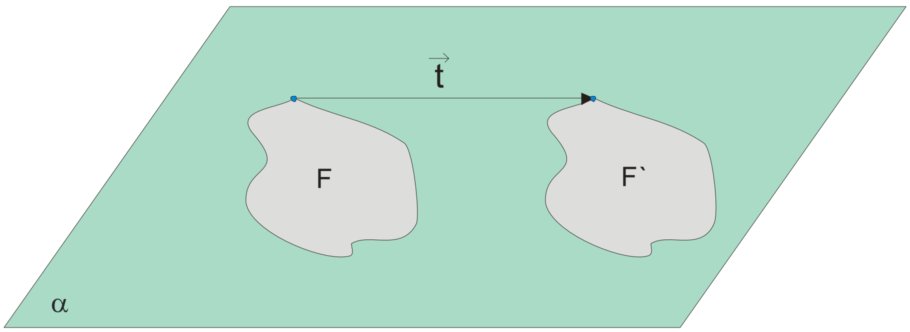
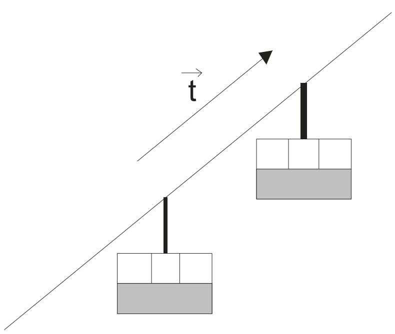
Translation

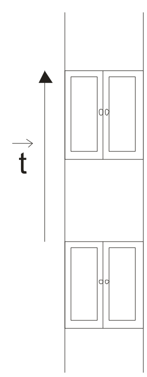
Given a figure F and a vector $\vec{t}$ in the plane α. If $F`$ is set of all points in which the translation $T_{\vec{t}}$ mapped points figure $F$, then we say that we have **translation** $T_{\vec{t}}(F) = F`$.



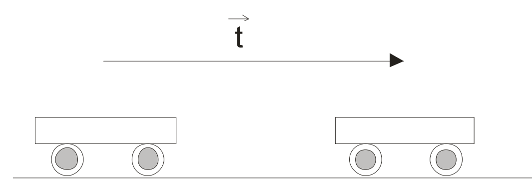
The movement of many objects in the environment associated with the translation. For example:



the mountain ski lift

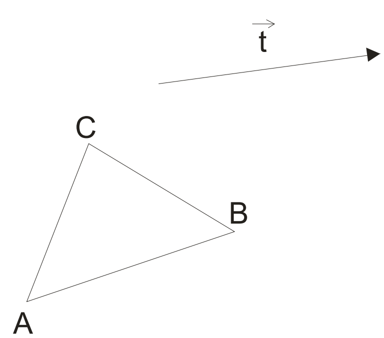


elevator



Example 1.

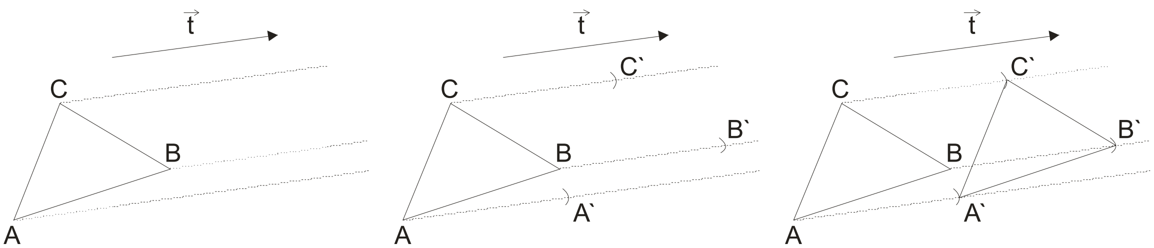
Given the triangle ABC and translation vector $\vec{t}$ (on picture). Determine the image of this triangle resulting translation of vector $\vec{t}$.



Solution:

How's it going process of translation?

First, in the direction parallel with translation vector, draw line from each vertex figures given, in this case of the triangle ABC (picture 1.)



picture 1. picture 2. picture 3.

Length of translation vector transfer to the parallrl lines (picture 2.)

Mark this points with A`, B`, C` and merge (picture 3.)

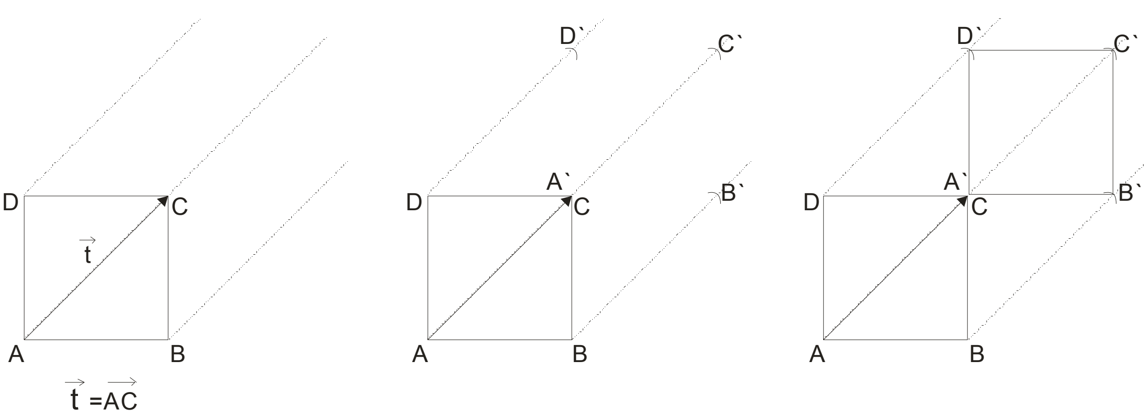
Example 2.

Given square ABCD. Determine its image caused by the translation:

a) Vertex A reflects in vertex C
b) Vertex A reflects in the midle point on BC
c) Vertex B reflects in the intersection of diagonal.

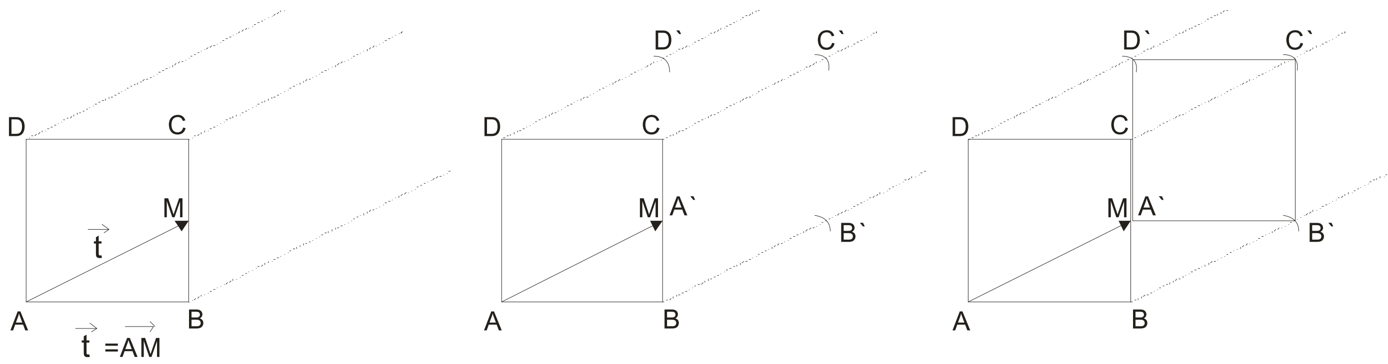
Solution:

a)



picture 1. picture 2. picture 3.

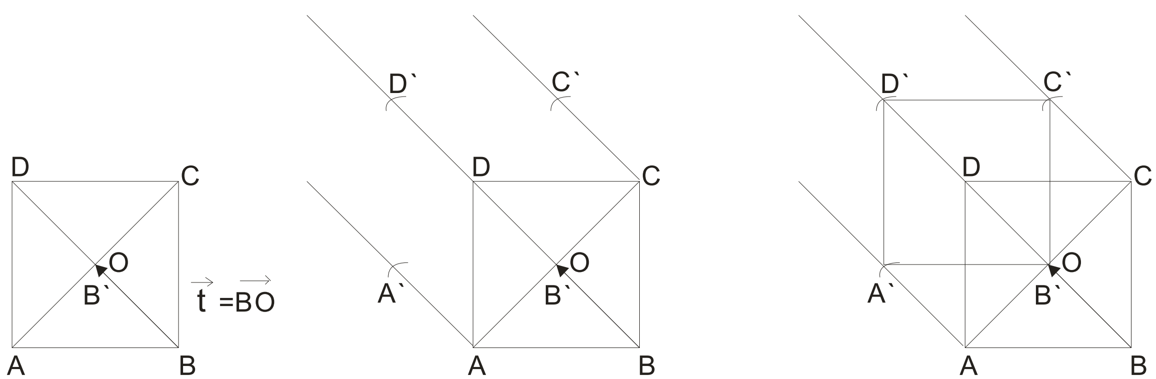
b)



picture 1. picture 2. picture 3.

Mark the middle of the page BC with M. Then the translation vector $\vec{t} = \overrightarrow{AM}$.

c)



picture 1. picture 2. picture 3.

Draw diagonal intersection and mark it with O. Translation vector is $\vec{t} = \overrightarrow{BO}$ and will be $B` \equiv O$.......

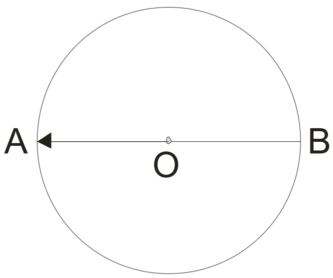
primer 3.

We have circle k (O, r) with a diameter AB. Determine its image caused by the translation

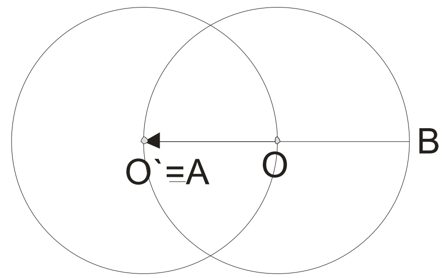
a) point O to point A
b) point A at the center of radius OB
c) point B at a given point on the circle- M

Solution:

a)

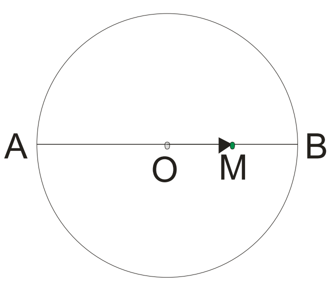


picture 1.

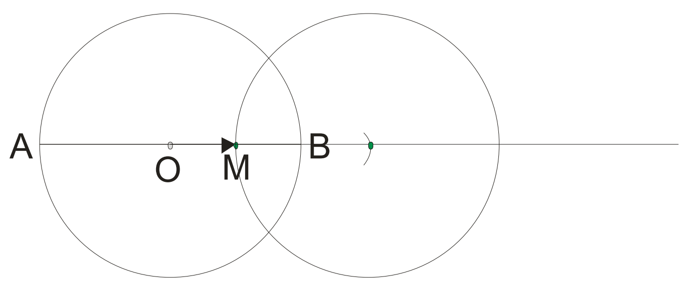


picture 2.

b)

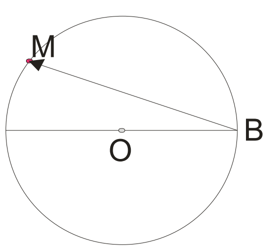


picture 1.

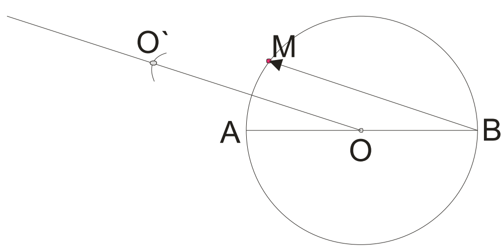


picture 2.

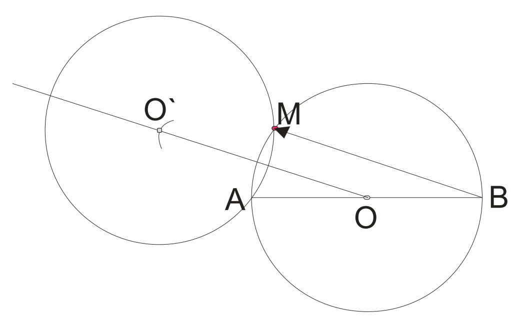
c)



picture 1.



picture 2.

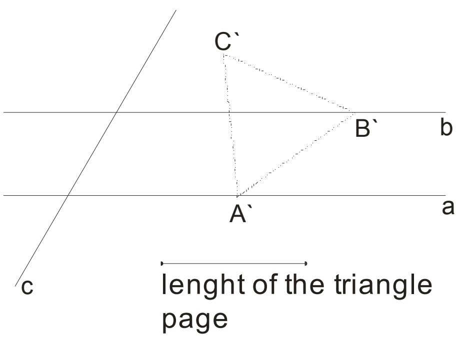


picture 3.

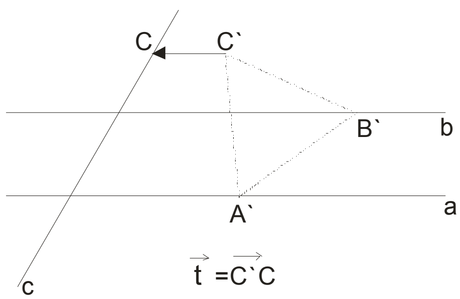
Example 4.

Construct equilateral triangle of given side *a* with two vertices belonging to two parallel straight lines, and a third vertice that belongs to a third straight parallel line which cut this two parallel lines.

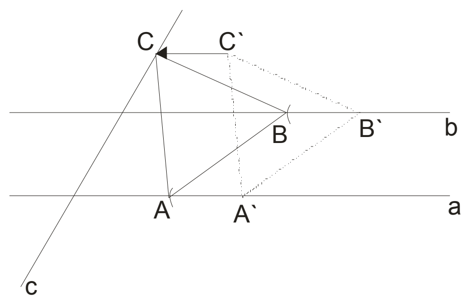
Solution:



picture 1.



picture 2.



picture 3.

We took an arbitrary page length of the triangle . On the line **a** take an arbitrary point A`, and from that point cut line b For lenght of the triangle. We have point B`. Point C` we will find as intersection of arcs from A` anb B`.

In this way we get a triangle A`B`C ` (picture 1.)

Since one requested vertex of triangle must be on the line c, we will translation triangle A `B` C `to vector $\vec{t} = \overrightarrow{C`C}$ that is parallel to the straight lines a and b (pictures 2. and 3.)

We can see that it was not difficult to solve this task, however ...

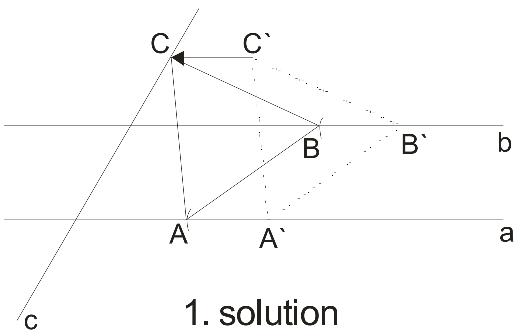
Here is a very interesting discussion!

Mark the distance between lines a and b with *d.* In our construction, we took to the length of the triangle side is greater than distance between lines a and b (we mark *d*)

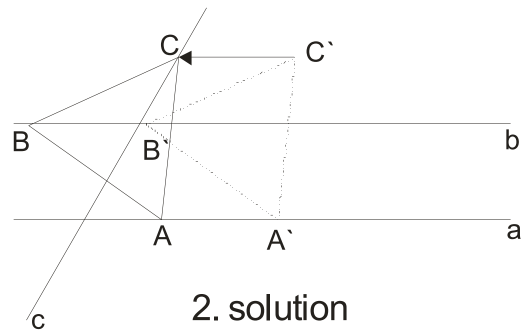
There are three possibilities:

i) **if the page length of a triangle is greater than the distance d between lines a and b (** $a > d$ **)**

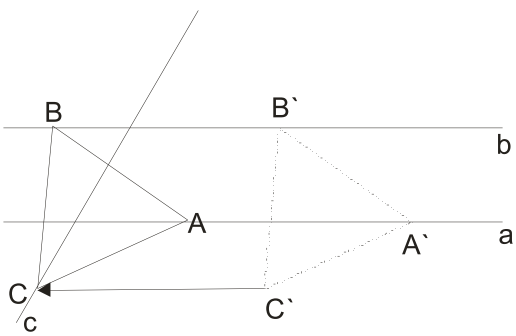
In this situation, the task has 4 solutions:



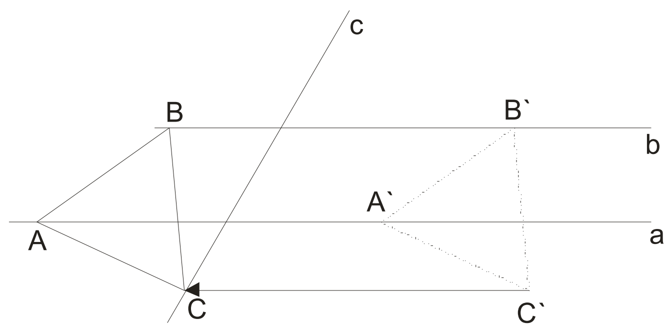
1. solution



2. solution



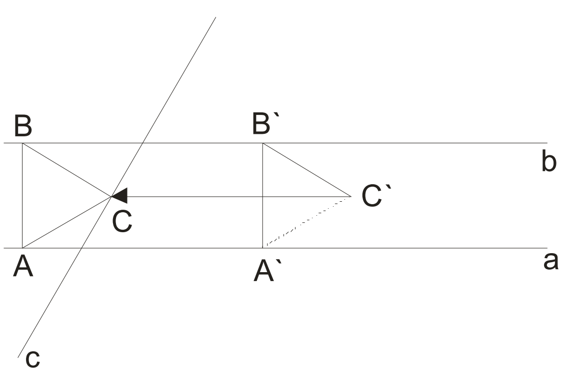
3. solution



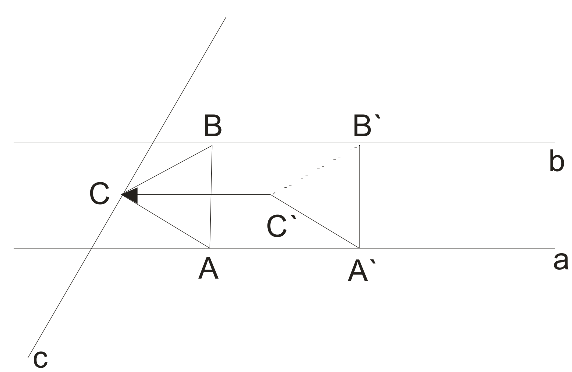
4. solution

ii) **if the page length of a triangle is equal to the distance d between lines a and b (** $a = d$ **)**

And here there are two solutions:



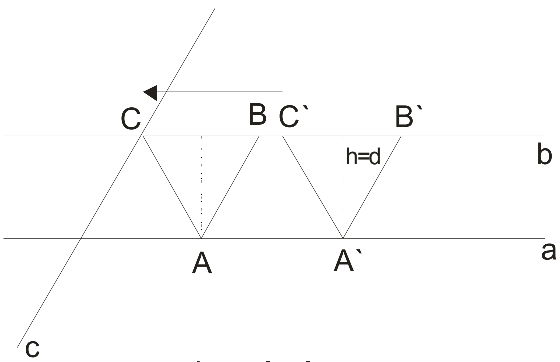
1. solution



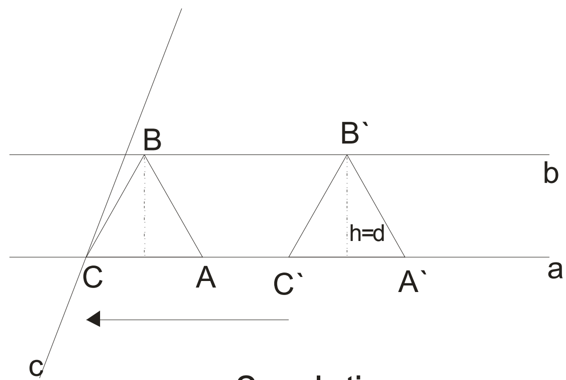
2. solution

iii) **if the height of the triangle is equal to the distance d between lines a and b ($h = d$)**

And here there are two solutions:



1. solution



2. solution

Then : $h = \frac{a\sqrt{3}}{2} \to d = \frac{a\sqrt{3}}{2} \to a = \frac{2d}{\sqrt{3}} \to a = \frac{2d}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} \to \boxed{a = \frac{2d\sqrt{3}}{3}}$

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