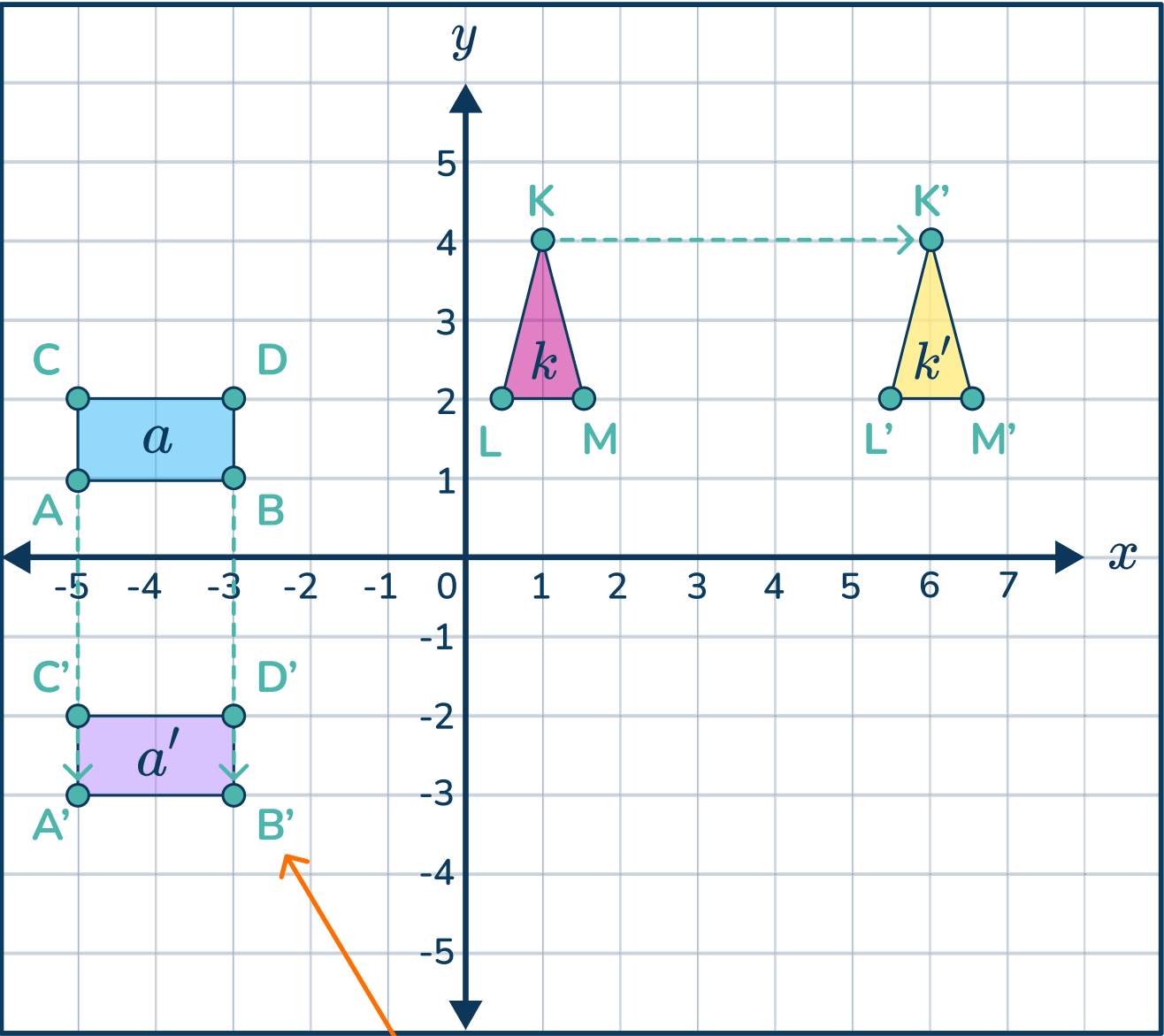
Let's learn

A translation shifts the shape left or right, up or down.
The translation preserves the original dimensions, changing only the location of the shape.

Let's look at how the figures shift because of a translation.

The original shape is called the **pre-image**.

The transformed shape is called the **image**.



the small symbol (prime) indicates a transformation

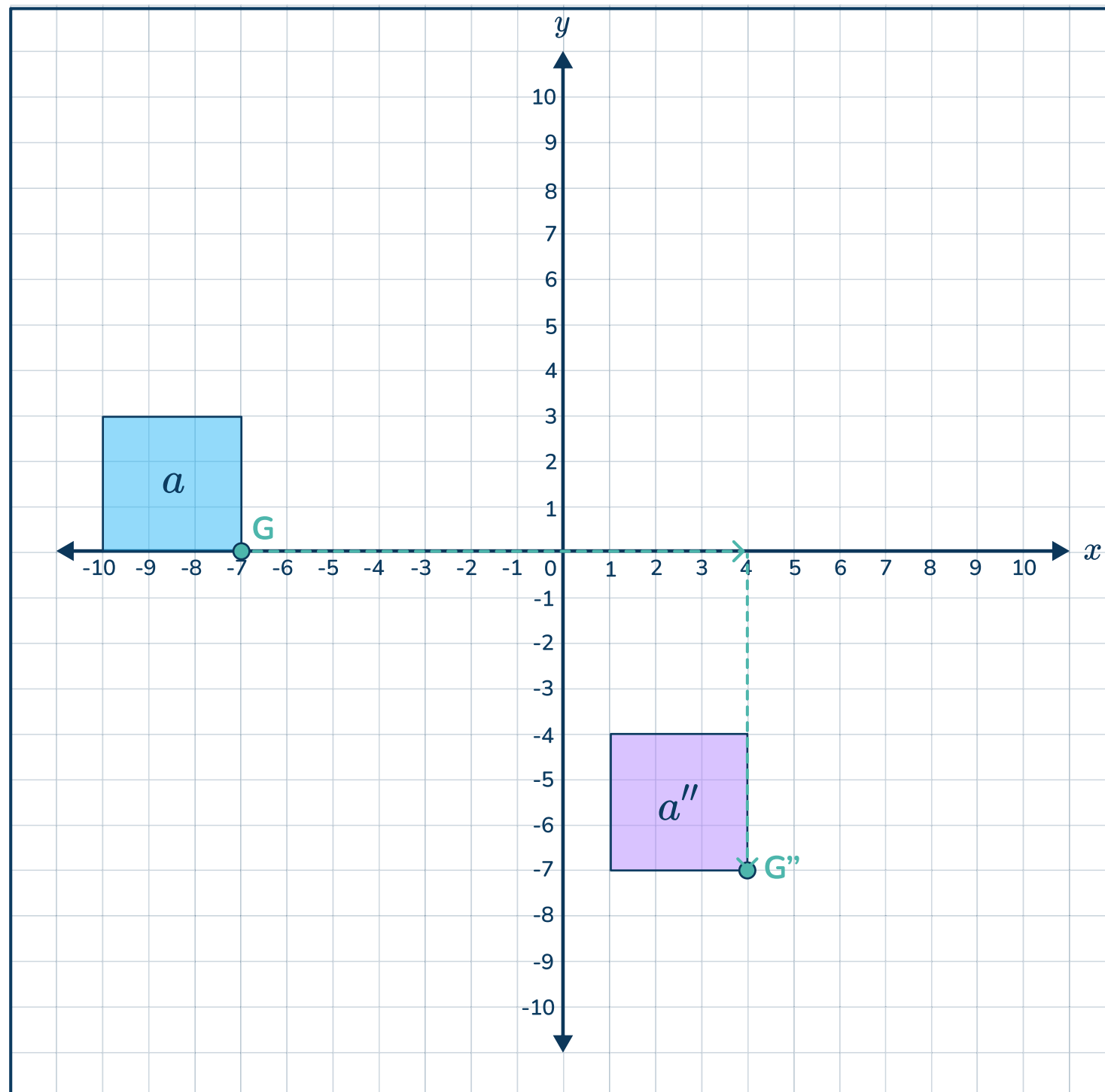
- a Identify the four vertices of the pre-image and image.

A (..... ,)	A' (-5 , -3)
B (-3 , 1)	B' (-3 , -3)
C (-5 , 2)	C' (-5 , -2)
D (-3 , 2)	D' (..... ,)
- b Shape *a* was translated units
- c Identify the three vertices of the pre-image and image.

K (..... ,)	K' (6 , 4)
L (0.5 , 2)	L' (..... ,)
M (1.5 , 2)	M' (6.5 , 2)
- d Shape *k* was translated units

Follow me

Let's look at an image that went through multiple translations.



Describe the translation from shape a to a'' .

- a Choose one vertex of shape a to track.

G (..... ,)

- b Identify the horizontal movement, left or right.

Point G was translated units

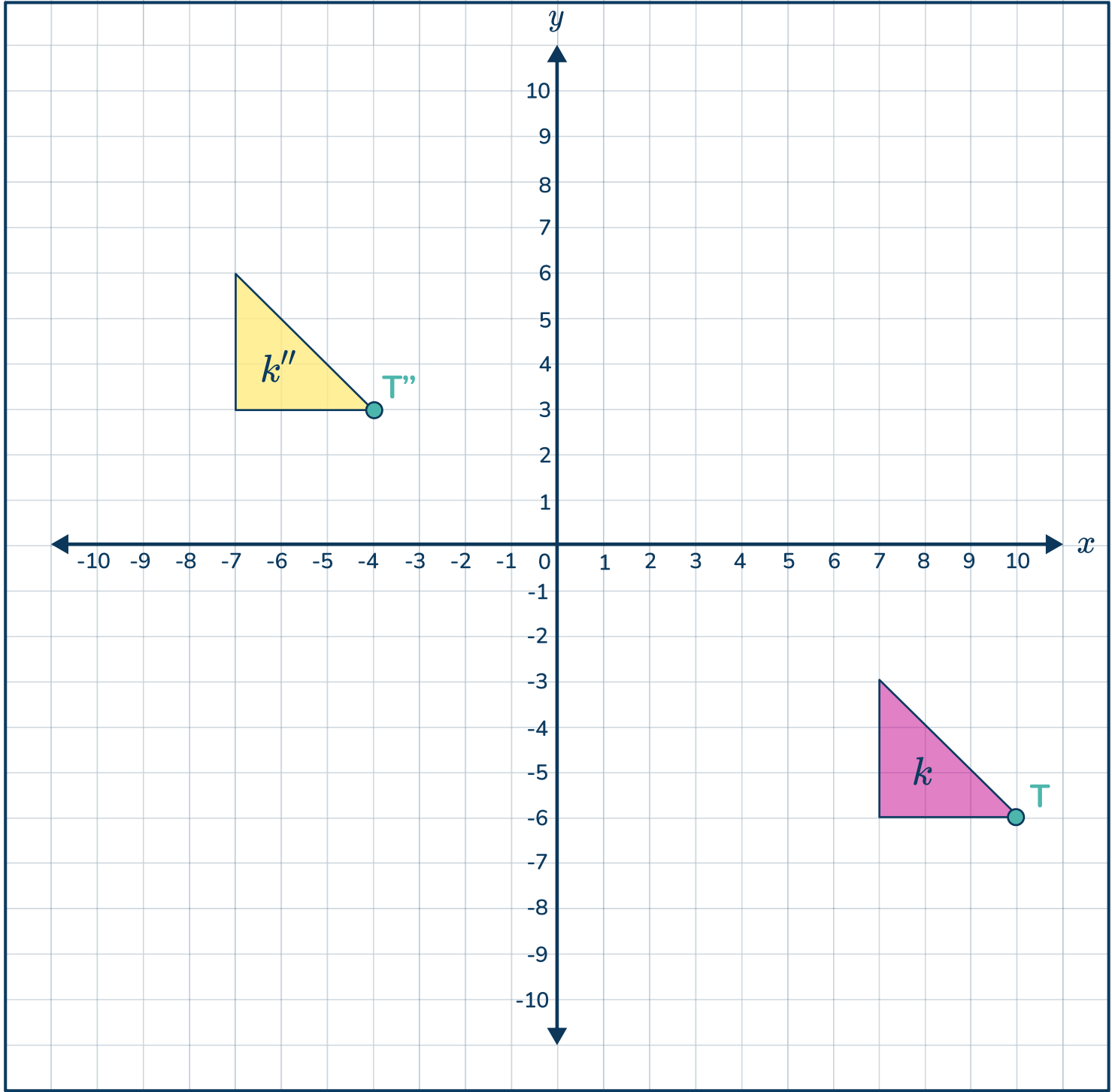
- c Identify the vertical movement, up or down.

Point G was translated units

- d Confirm that the same translations were applied to the other vertices.

- e Shape a was translated units and units

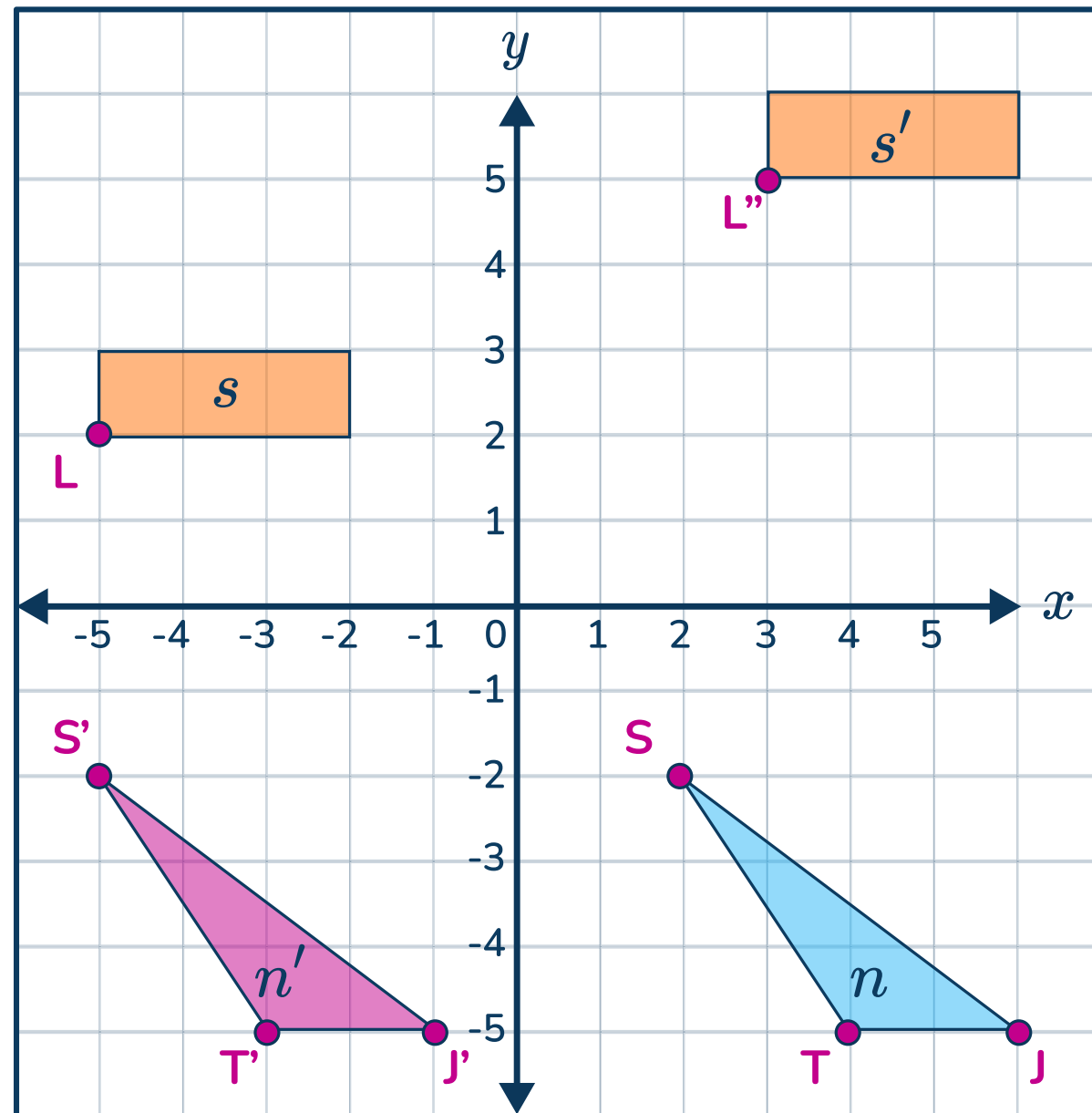
Your turn



Describe the translation from shape k to k'' .

- a Choose one vertex of the shape to track
 T (..... ,)
- b Identify the horizontal movement, left or right.
Point T was translated units
- c Identify the vertical movement, up or down.
Point T was translated units
- d Confirm that the same translations were applied to the other vertices.
- e Shape k was translated units and units

You do



1 Describe the translation from shape n to n' .

- a Identify the three vertices of the pre-image and image.
- | | |
|-----------------------|------------------------|
| S (..... ,) | S' (-5 , -2) |
| T (4 , -5) | T' (..... ,) |
| J (6 , -5) | J' (-1 , -5) |

b n was translated units

2 Describe the translation from shape s to s' .

a Identify the horizontal movement, left or right.

Point L was translated units

b Identify the vertical movement, left or right.

Point L was translated units

c Shape s was translated units and units

- 3 Triangle EFC has vertices E(4,1), F(-3,3) and C(3, 6). It is translated 6 units up and 4 units left. What are the coordinates of triangle E''F''C''?

E'' (..... ,)

F'' (..... ,)

C'' (..... ,)

Go further

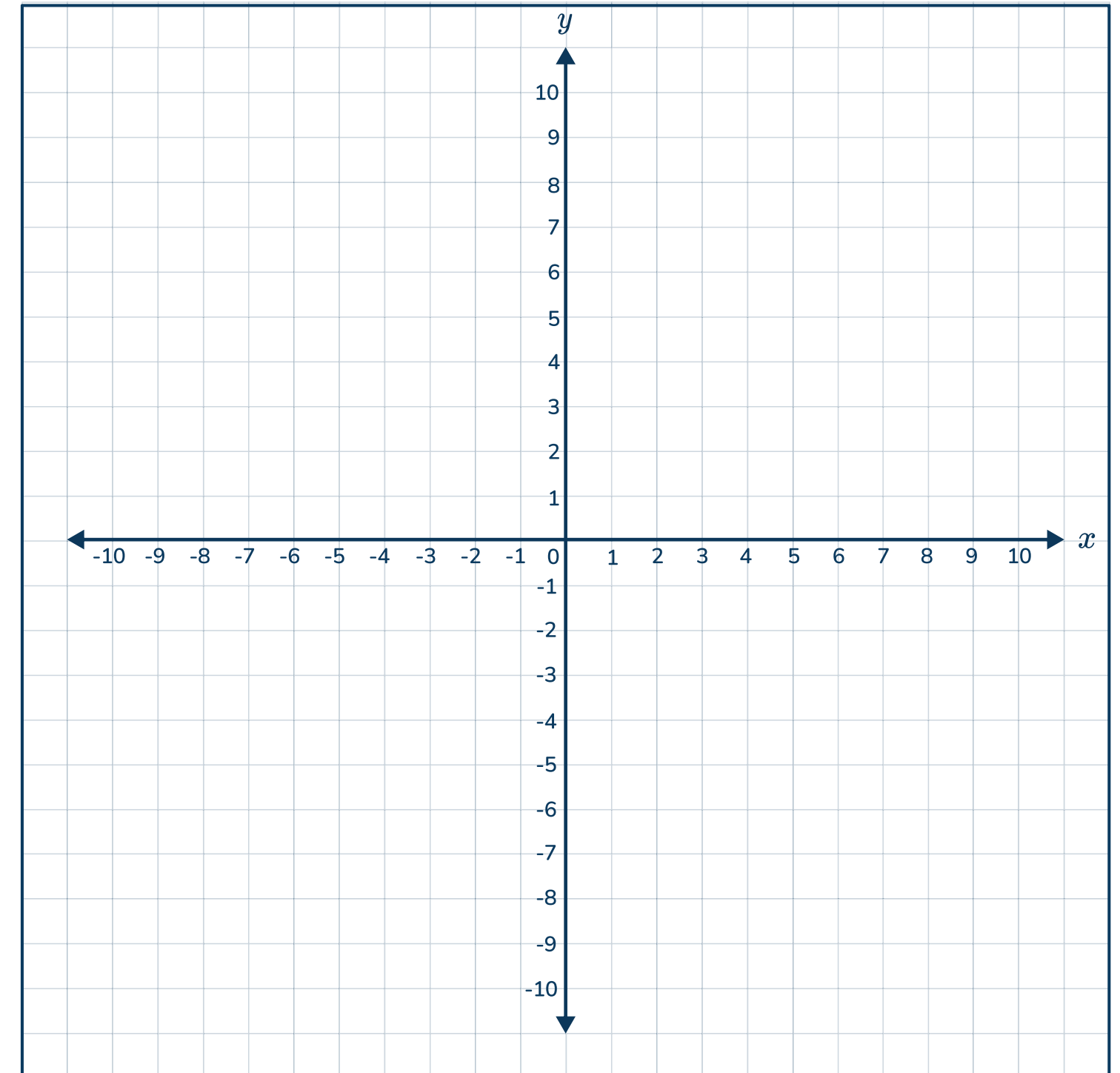
When given the image coordinates, work backwards to find the pre-image coordinates.

Triangle $E''B''Q''$ has vertices $E''(-3,2)$, $B''(2,0)$ and $Q''(-1, 4)$.
It was translated 3 units up and 2.5 units right from
Triangle EBQ . What are the coordinates of Triangle EBQ ?

E (..... ,)

B (..... ,)

Q (..... ,)



Let's use a graph to better understand the translation.

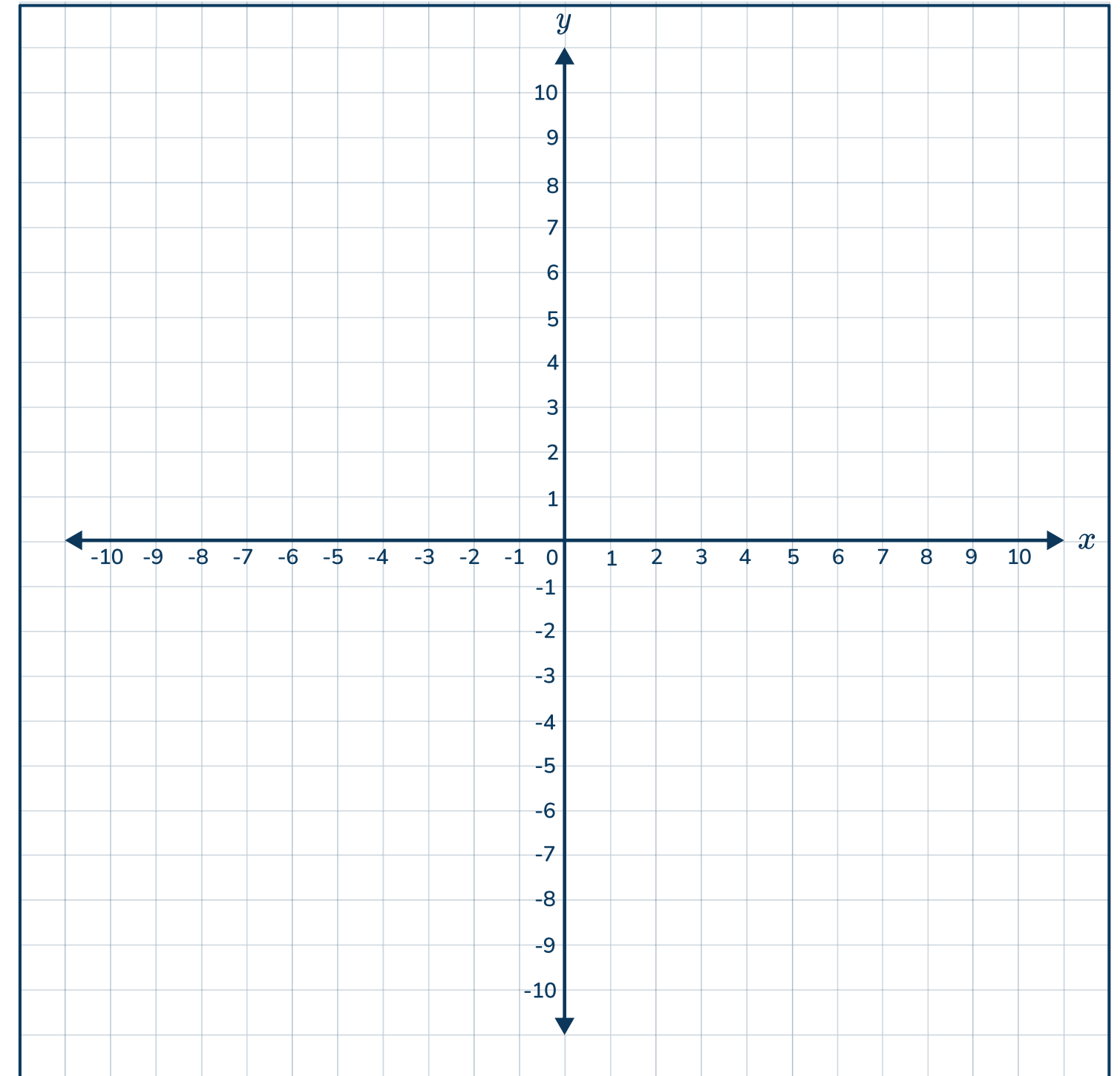
Triangle EFC has vertices E(4,1), F(-3,3) and C(3, 6). It is translated 6 units up and 4 units left. What are the coordinates of Triangle E''F''C''?

- a Graph the pre-image.
- b Translating 4 units left will decrease the coordinate by
- c Translating 6 units up will increase the coordinate by
- d Identify the vertices of the image.

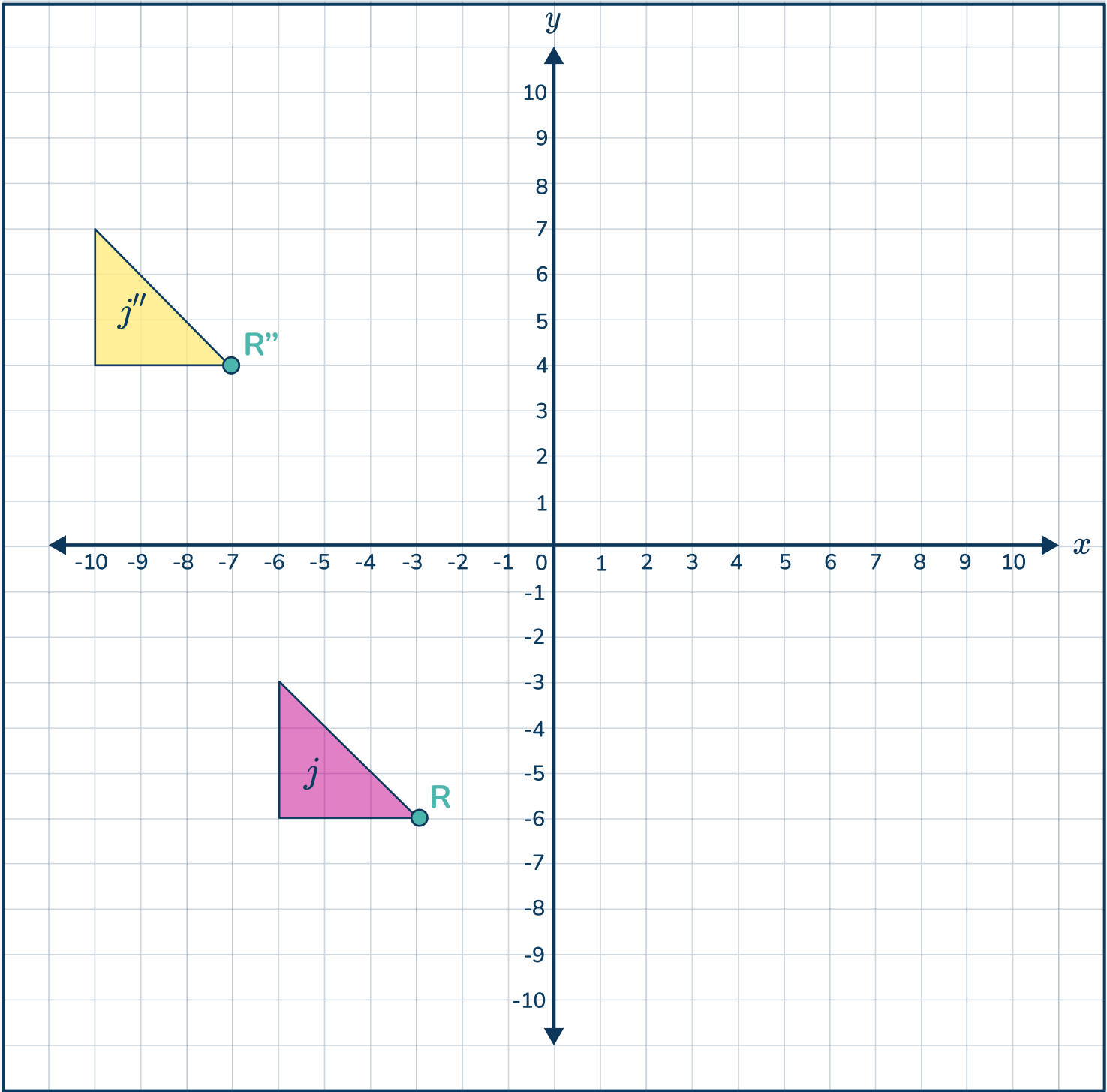
E'' (..... ,)

F'' (..... ,)

C'' (..... ,)



Check your understanding



Describe the translation from j to j'' .

.....

.....

.....

Why do I need to try this question on my own first?

- To show your tutor what you understand
- To give you more practice
- To show your teacher how you are doing



Do you have a group of students who need a boost in math?

Each student could receive personalized lessons every week from our specialist one-on-one math tutors.




- ✓ Differentiated instruction for each student
- ✓ Aligned to your state's standards
- ✓ Scaffolded learning to close gaps

“We just had our first session and it went great! The kids really liked it and felt like they were learning! One even said he finally felt like math was making sense.”



Michelle Craig, Instructional Coach,
Sherwood Forest Elementary, Washington

Speak to us

-  thirdspacelearning.com/us/
-  (929) 298-4593
-  hello@thirdspacelearning.com



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