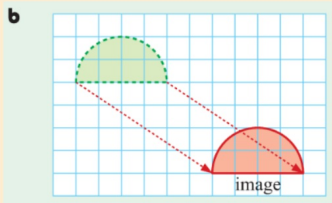
Welcome Back MYP Math 9!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 1 - 8 Topic: No homework over break :)	0 1 2	
Tuesday Date: _____ Topic: _____	0 1 2	
Wednesday Date: _____ Topic: _____	0 1 2	
Thursday Date: _____ Topic: _____	0 1 2	
Friday Date: _____ Topic: _____	0 1 2	

Chapter 16 Transformations

Class Plan:

1. Warm-up - Types of Transformations
2. 16A Translations
3. Practice Translating
4. Mathematician Monday!



Islamic Golden Age of science
Narrator: Neal Degrasse Tyson
(From **"Cosmos"** series)

Chapter 16 Transformations

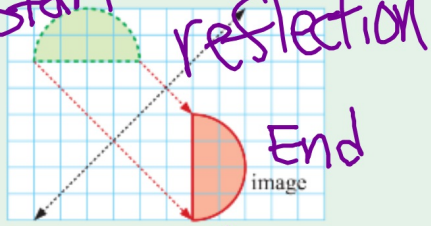
Today: 16A Translations

Warm-up: Describe the transformations below

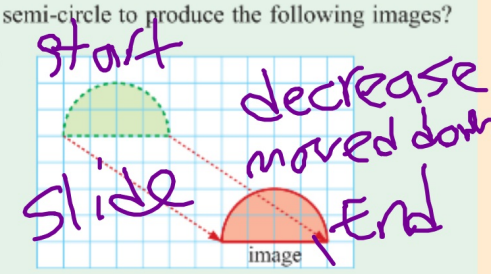
OPENING PROBLEM

How can we describe the transformation of the green semi-circle to produce the following images?

a

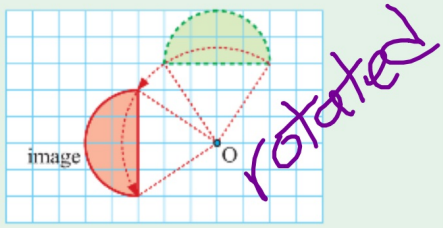


b

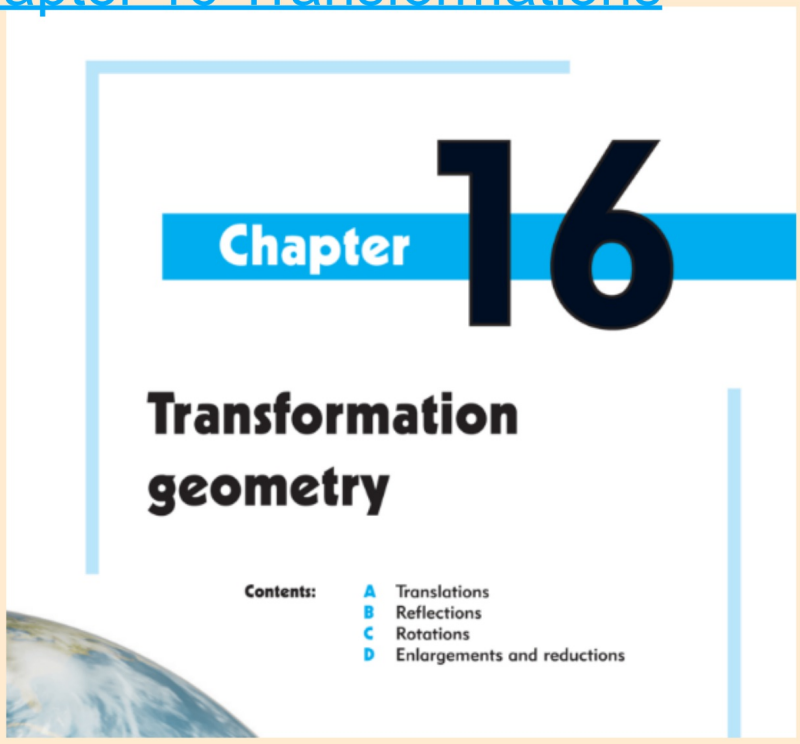


c

d



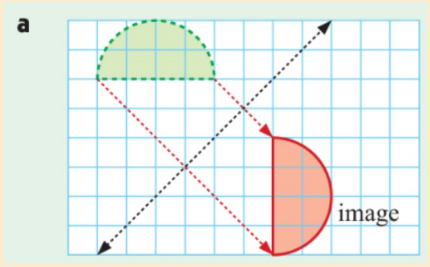
Chapter 16 Transformations



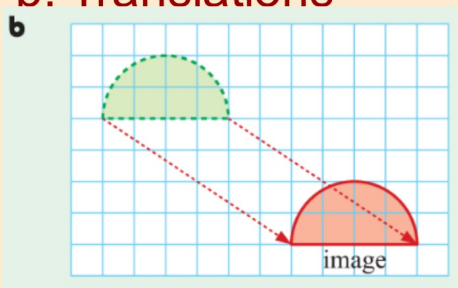
Chapter 16 Transformations

Warm-up: Describe the transformations below

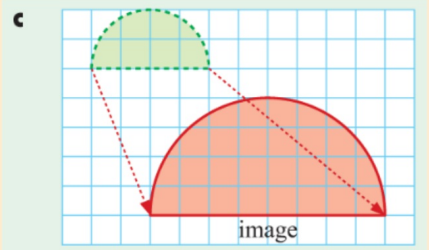
a. Reflections



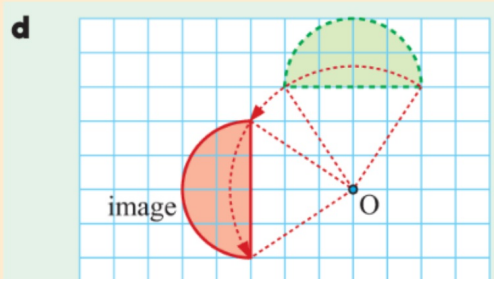
b. Translations



c. Enlargements and Reductions



d. Rotations



How do we define tranformations?

Transformation: A change in the size, shape, orientation, or position of a figure.

Types of Transformations

Start

Object - Before transformation

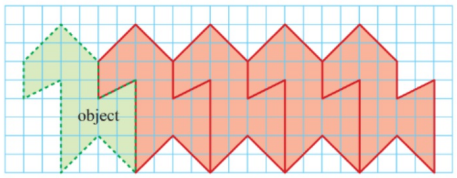
Image - After transformation

End

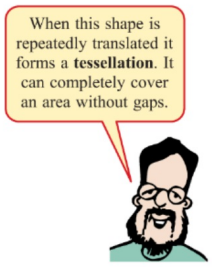
Chapter 16 Transformations

The transformations that we will consider in this chapter are:

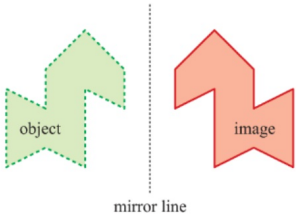
- **translations**, where every point moves a fixed distance in a given direction



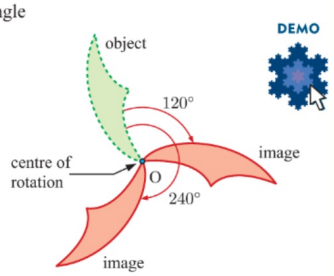
slide the original 4 units to the right to find each new image



- **reflections** or mirror images

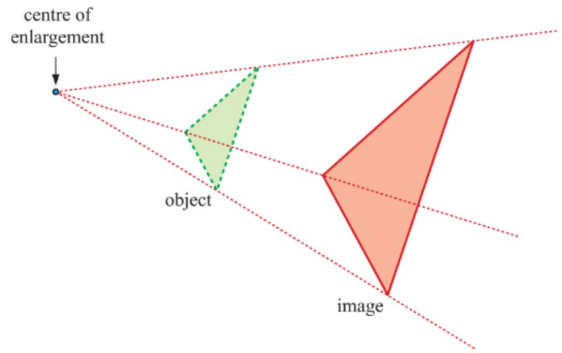


- **rotations** about a point through a given angle



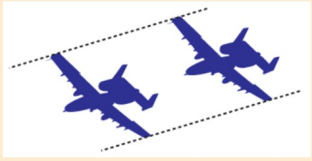
Chapter 16 Transformations

- **enlargements** and **reductions**, where objects are transformed into larger or smaller objects of the same shape.



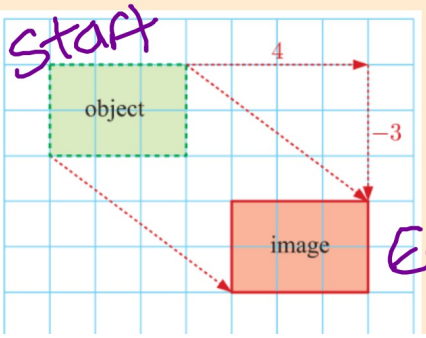
A TRANSLATIONS

A **translation** is a transformation in which every point on the figure moves a fixed distance in a given direction.



Translation: A *shift, slide*, or movement of a figure. The shape and size do not change.

Describe the translation below:



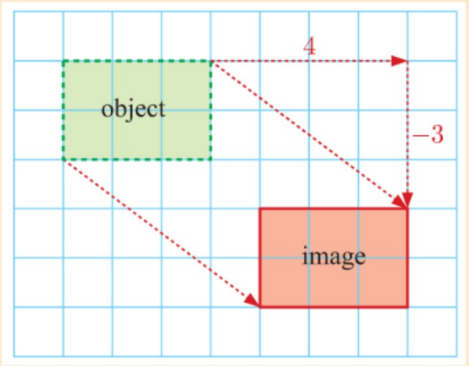
right 4
down 3

Abbreviation of translation description:

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \text{horizontal} - \text{movement} \\ \text{vertical} - \text{movement} \end{pmatrix}$$

Similar to (x, y)

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4 \\ -3 \end{pmatrix}$$



This object has been translated 4 units right and 3 units down.

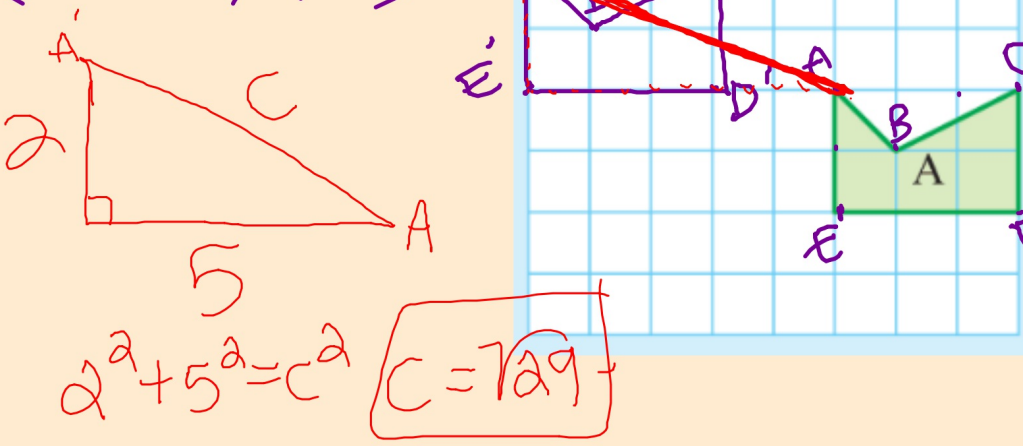
We can describe the translation using the **translation vector** $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$ ← horizontal movement ← vertical movement

Example 1

a Translate this object by the translation vector $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$.

b How far has the object moved?

(left 5, up 2) A'



$2^2 + 5^2 = c^2$ $\boxed{c = \sqrt{29}}$

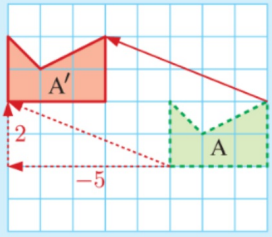
Example 1

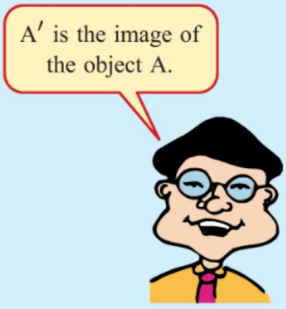
a Translate this object by the translation vector $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$.

b How far has the object moved?

SOLUTION

a The translation vector $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$ means that the object moves 5 units left and 2 units up.





b Let the distance be x units.

Using Pythagoras' theorem, $x^2 = 5^2 + 2^2$

$\therefore \quad x^2 = 29$

$\therefore \quad x = \sqrt{29} \qquad \{\text{as } x > 0\}$

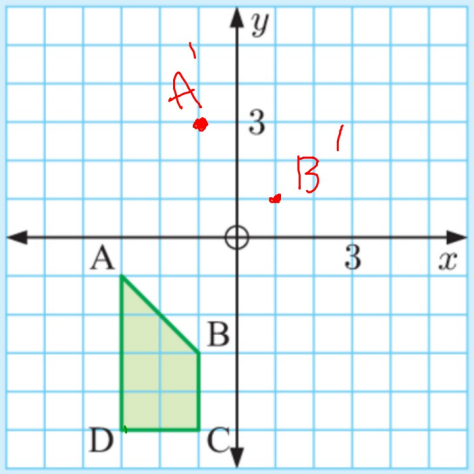
$\therefore$ the object has moved $\sqrt{29}$ units.

Example 2

a Translate the quadrilateral ABCD 2 units right and 4 units up.

b Use a translation vector to describe this translation.

c State the vertex coordinates of the image quadrilateral.



(b)

Vector = $\begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} x \\ y \end{pmatrix}$

(c)

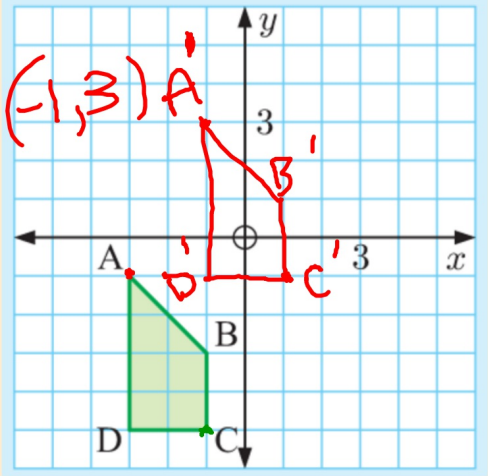
Object	Image
A(-3,-1)	A'(-1,3)
B(-1,-3)	B'(1,1)
C(-1,-5)	C'( )
D(-3,-5)	D'( )

Example 2

a Translate the quadrilateral ABCD 2 units right and 4 units up.

b Use a translation vector to describe this translation.

c State the vertex coordinates of the image quadrilateral.



Vector = $\begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} x \\ y \end{pmatrix}$

Object	Image
A(-3,-1)	A'(-1,3)
B(-1,-3)	B'(1,1)
C(-1,-5)	C'(1,-1)
D(-3,-5)	D'(-1,-1)

Example 2

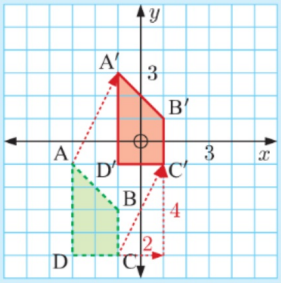
a Translate the quadrilateral ABCD 2 units right and 4 units up.

b Use a translation vector to describe this translation.

c State the vertex coordinates of the image quadrilateral.

SOLUTION

a

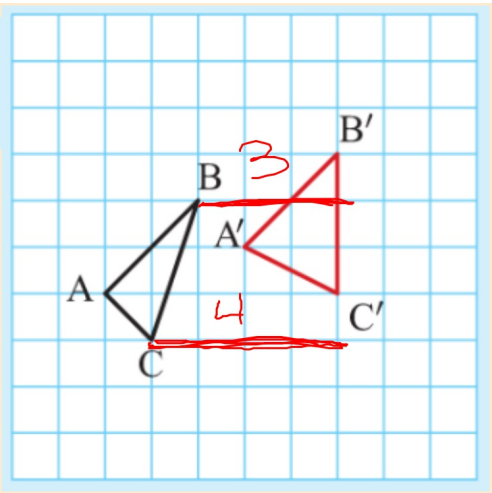


b The translation vector is $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$.

c The vertices of the image quadrilateral are $A'(-1,\ 3)$, $B'(1,\ 1)$, $C'(1,\ -1)$, and $D'(-1,\ -1)$.

Example 3

Is this transformation a translation?



NO not the same shape

3 right ≠ 4

Example 3

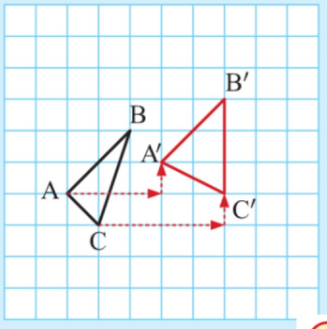
Is this transformation a translation?

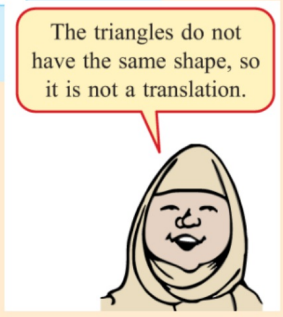
SOLUTION

In a translation, every point on the figure moves the same distance in the same direction.

In this case, A has moved 3 units right and 1 unit up, while C has moved 4 units right and 1 unit up.

This transformation is **not** a translation.





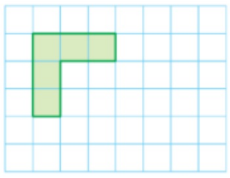
Exercises...16A (p.324-5) #1(a-c),2(a-c),4, Challenge Question 7

Vector $= \begin{pmatrix} x \\ y \end{pmatrix}$

EXERCISE 16A

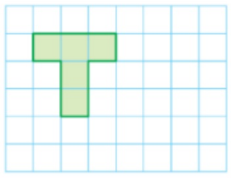
1 Translate the given figures in the direction indicated. In each case, describe the translation using a translation vector.

a



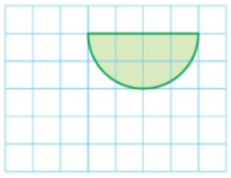
3 units right, 2 units down.

b



4 units right.

c



3 units down.

$\begin{pmatrix} 4 \\ 0 \end{pmatrix}$ $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$

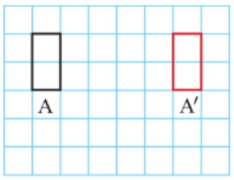
Exercises...

16A (p.324-5) #1(a-c),2(a-c),4,

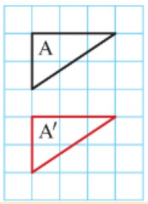
Challenge Question 7

2 Describe the translation from A to A′ in words and using a translation vector.

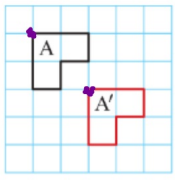
a



b



c



$\begin{pmatrix} 2 \\ -2 \end{pmatrix}$ right 2 down 2

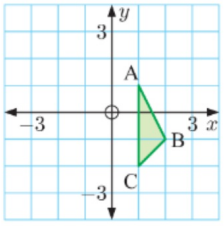
Exercises...

16A (p.324-5) #1(a-c),2(a-c),4,

Challenge Question 7

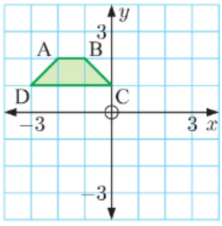
4 Translate each figure in the direction given, and state the vertex coordinates of the image:

a



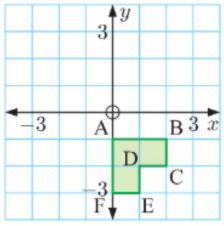
Translate 4 units left.

b



Translate 2 units right, then 1 unit down.

c



Translate 3 units left, then 4 units up.

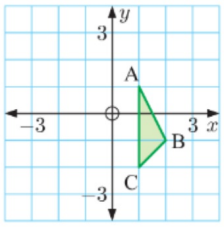
Exercises...

16A (p.324-5) #1(a-c),2(a-c),4,

Challenge Question 7

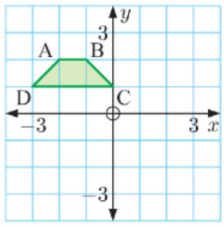
4 Translate each figure in the direction given, and state the vertex coordinates of the image:

a



Translate 4 units left.

b



Translate 2 units right, then 1 unit down.

Image

A'( )

B'( )

C'( )

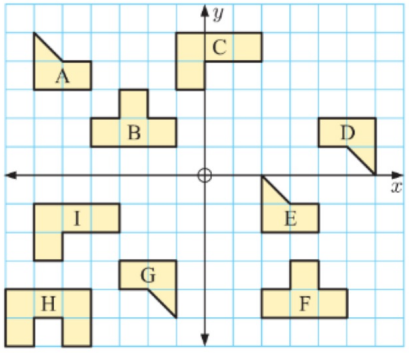
D'( )

Exercises...

16A (p.324-5) #1(a-c),2(a-c),4, Challenge Question 7

7 Consider the figures alongside.

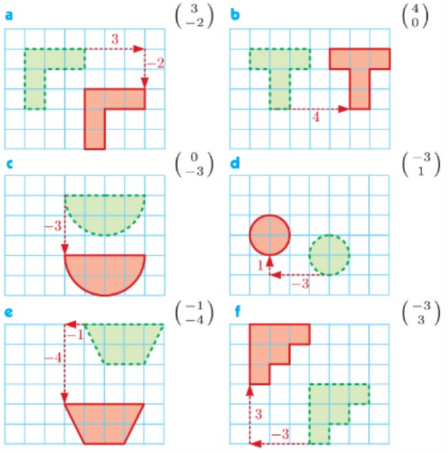
- **a** Which of these figures is a translation of figure C? Describe the translation from figure C to this figure.
- **b** Which of these figures is a translation of figure G? Describe the translation from figure G to this figure.
- **c** Which of these figures cannot be translated to any other figure?



Exercises...16A (p.324-5) #1,2,4,7
SOLUTIONS

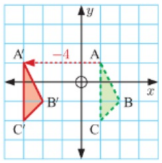
EXERCISE 16A

1 **a** $\begin{pmatrix}3\\-2\end{pmatrix}$ **b** $\begin{pmatrix}4\\0\end{pmatrix}$ **c** $\begin{pmatrix}0\\-3\end{pmatrix}$ **d** $\begin{pmatrix}-3\\1\end{pmatrix}$ **e** $\begin{pmatrix}-1\\-4\end{pmatrix}$ **f** $\begin{pmatrix}-3\\3\end{pmatrix}$



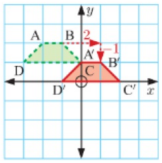
2 **a** 5 units right, $\begin{pmatrix}5\\0\end{pmatrix}$ **b** 3 units down, $\begin{pmatrix}0\\-3\end{pmatrix}$
c 2 units right, 2 units down, $\begin{pmatrix}2\\-2\end{pmatrix}$

4 **a**



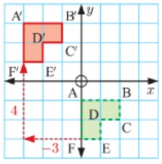
A′(−3, 1)
B′(−2, −1)
C′(−3, −2)

b



A′(0, 1)
B′(1, 1)
C′(2, 0)
D′(−1, 0)

c



A′(−3, 3)
B′(−1, 3)
C′(−1, 2)
D′(−2, 2)
E′(−2, 1)
F′(−3, 1)

7 **a** I, $\begin{pmatrix}-5\\-6\end{pmatrix}$ **b** D, $\begin{pmatrix}7\\5\end{pmatrix}$ **c** H