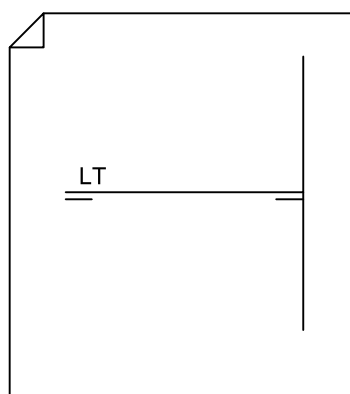
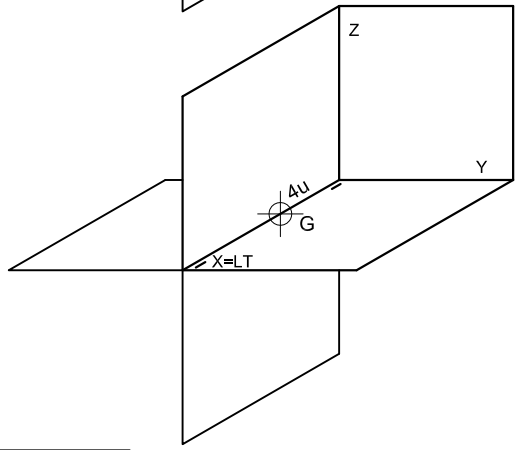
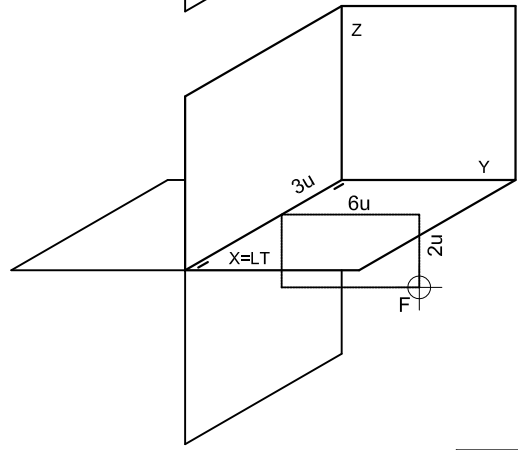
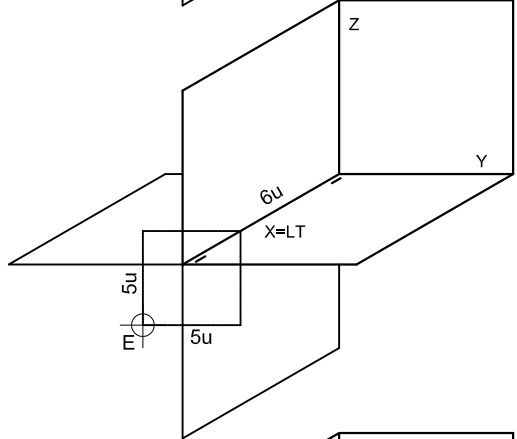
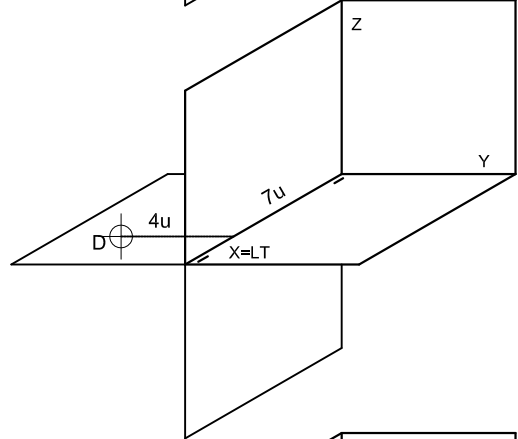
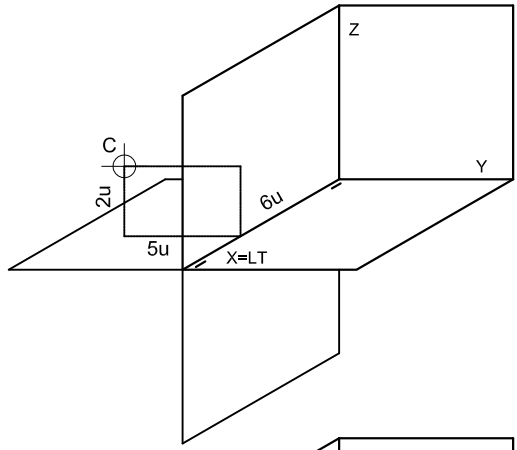
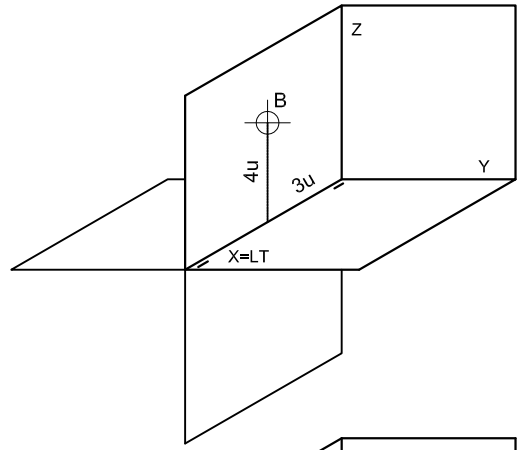


# EXERCISE 1

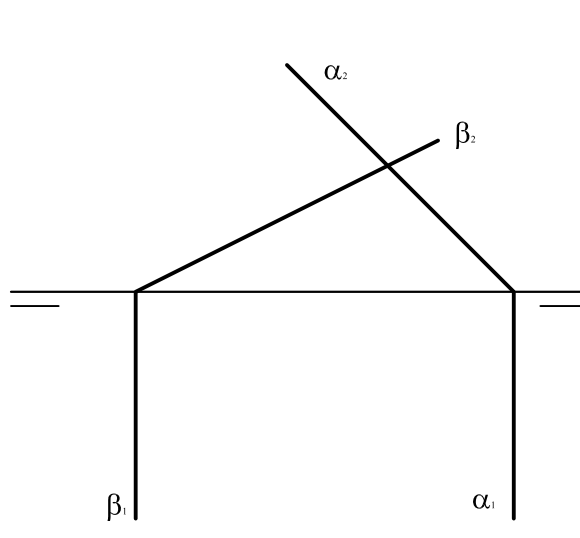
Represent the diedric projections of the points B, C, D, E, F and G.



## EXERCISE 2

Find the intersection of the plane  $\alpha$  determined by the points  $(4,0,3)$ ,  $(1,0,0)$  and  $(1,1,0)$ , and the plane  $\beta$  determined by  $(2,0,2)$ ,  $(6,0,0)$  and  $(6,3,0)$ .

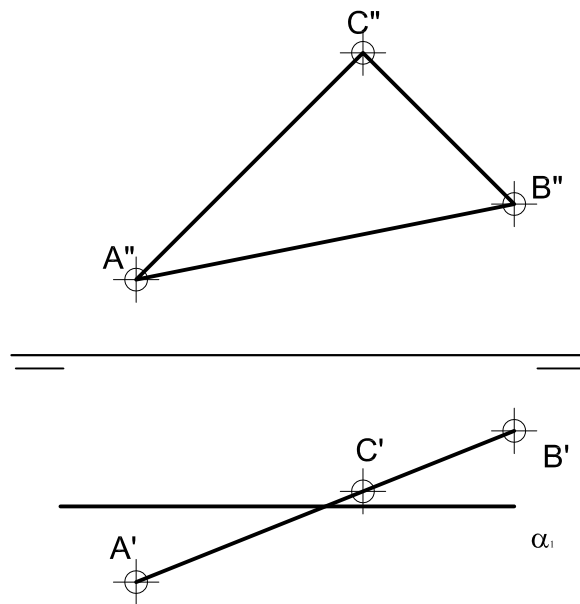
Find the intersection between the planes  $\alpha$  and  $\beta$ .



### EXERCISE 3

Calculate the intersection between the planes  $\beta$  and  $\alpha$ .  $\beta$  contains the points  $A=(6,3,1)$ ,  $B=(1,1,2)$  and  $C=(3,y,4)$ , and it is perpendicular to the plane  $XOY$ .  $\alpha$  contains the point  $P(1,1,2)$ , and it is parallel to the plane  $XOZ$ .

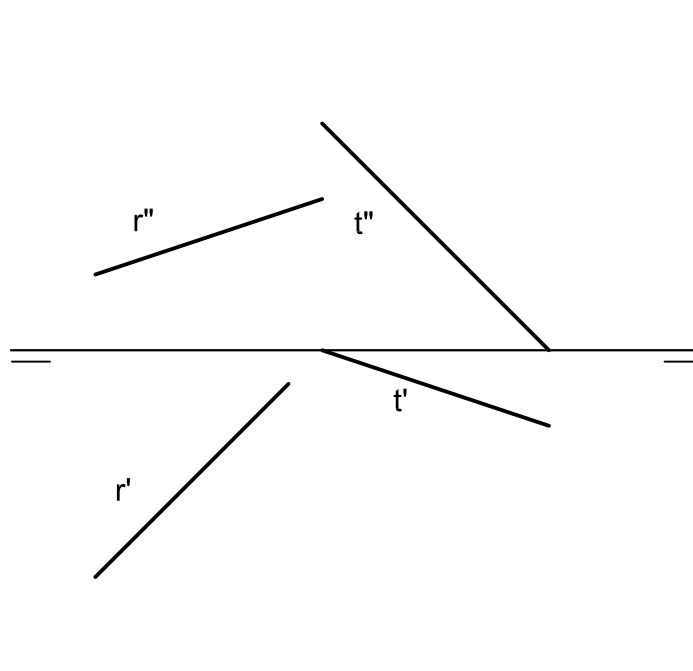
Find the intersection between the planes  $ABC$  and  $\alpha$ . Which kind of line is it?



## EXERCISE 4

Find the parallel plane to the line  $r: \begin{cases} x + 3z = 11 \\ y + 3z = 6 \end{cases}$  which contains the line  $t: \frac{x-2}{3} = 1 - y = \frac{z}{3}$ .

Draw the plane that being parallel to the line  $r$ , contains the line  $t$ .



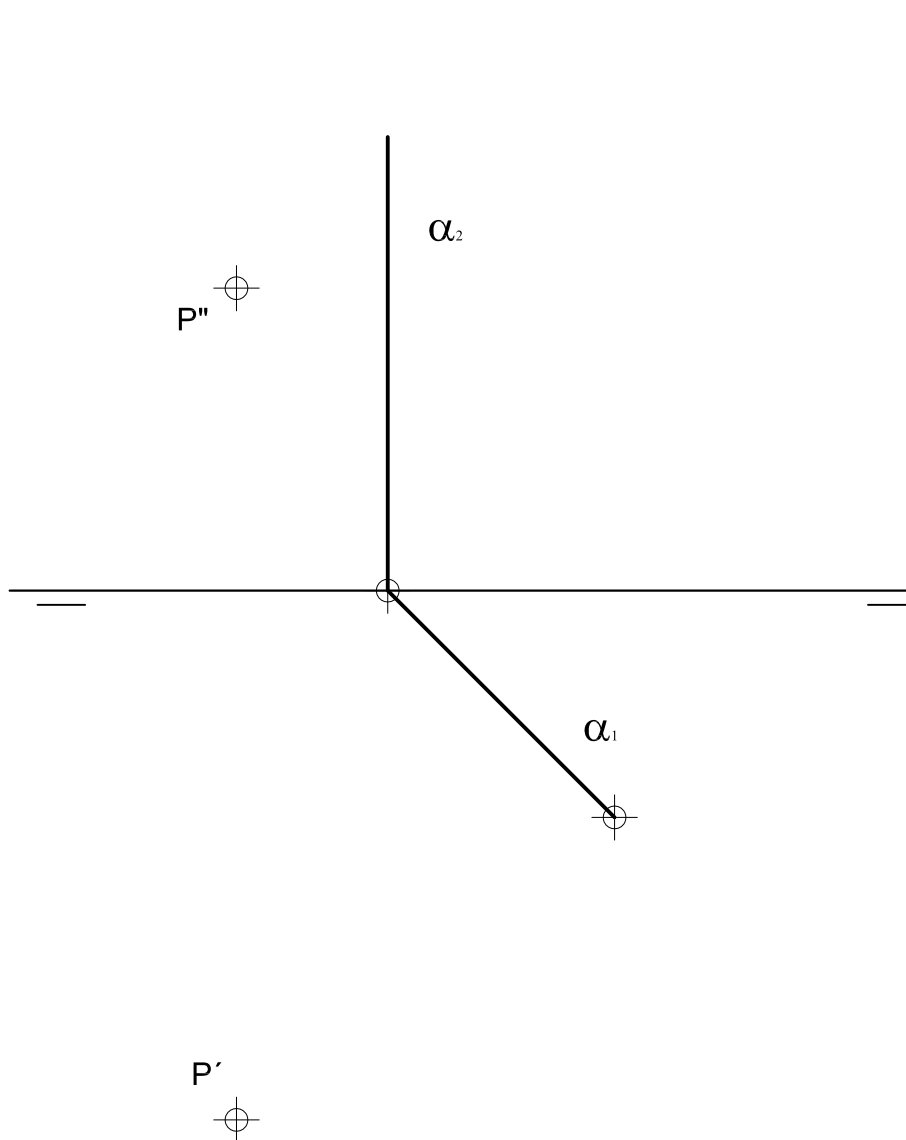
### EXERCISE 5

Find the line that passing through the point  $P(9,7,4)$ , is perpendicular to the plane  $\alpha$ .

This plane contains the points  $(7,0,0)$  and  $(4,3,0)$ , and it is perpendicular to the plane  $z = 0$ . Calculate the point of intersection between them

Draw the line  $p$  that passing through the point  $P$  is perpendicular to the plane  $\alpha$ .

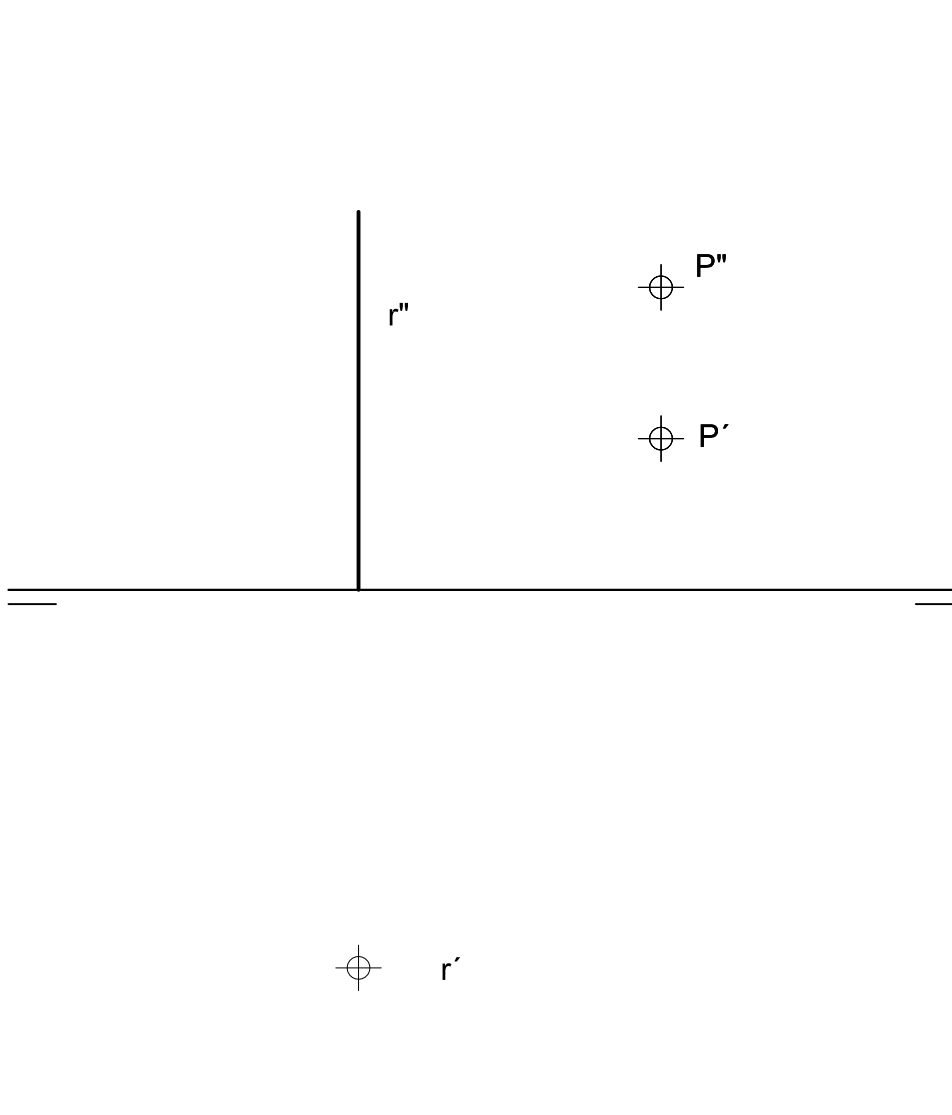
Calculate the point of intersection  $I$  between them.



### EXERCISE 6

Find the plane that passing through the point  $P(2, -2, 4)$  is perpendicular to the line that passing through the point  $(8, 5, 2)$  is perpendicular to the plane  $XOY$ . Calculate the point of intersection between them.

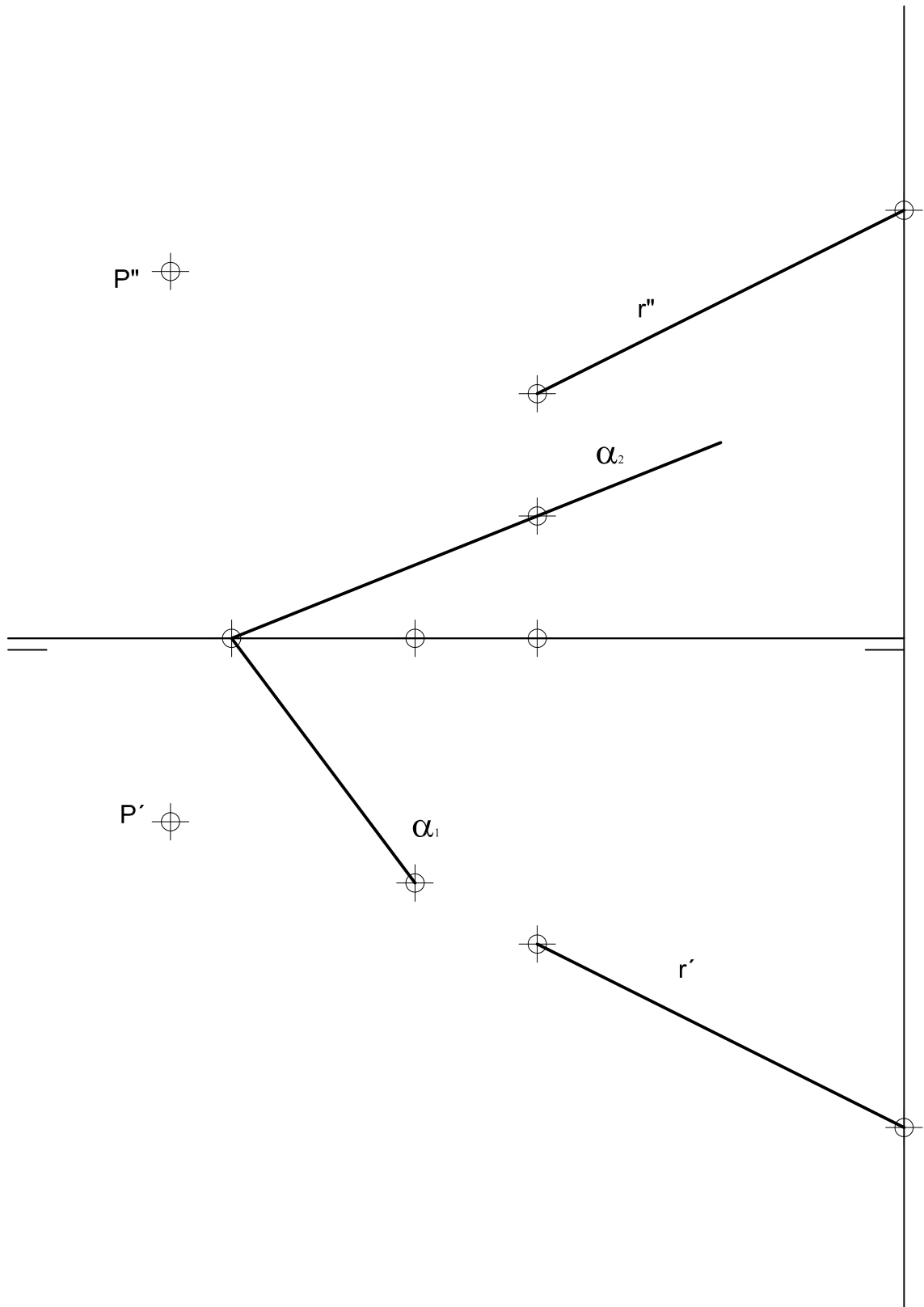
Draw the plane  $\alpha$  that contains the point  $P$  and it is perpendicular to the line  $r$ . Find the intersection between them ( $I$ ).



## EXERCISE 7

Draw the line that passing through the point  $P(12,3,6)$  is perpendicular to the line  $r$  that passes through  $(6,5,4)$  and  $(0,8,7)$ , and is parallel to the plane  $\alpha$  determined by the points  $(11,0,0)$ ,  $(6,0,2)$  and  $(8,4,0)$ .

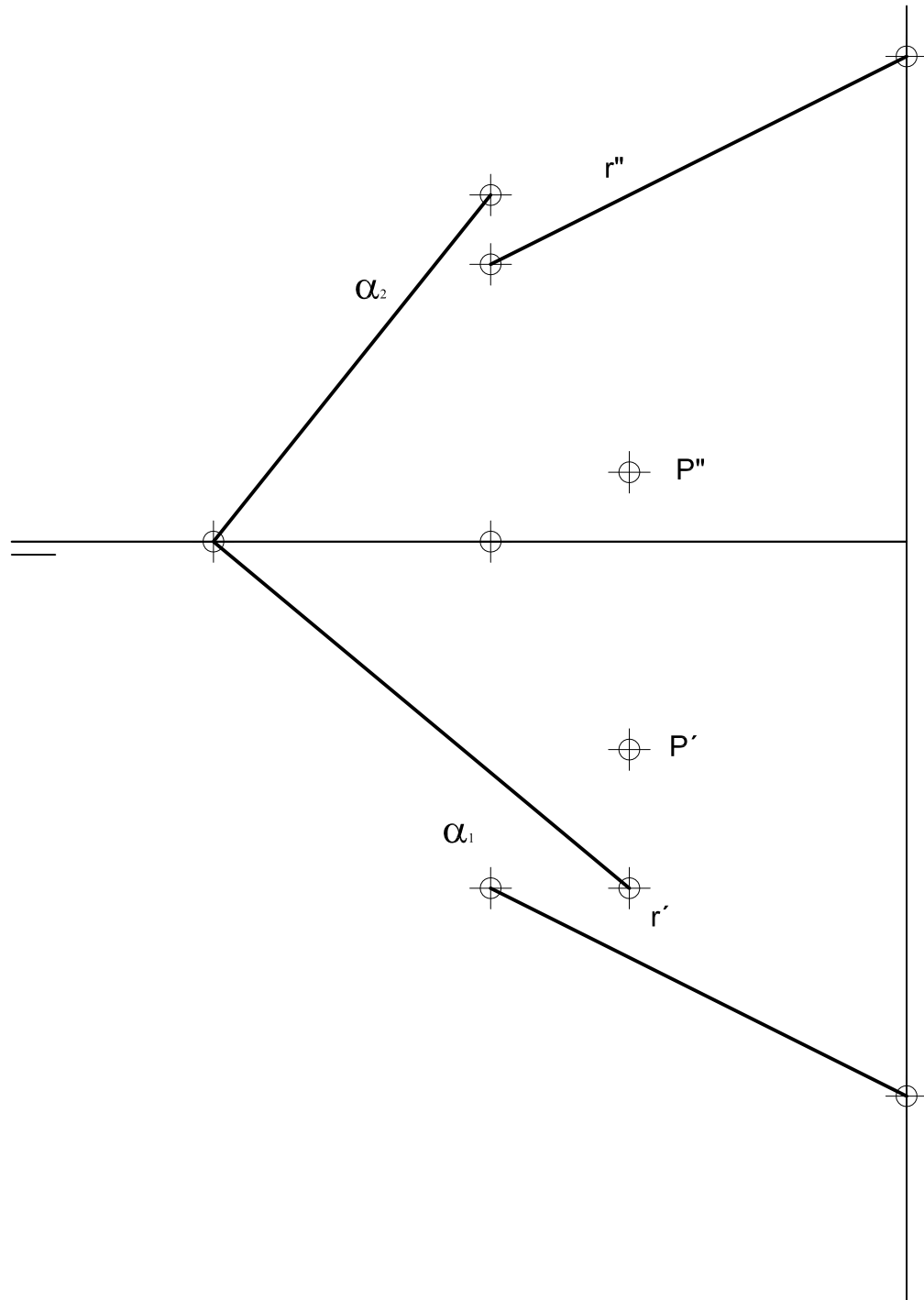
Draw the line  $r$  that passes through the point  $P$  and it is parallel to the plane  $\alpha$ .



### EXERCISE 8

Find the planes that contain the point  $P(4,3,1)$ , are perpendicular to the plane  $\alpha : 5x + 6y + 4z = 50$  and parallel to the line  $r$  that passes through the points  $(6,5,4)$  and  $(0,8,7)$ .

Draw the planes that contain the point  $P$ , are perpendicular to  $\alpha$  and parallel to the line  $r$ .

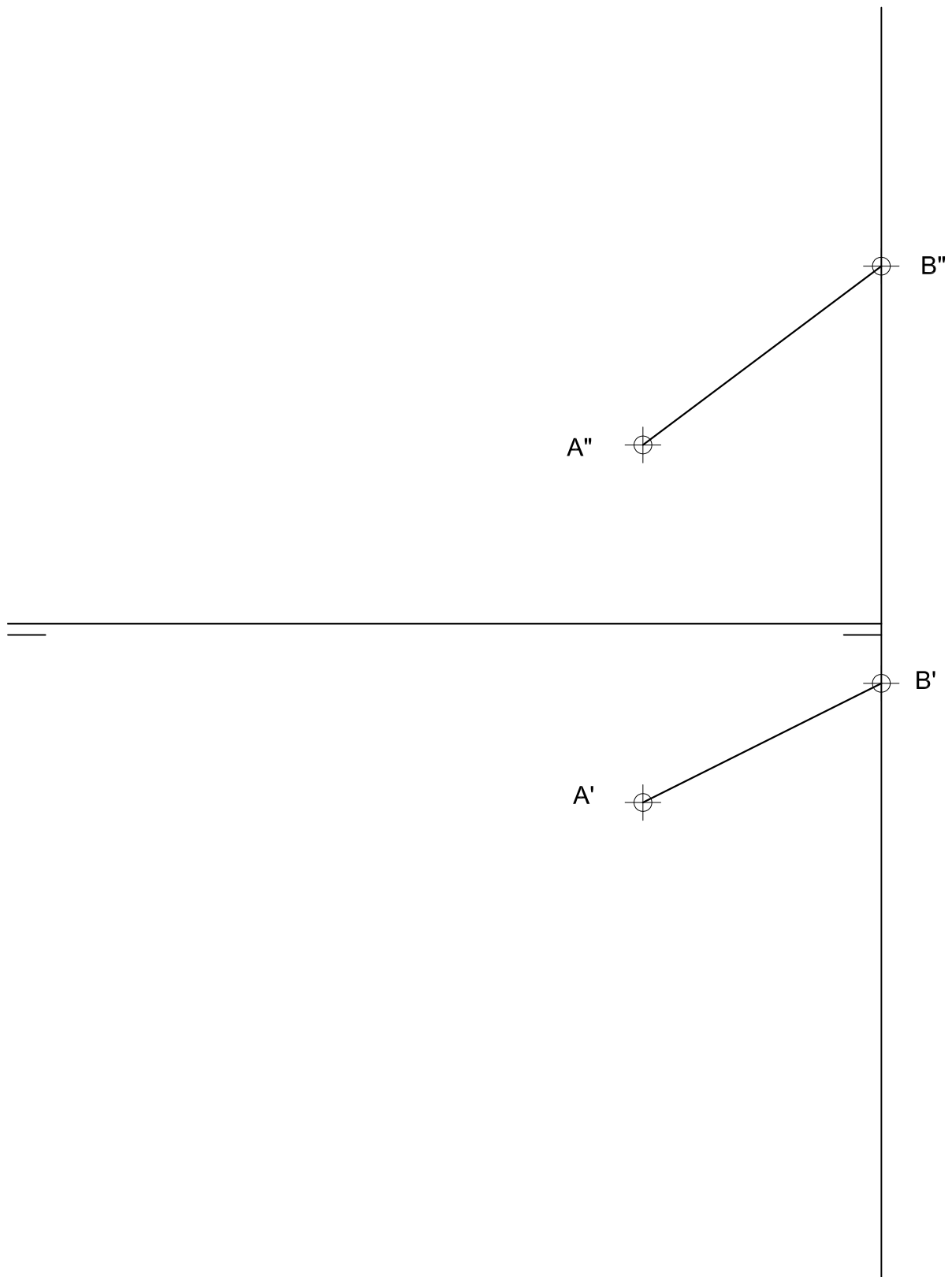




## EXERCISE 9

Calculate the distance between the points  $A(4,3,3)$  and  $B(0,1,6)$ .

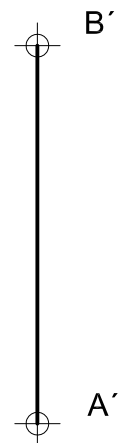
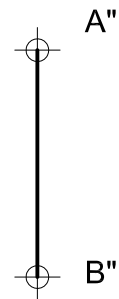
Calculate the distance between the points  $A$  and  $B$ .



EXERCISE 10

Calculate the distance between the points  $A(4,8,6)$  and  $B(4,3,3)$ .

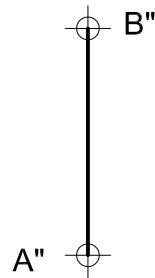
Calculate the distance between the points  $A(4,8,6)$  and  $B(4,3,3)$ .



## EXERCISE 11

Calculate the distance between the points  $A(4,3,3)$  and  $B(4,3,6)$ .

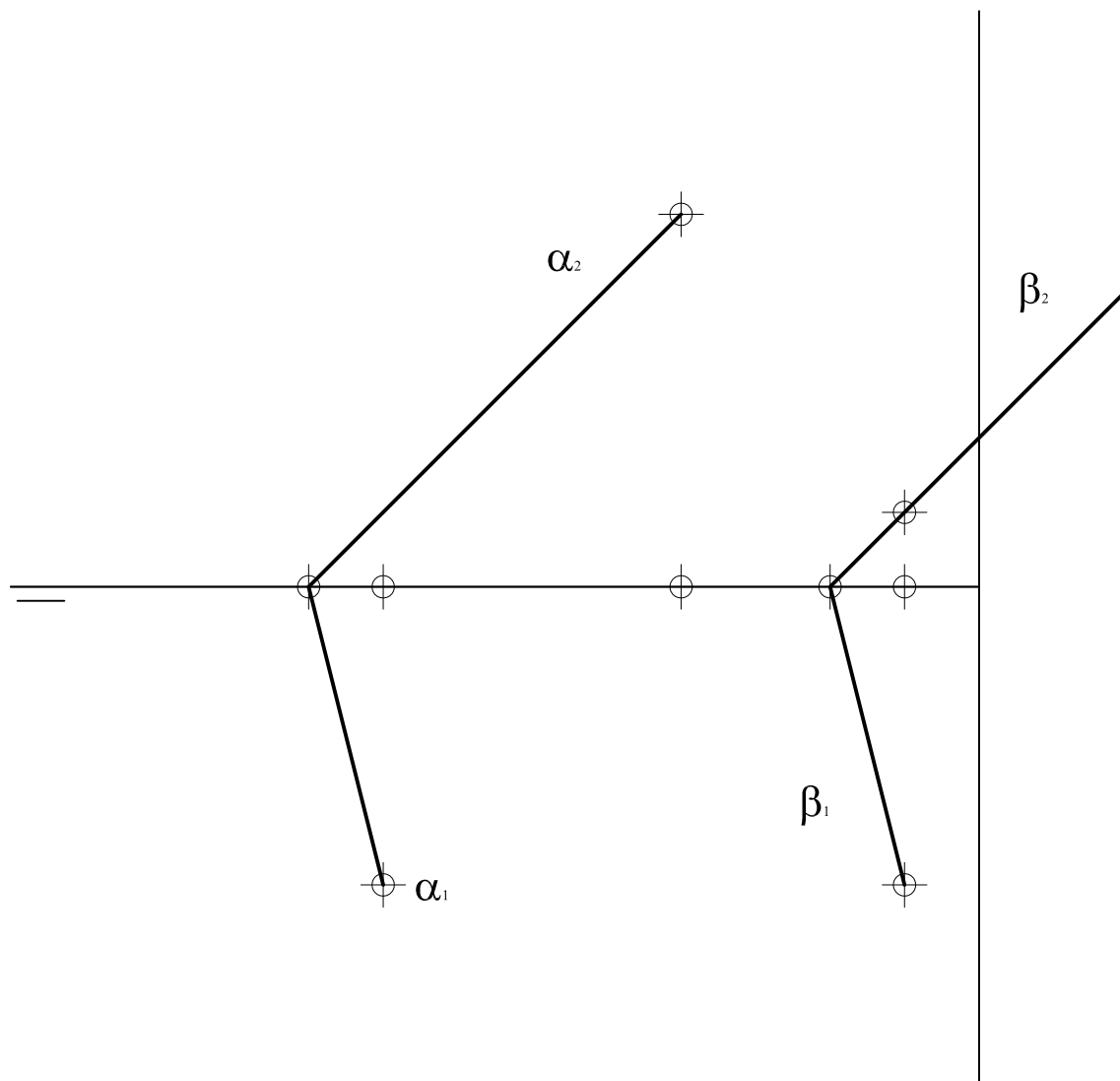
Calculate the distance between the points  $A$  and  $B$ .



## EXERCISE 12

Calculate the distance between the plane  $\alpha : 4x + y + 4z = 36$  and the plane  $\beta$  determined by the points  $(2,0,0)$ ,  $(1,0,1)$  and  $(1,4,0)$ .

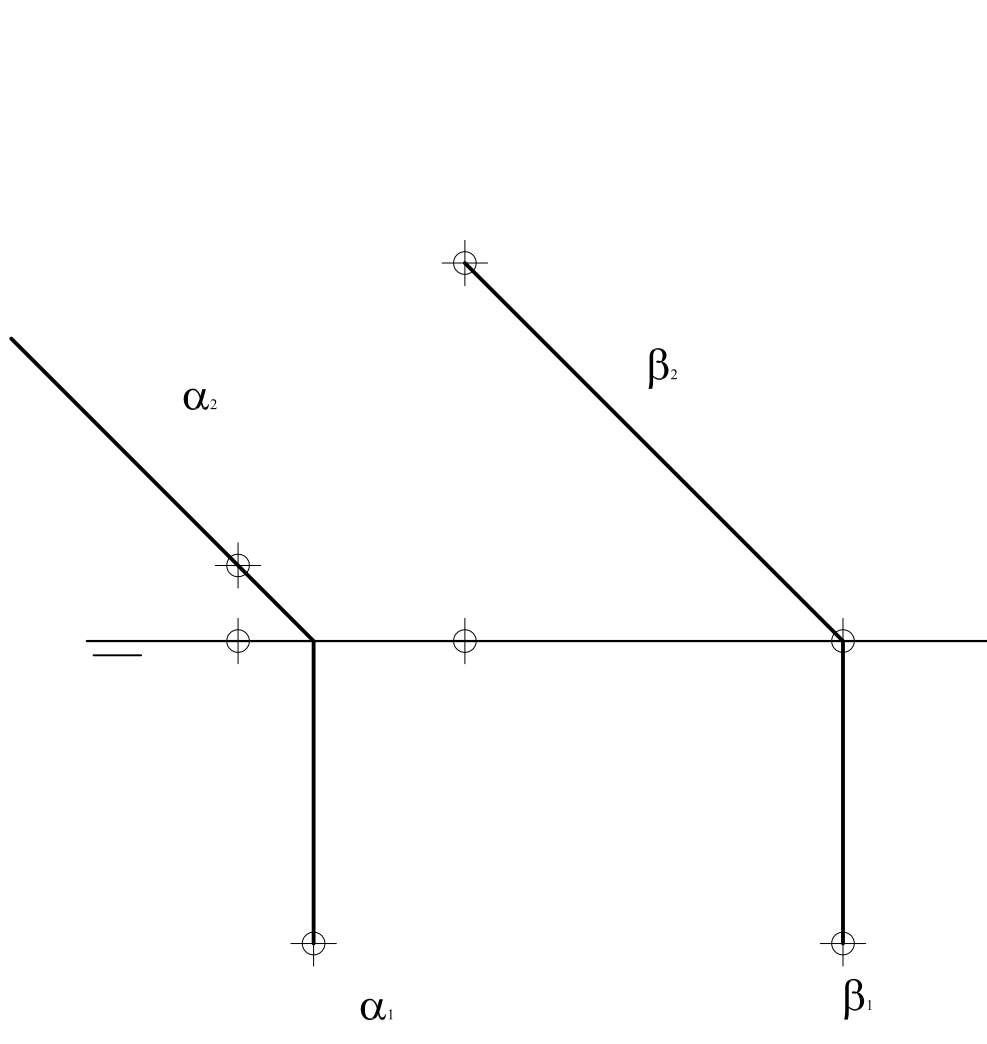
Calculate the distance between the planes  $\alpha$  and  $\beta$ .



### EXERCISE 13

Let  $\alpha$  be a plane determined by the points,  $(9,0,0)$ ,  $(10,0,1)$  and  $(9,4,0)$ , and  $\beta$  determined by  $(2,0,0)$ ,  $(7,0,5)$  and  $(2,4,0)$ . Calculate the distance between these planes.

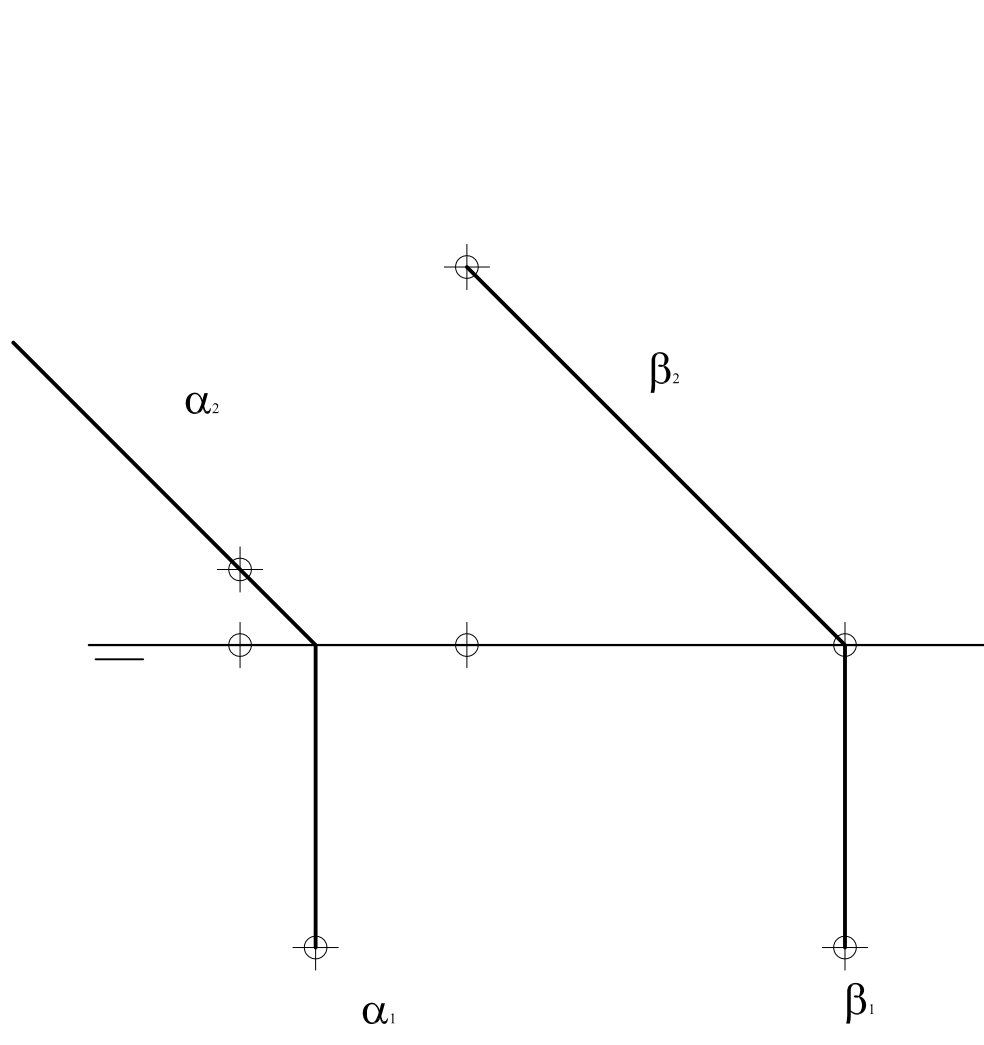
Calculate the distance between the planes  $\alpha$  and  $\beta$ .



## EXERCISE 14

Let  $\alpha$  be a plane determined by the points  $(9,0,0)$ ,  $(10,0,1)$  and  $(9,4,0)$ , and the plane  $\beta$  determined by  $(2,0,0)$ ,  $(7,0,5)$  and  $(2,4,0)$ . Calculate the bisector plane of  $\alpha$  and  $\beta$ .

Calculate the bisector plane of the planes  $\alpha$  and  $\beta$ .

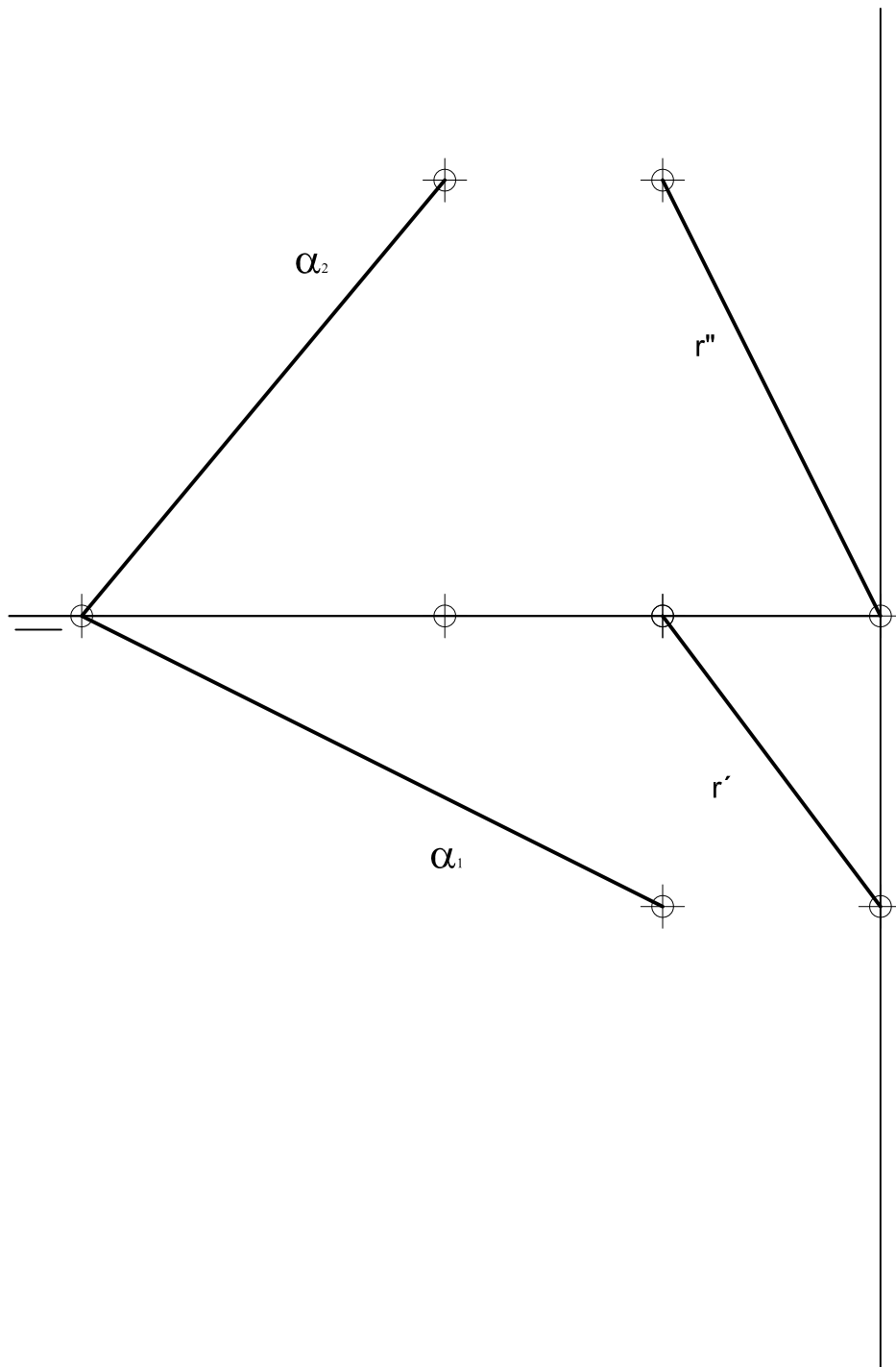


EXERCISE 15

Calculate the distance between the line  $r : \begin{cases} x = 3 - 3t \\ y = 6 - t \\ z = 6t \end{cases}$  and the plane

$\alpha : 6x + 12y + 5z - 66 = 0$  which is parallel to the line.

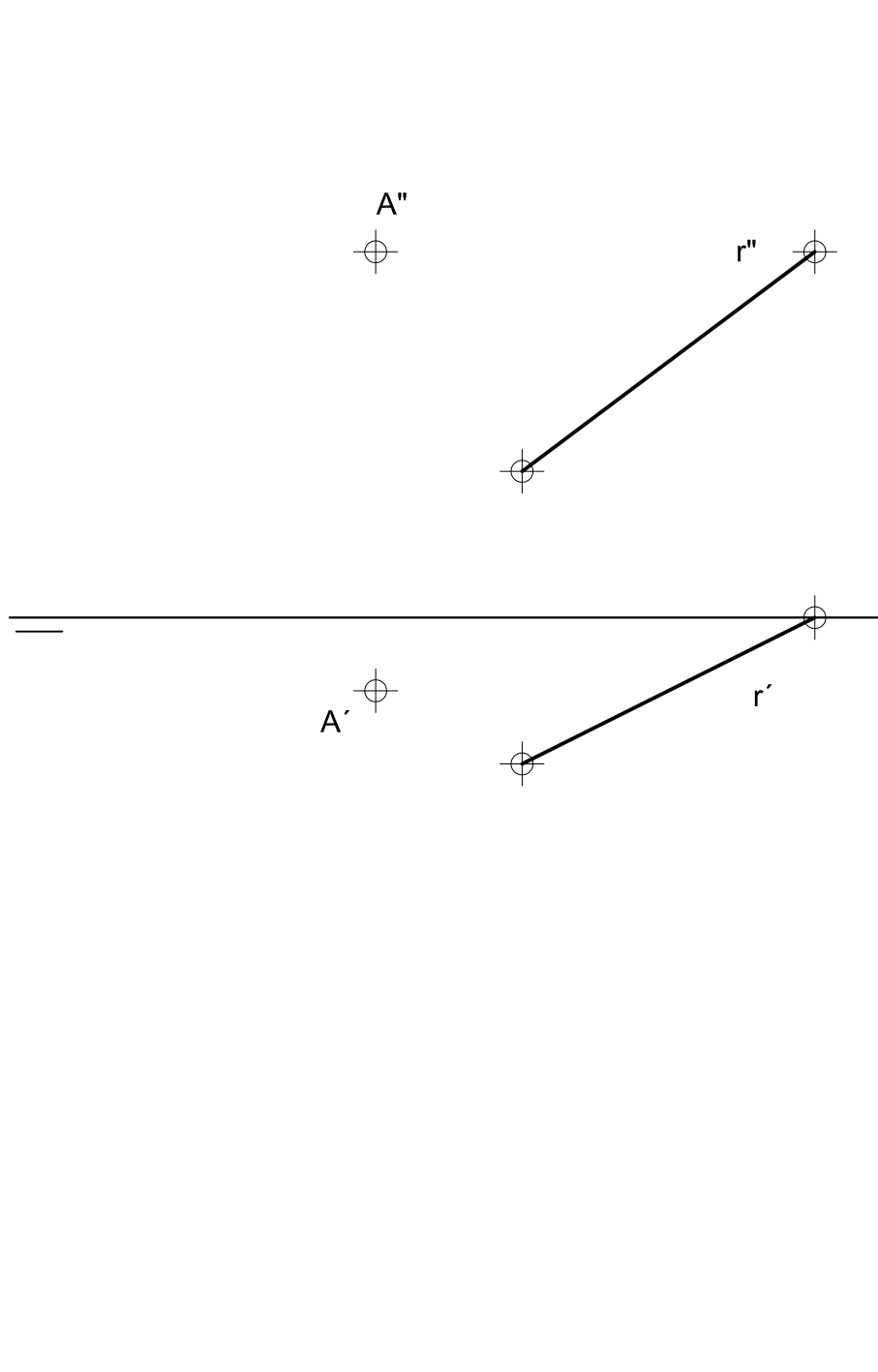
Calculate the distance between the the line  $r$  and the plane  $\beta$ .



## EXERCISE 16

Calculate the distance from the point  $A(7,1,5)$  to the line  $r: \frac{x-1}{4} = \frac{y}{2} = \frac{z-5}{-3}$ .

Calculate the distance between the line  $r$  and the point  $A$ .

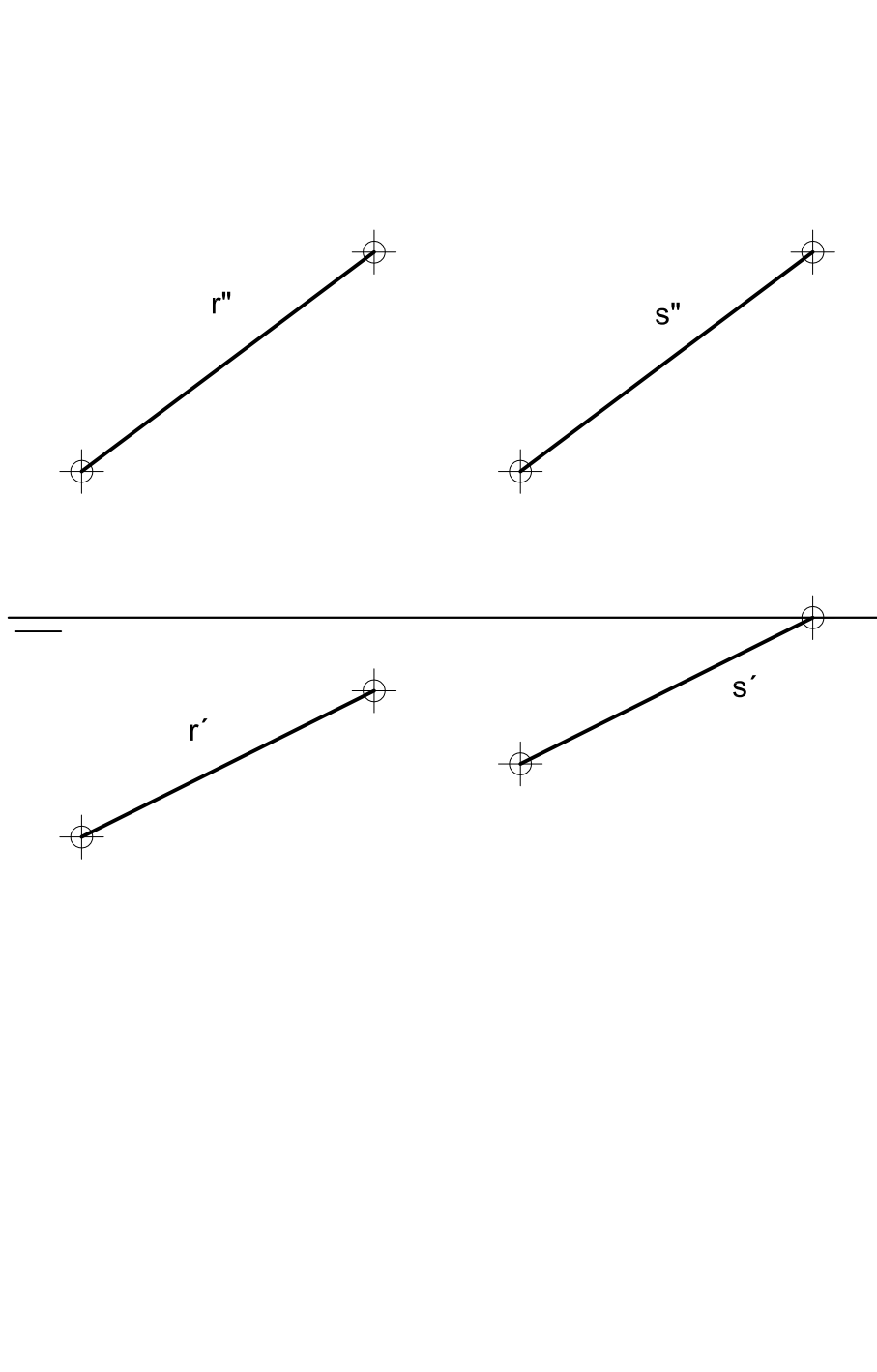




EXERCISE 17

Calculate the distance between the lines  $r: \frac{x-1}{4} = \frac{y}{2} = \frac{z-5}{-3}$  and  $s: \begin{cases} x = 7 + 4t \\ y = 1 + 2t \\ z = 5 - 3t \end{cases}$ .

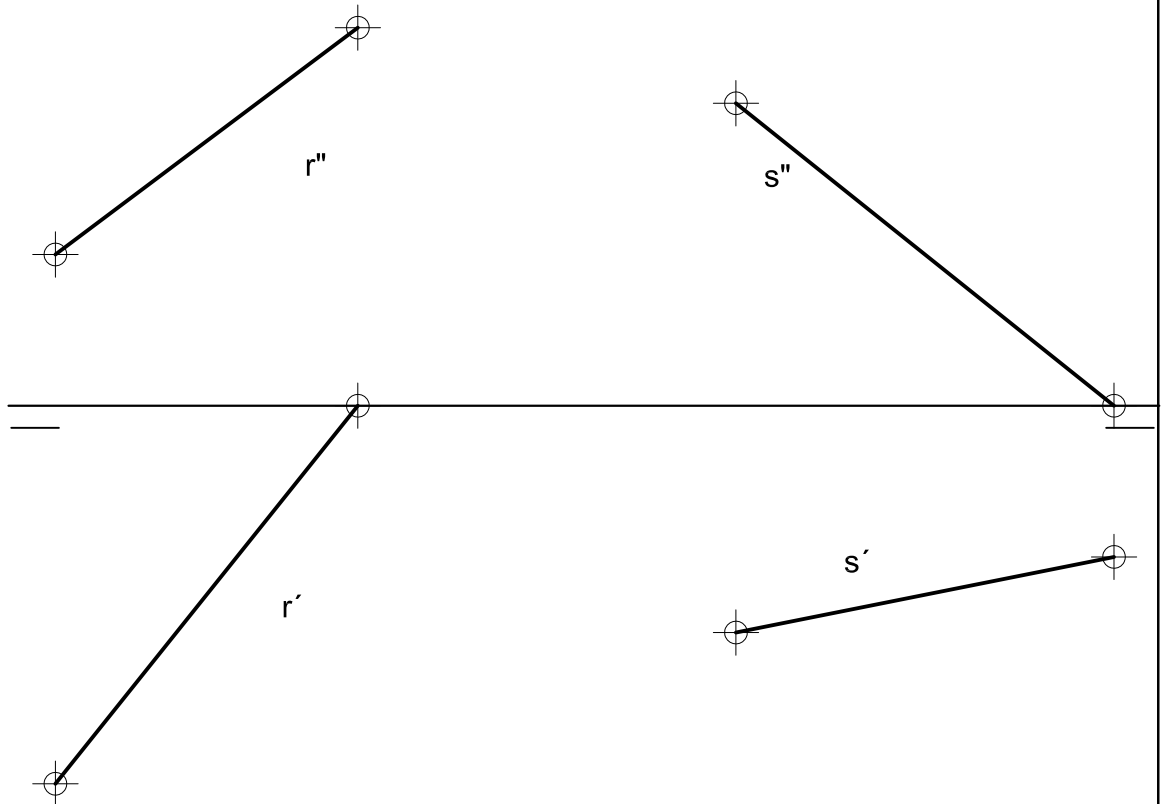
Calculate the distance between the lines  $r$  and  $s$ .



## EXERCISE 18

Calculate the distance between the lines  $r((13,0,5)(17,5,2))$  and  $s((3,2,0)(8,3,4))$ .

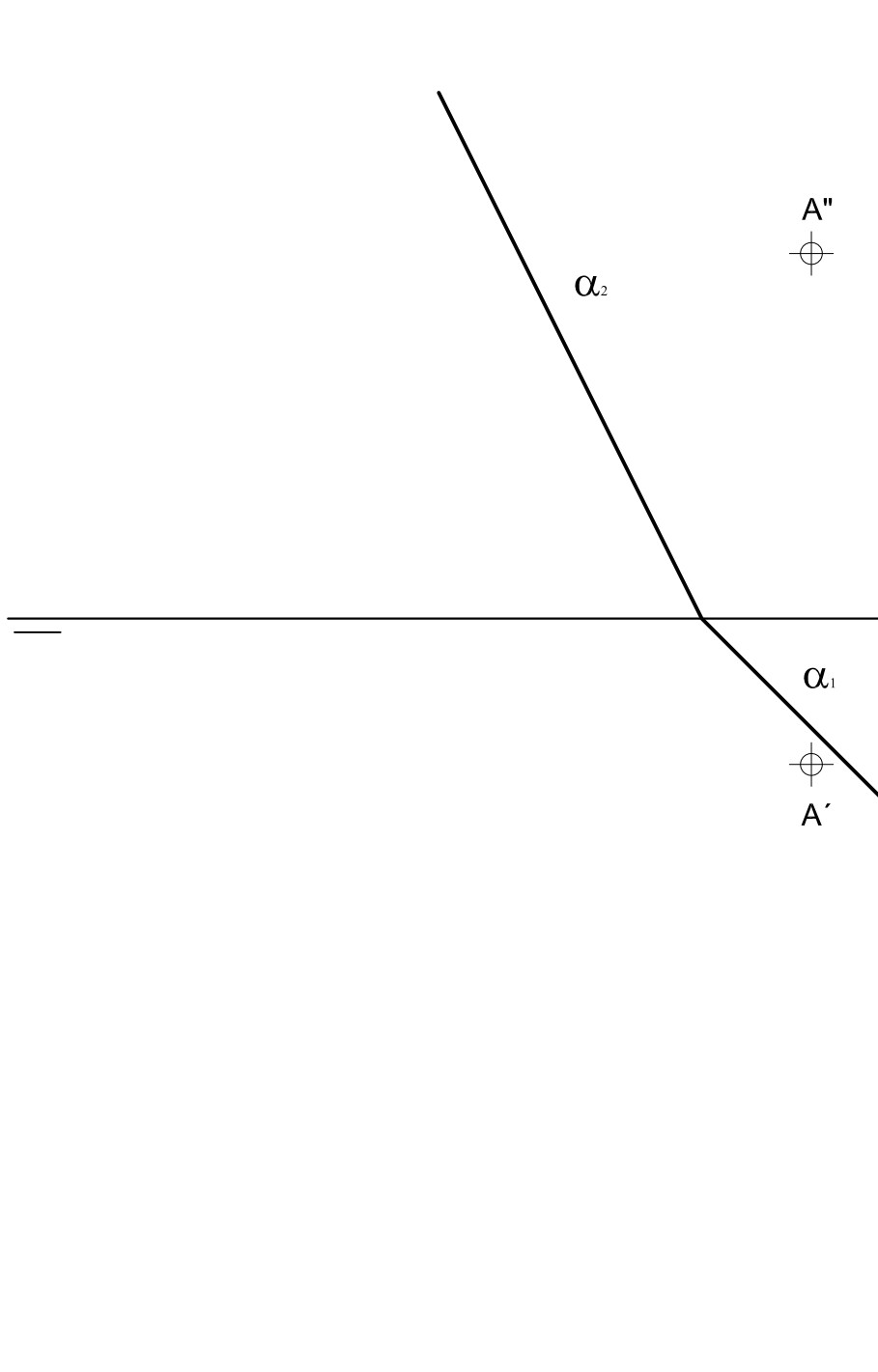
Calculate the distance between the lines  $r$  and  $s$ .



## EXERCISE 19

Calculate the distance from the point  $A(1,2,5)$  to the plane  $\alpha : 2x + 2y - z - 5 = 0$ .

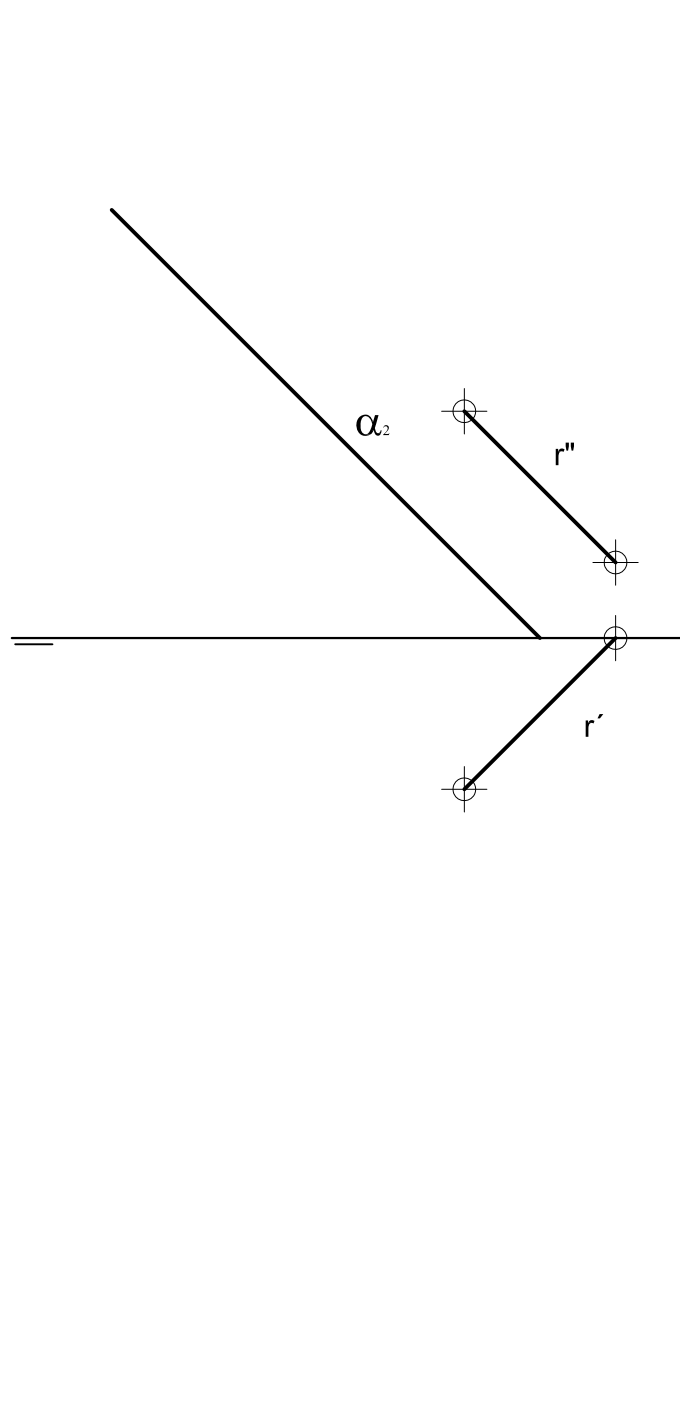
Calculate the distance between the point  $A$  and the plane  $\alpha$ .



20 ARIKETA

Izan bitez  $r: \frac{x-1}{2} = \frac{y}{2} = \frac{z-1}{2}$  zuzena eta  $\alpha: x - z = 2$  plano. Kalkulatu bien arteko distantzia.

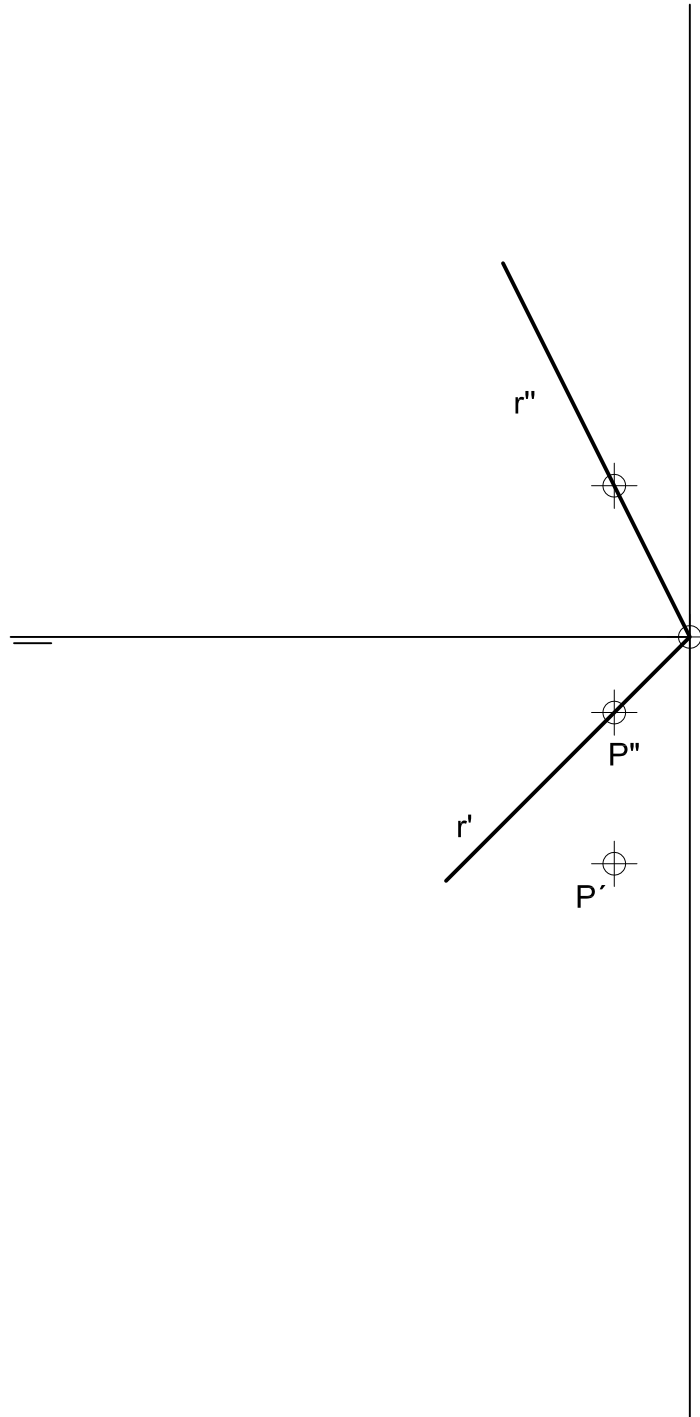
Calculate the distance between the plane  $\alpha$  (perpendicular to PV) and the line  $r$ .



21 ARIKETA

Kalkulatu  $P(1,3,-1)$  puntutik  $r: \begin{cases} x - y = 0 \\ x + y - z = 0 \end{cases}$  zuzenera dagoen distantzia.

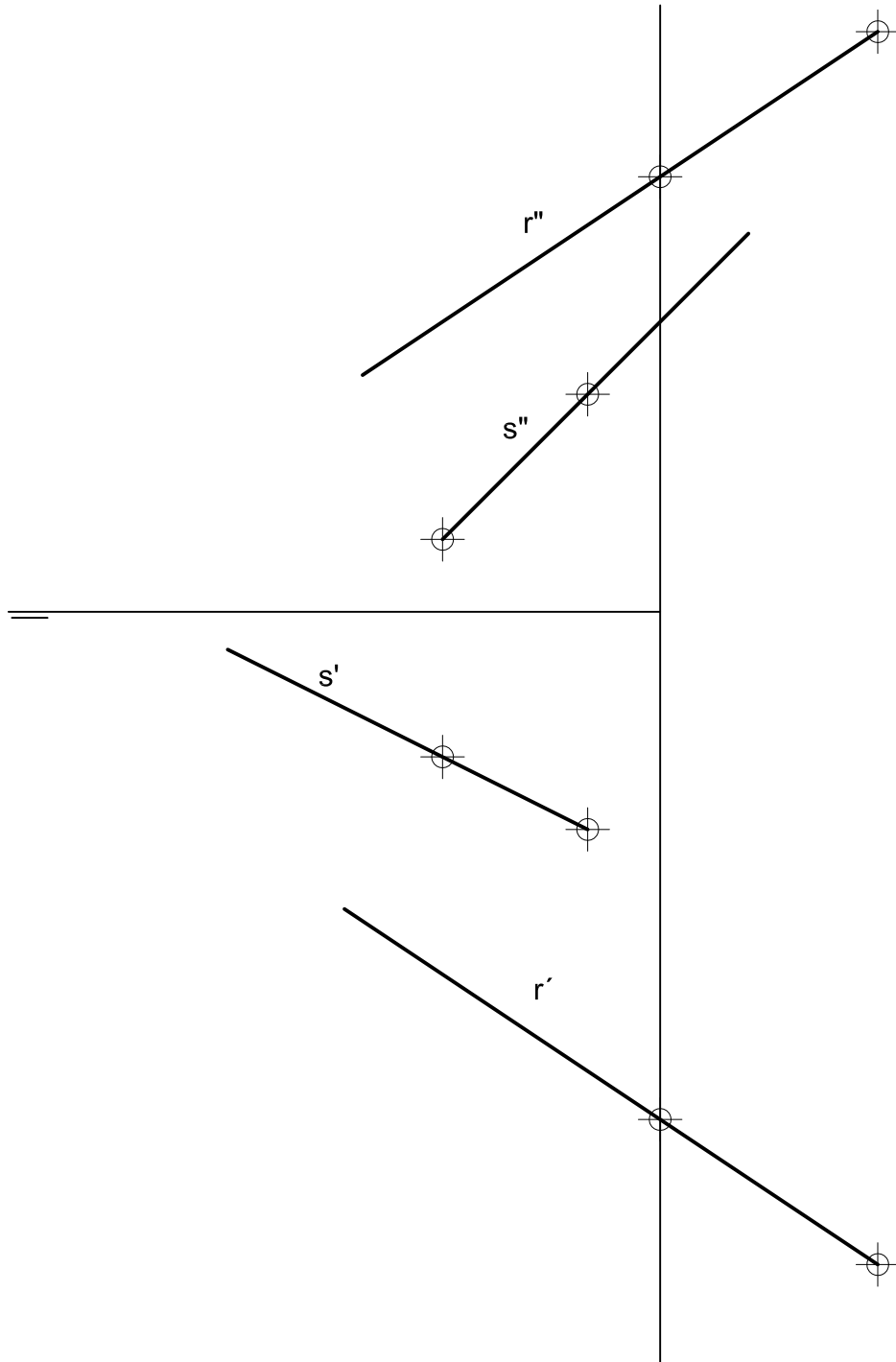
Calculate the distance between the point  $P$  and the line  $r$ .



22 ARIKETA

Kalkulatu  $r: \frac{x+3}{3} = \frac{y-9}{-2} = \frac{z-8}{-2}$  eta  $s: \frac{x-3}{-2} = \frac{y-2}{1} = \frac{z-1}{2}$  zuzenen arteko distantzia.

Calculate the distance between the lines  $r$  and  $s$ .

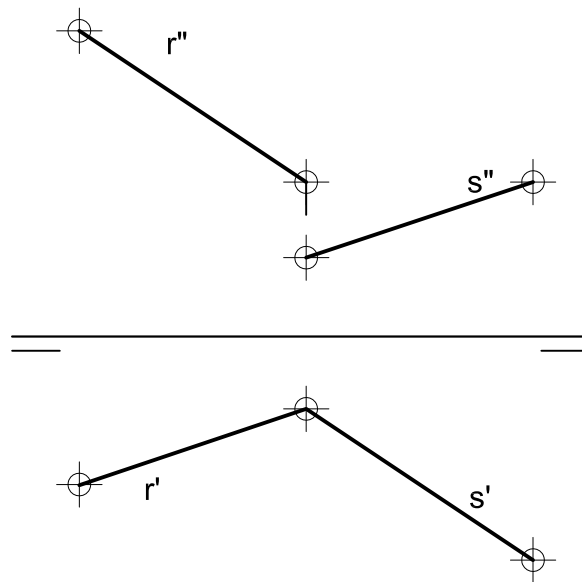


## 23 ARIKETA

Kalkulatu  $r: \begin{cases} x - 3y = 1 \\ 2y = z \end{cases}$  zuzenak eta  $(4,1,1)$  eta  $(1,3,3)$  puntuetatik pasatzen den  $s$

zuzenak osatzen duten angelua.

Find the angle between the lines  $r$  and  $s$ .

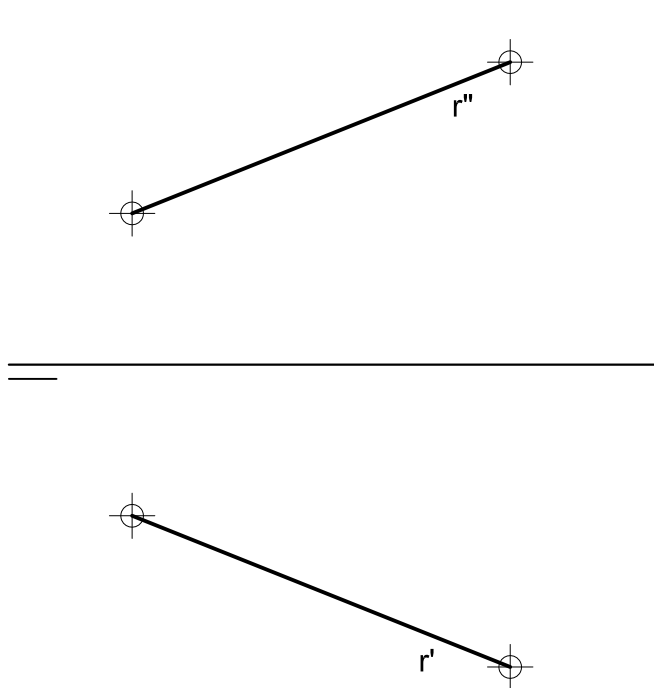


## 24 ARIKETA

Kalkulatu  $r: \begin{cases} 2x + 5z = 24 \\ y = z \end{cases}$  zuzenak plano horizontalarekin ( $z = 0$ ) eta bertikalarekin

( $y = 0$ ) osatzen dituen angeluak.

Find the angle between the line  $r$  with the projection planes  $PH$  and  $PV$ .

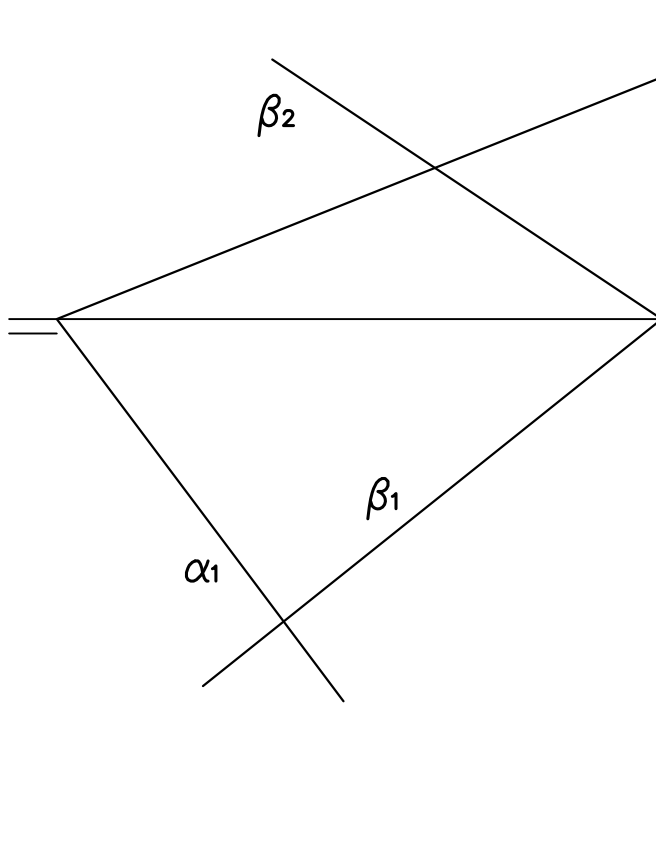




25 ARIKETA

Kalkulatu  $\alpha : 4x + 3y + 10z = 32$  planoak eta  $\beta : 4x - 5y - 6z = 0$  planoak osatzen duten angelua.

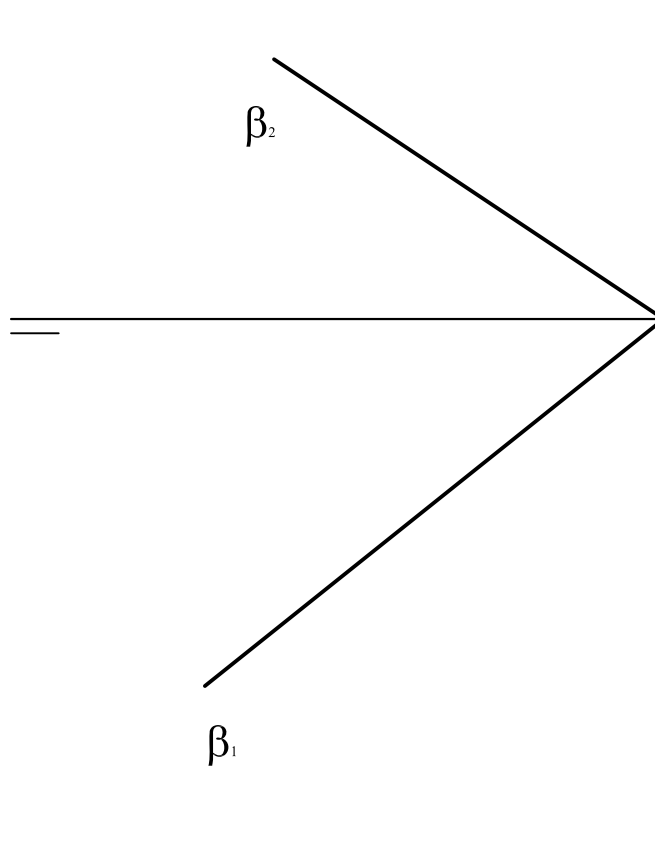
Find the angle between the planes  $\alpha$  and  $\beta$ .



26 ARIKETA

Kalkulatu  $\pi : 4x - 5y - 6z = 0$  planoak eta plano bertikalak ( $y = 0$ ) osatzen duten angelua.

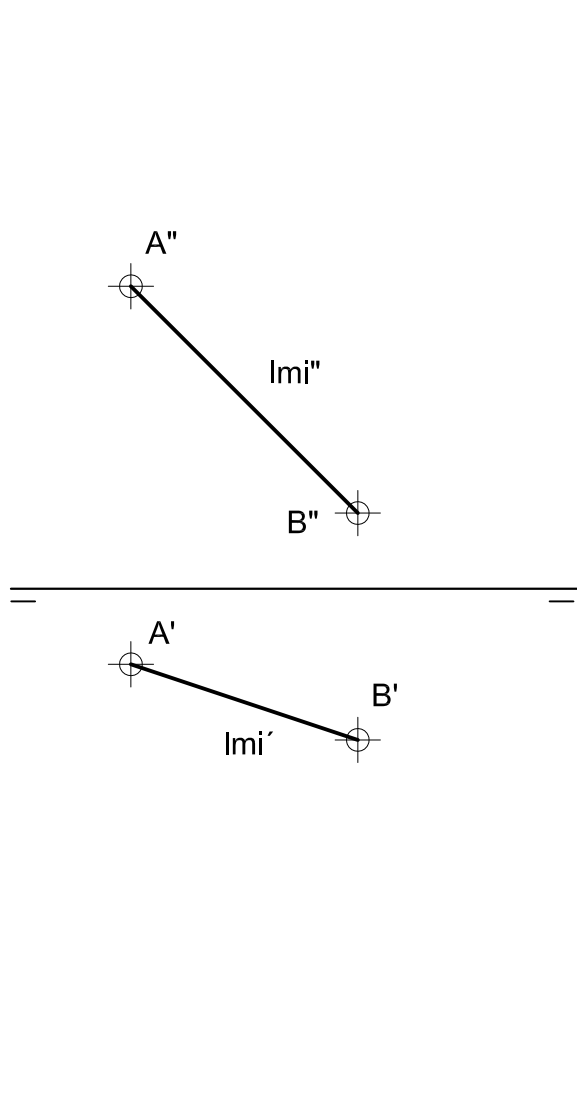
Find the angle between the plane  $\beta$  and the projection plane PV.



27 ARIKETA

Malda handieneko lerrotzat  $s: \begin{cases} x + 3y = 9 \\ 3y + z = 7 \end{cases}$  zuzena duen  $\alpha$  plano definitu.

Find the plane  $\alpha$ , being  $l_{mi}$  its line of maximum inclination.

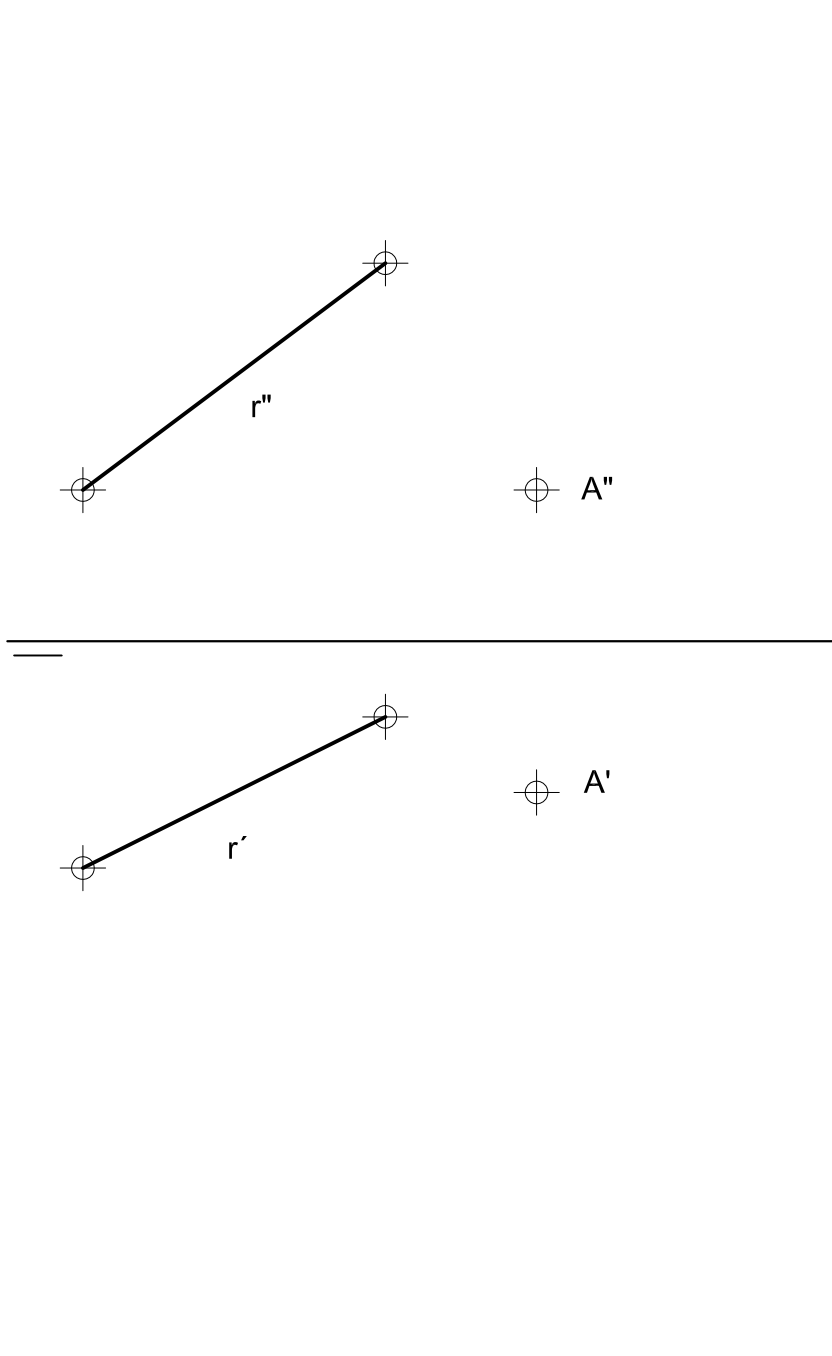


28 ARIKETA

$A(4,2,2)$  puntua emanik, kalkulatu bere simetrikoa  $r: \frac{x-6}{4} = \frac{y-1}{2} = \frac{z-5}{-3}$

zuzenarekiko.

Find the symmetrical point of A with respect to the line r.



## 29 ARIKETA

ABCD karratu baten erpinen koordenatuak definitu ondokoa jakinik:

- AB zuzena  $y = z$  planoan dago.
- BC zuzena plano horizontalarekiko elkarzuta den  $\beta$  plano batekiko paraleloa da.
- $\beta$  planoaren eta XOY planoaren arteko ebakidura  $(0,0,0)$  eta  $(2,3,0)$  puntuetatik pasatzen den zuzena da.
- B erpinaren hirugarren osagaia (kota) 4 da.
- A eta B puntuen arteko distantzia 6,5 da.
- A erpinaren  $x$  osagaia 12 da eta  $y$  osagaia 2.

Draw the rectangle ABCD that is in the first quadrant.

Data:

1. The segment AB is in the first bisector.
2. BC is parallel to the plane  $\beta$ , that is perpendicular to the PH.
3. The elevation of B is 4.
4. The distance between the points A and B is 6,5.
5. B is projected in the right-hand side of A.

A' 

  
 $\beta_1$

## 30 ARIKETA

Izan bitez  $P(11, -3, 3)$  eta  $Q(-, -3, -3)$  puntuak. Definitu ABCD karratu baten erpinak ondokoa jakinik:

- Karratuaren erpinak  $P$  eta  $Q$  puntuekiko distantziakideak dira.
- $P$  eta  $Q$  puntuen arteko distantzia 10 da.
- $A$  puntua  $y = 0$  planoan dago.
- $A$  puntuaren hirugarren osagaia (kota) 4 da.

*Draw the square of vertexes ABCD equidistant to the points P and Q.*

*Data:*

- 1. The elevation of Q is -3 and it is in the first bisector.*
- 2. The distance between P and Q is 10.*
- 3. A is in the PV and its elevation is 4.*

 P" P'

### 31 ARIKETA

Izan bitez  $P(18,3,1)$  eta  $Q(11,6,7)$  puntuak. Definitu  $P$  eta  $Q$  puntuekiko distantziakidea den  $ABC$  triangelu aldekide bat,  $A(-, 2'5,3)$  izanik.

Draw the equilateral triangle  $ABC$ , knowing that its vertex are the same distance from the points  $P$  and  $Q$ .

Data:

The elevation of  $A$  is 3 and the distance to  $PV$  is 2,5.

