MOMENTO DI UNA FORZA

movimenti possibili nello $\underbrace{\text{spazio}}_{2D,\,3D,\,\ldots}$ $\Longrightarrow$ $\begin{cases} \text{TRASLAZIONI} \\ \text{ROTAZIONI} \end{cases}$

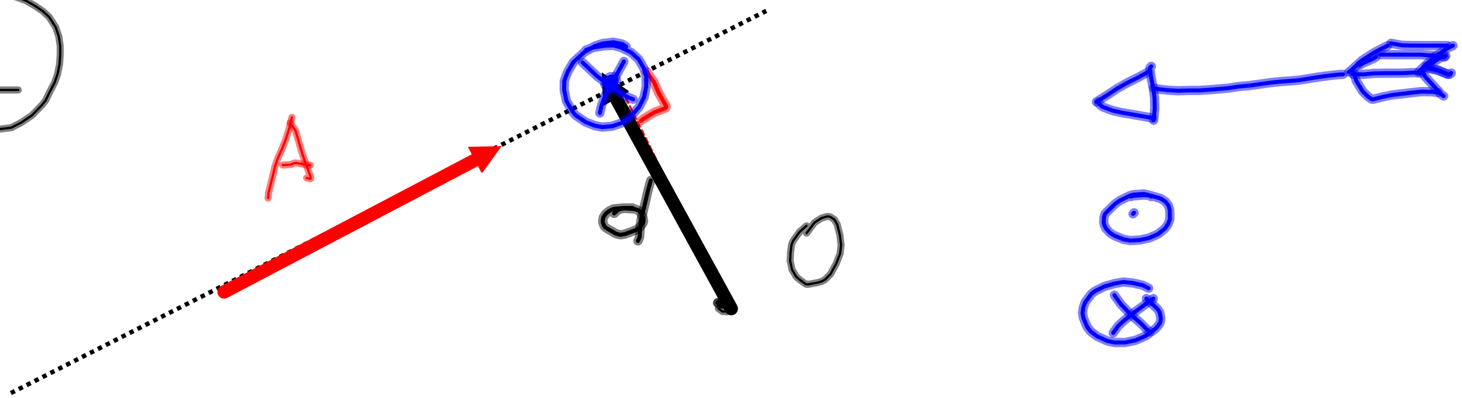
$$\begin{cases} \text{TRASLAZIONI} \Longrightarrow \sum F \neq 0 \\ \text{ROTAZIONI} \Longrightarrow \sum M_P \neq 0 \end{cases}$$

$\sum F = 0$

$\sum M \neq 0$

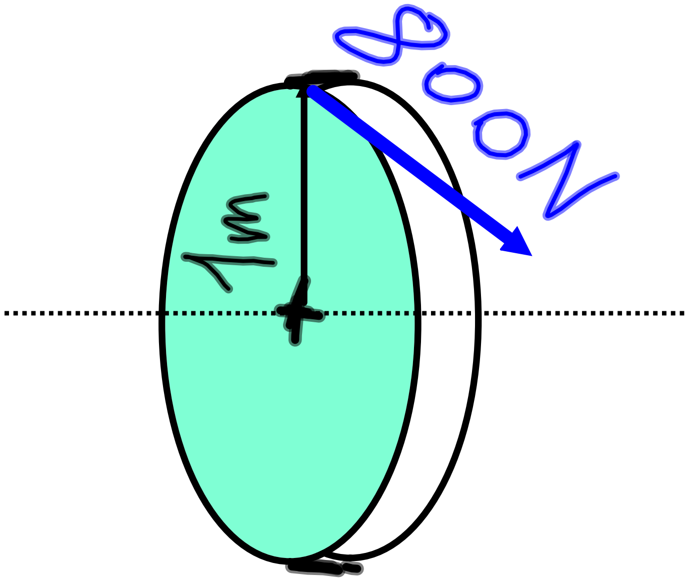
MOMENTO
1. FORZA × BRACCIO
2. COPPIA/MOMENTO

1



$$\boxed{\vec{M}_o = \vec{A} \times \vec{d}}$$

COPPIA = 800 N · m
= 800N · 1m



PRODOTTO SCALARE = OUTPUT : NUMERO x u.d.m.

LAVORO = FORZA · SPOSTAMENTO

PRODOTTO VETTORIALE = OUTPUT : VETTORE

LAVORO = FORZA · SPOSTAMENTO

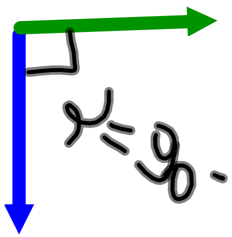
$= |F| \cdot |S| \cdot |\cos\alpha|$

P. SCALARE: ·

P. VETTORIALE: ×

1

$\cos(90°) = 0$



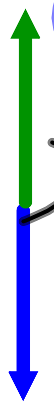
$\alpha = 90°$

SPOSTAMENTO

FORZA PESO

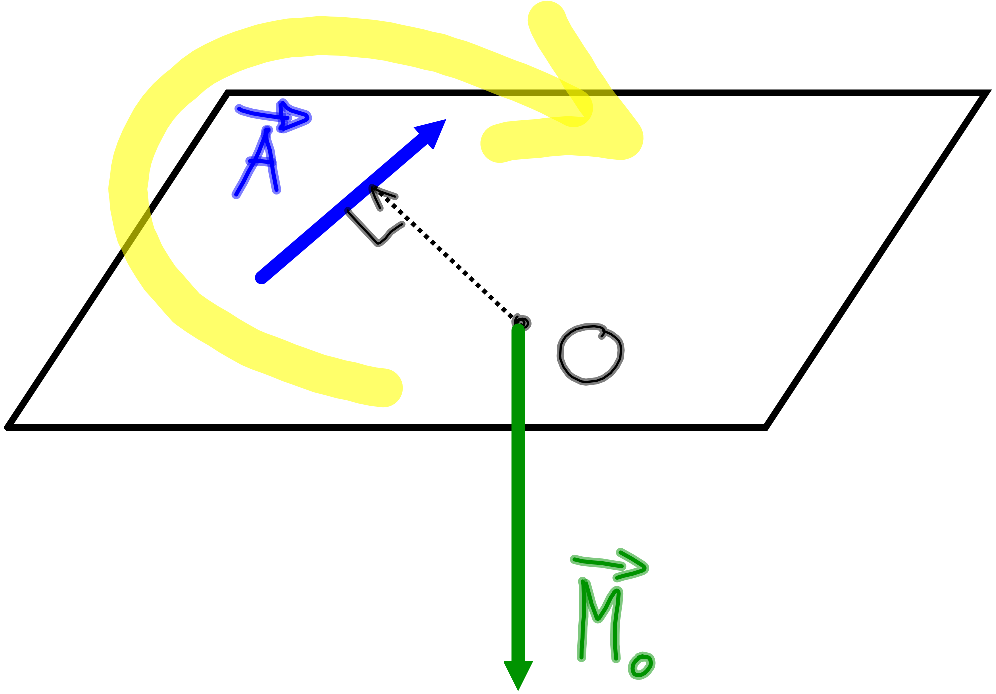
2

$\cos(180°) = -1$



$\alpha = 180°$

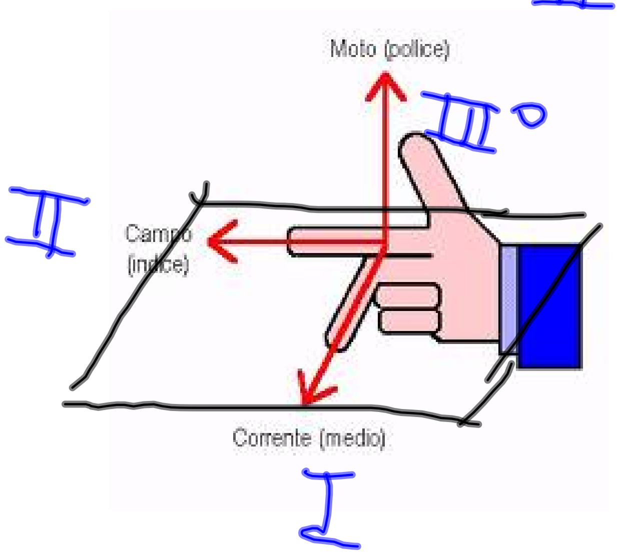
$|\cos 180°| = 1$

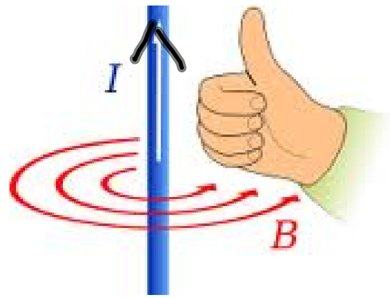


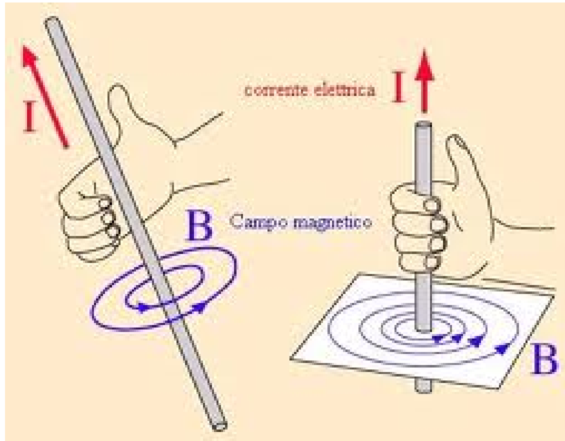
$\vec{A}$
O
$\vec{M}_o$

$$\vec{M}_o = \vec{A} \times \vec{d}$$

$$III° = I° \times II°$$



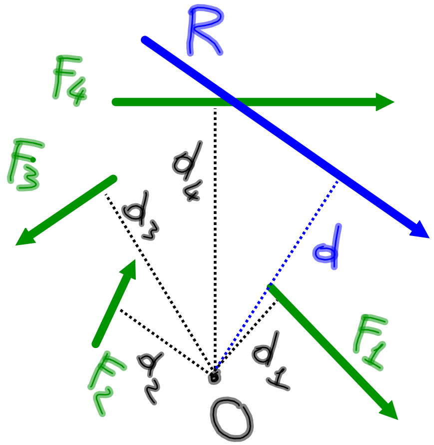




Teorema di Varignon

Dato un sistema di forze complanari e scelto un punto nel piano, si può calcolare il momento di ciascuna forza e determinare il momento risultante ; ma i singoli momenti e il momento risultante devono soddisfare il teorema di Varignon, per il quale:
"In un sistema di forze complanari il momento della risultante , rispetto a un punto "O" qualsiasi nel piano, è uguale alla somma algebrica dei momenti delle singole forze rispetto al piano stesso."

es. $F_1 \times d_1$ ....



$$F_1 \times d_1 + F_2 \times d_2 + F_3 \times d_3 + F_4 \times d_4 = R \times d$$

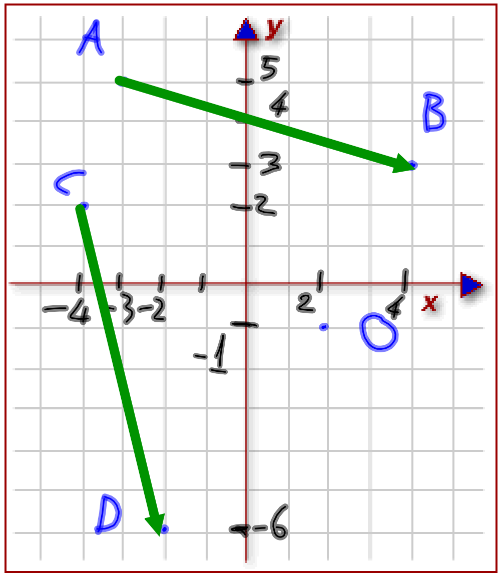
$$d = \frac{F_1 \times d_1 + F_2 \times d_2 + F_3 \times d_3 + F_4 \times d_4}{R}$$

ESERCIZIO

Dati i seguenti punti A,B,C,D,O calcolare la risultante ed il momento della risultante rispetto al punto "O" con riferimento ai seguenti vettori:

$\overline{AB}$ e $\overline{CD}$

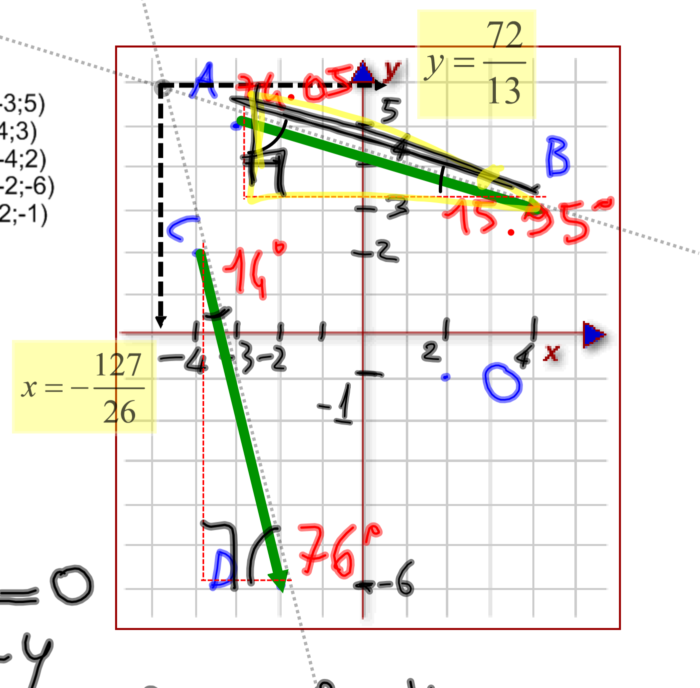
A(-3;5)
B(4;3)
C(-4;2)
D(-2;-6)
O(2;-1)



equazione della retta passante per due punti generici "A" e "B":

$$\frac{x-x_B}{x_A-x_B}=\frac{y-y_B}{y_A-y_B}$$

A(-3;5)
B(4;3)
C(-4;2)
D(-2;-6)
O(2;-1)



$$\frac{x-4}{-3-4}=\frac{y-3}{5-3}$$

$$\frac{x-4}{-7}=\frac{y-3}{2}$$

$$\frac{-2(x-4)-7(y-3)}{14}=0$$

$$-2x+8-7y+21=0$$

$$-2x+8+21=7y$$

$$\frac{-2x+29}{7}=\frac{7y}{7} \longrightarrow \frac{-2x+29}{7}=y$$

$$\frac{AB}{\mathrm{sen}\,90}=\frac{AC}{\mathrm{sen}\,\hat{B}}$$

$\mathrm{sen}\,90 = 1$

equazione della retta passante per due punti generici "A" e "B":

$$\frac{x - x_B}{x_A - x_B} = \frac{y - y_B}{y_A - y_B}$$

A(-3;5)
B(4;3)
C(-4;2)
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O(2;-1)

$$\frac{x-4}{-3-4} = \frac{y-3}{5-3}$$

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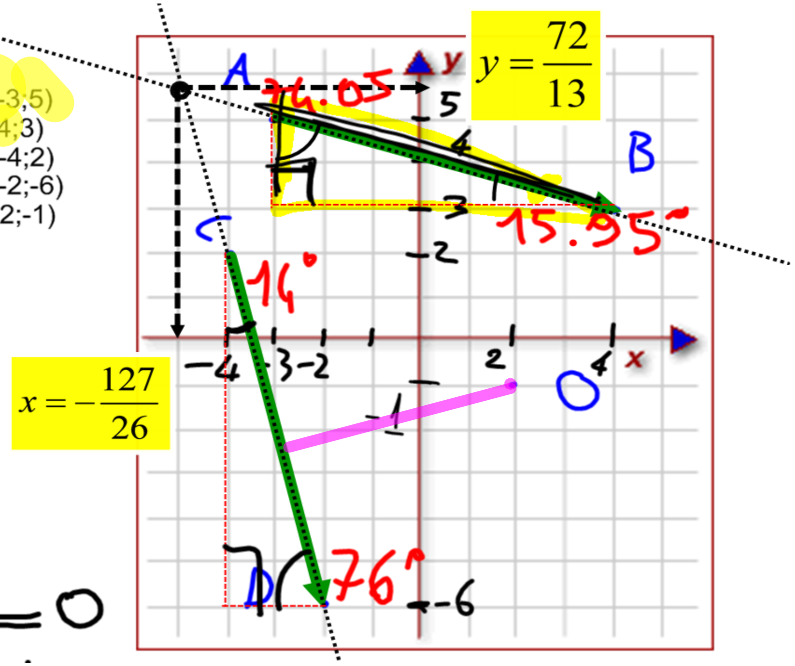
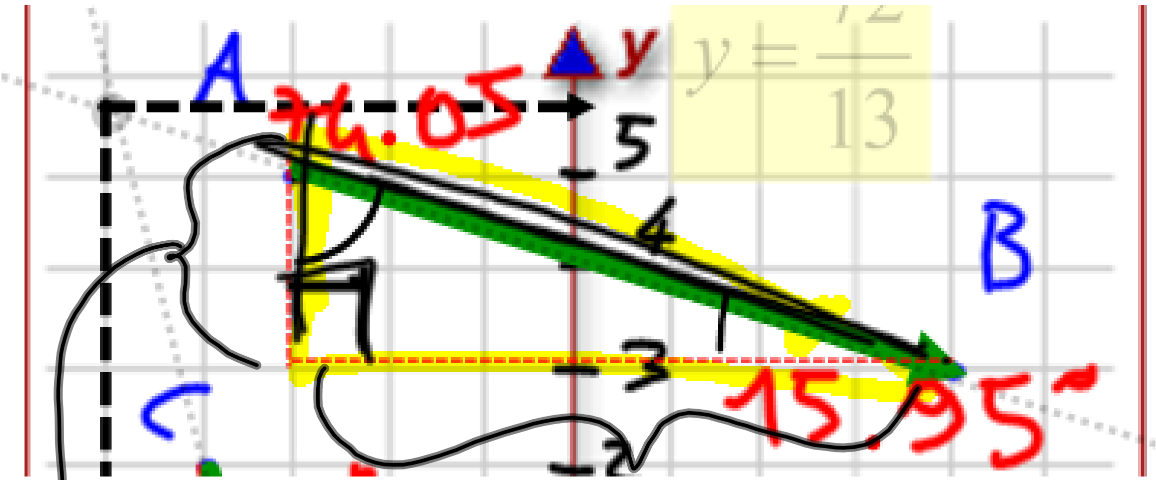
$$-2x+8-7y+21=0$$





$A(x_A; y_A)$

$B(x_B; y_B)$

$|x_B - x_A|$

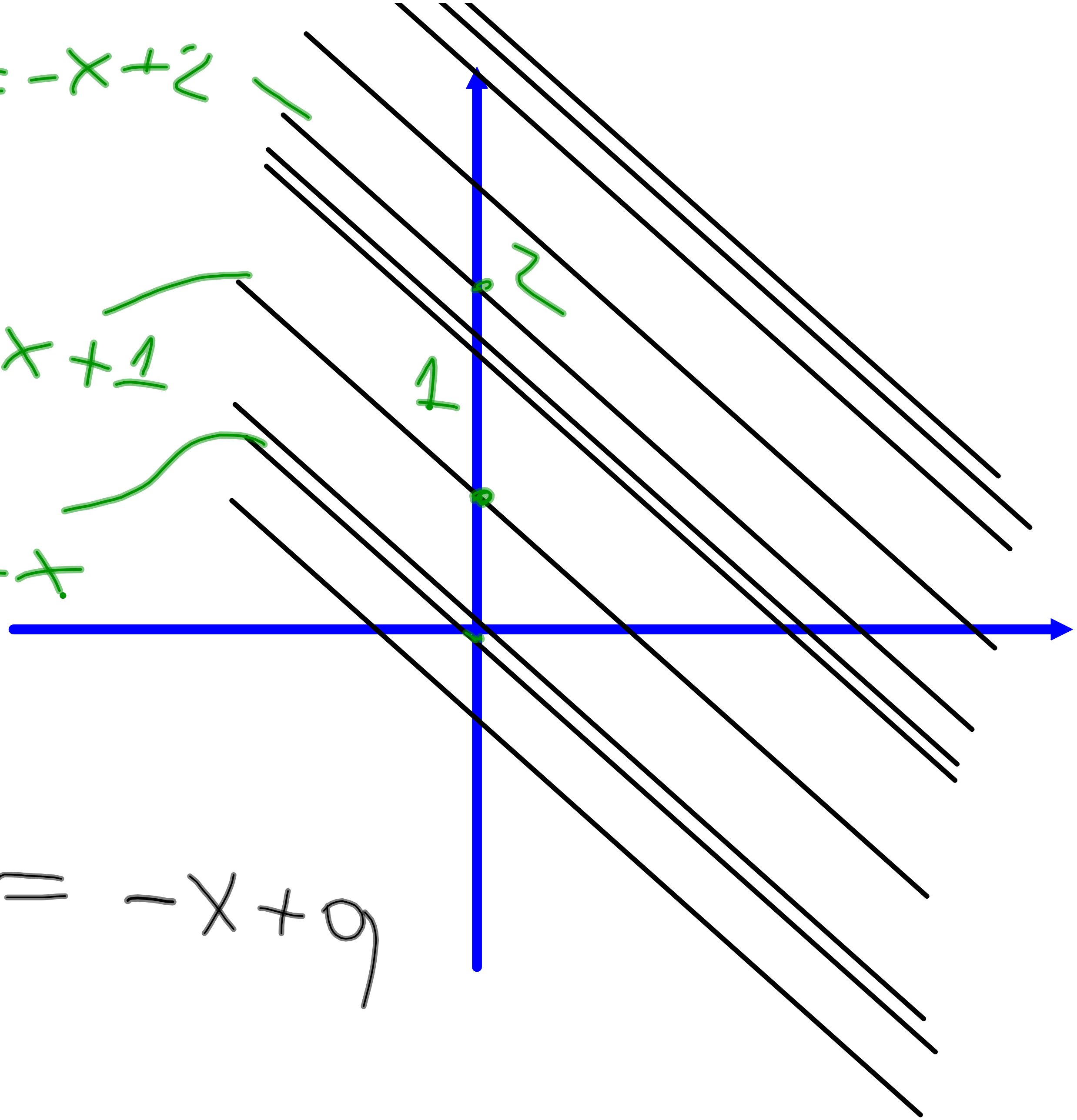
$\overline{AB} = \sqrt{(x_B - x_A)^2 + (y_A - y_B)^2}$

$|y_A - y_B|$

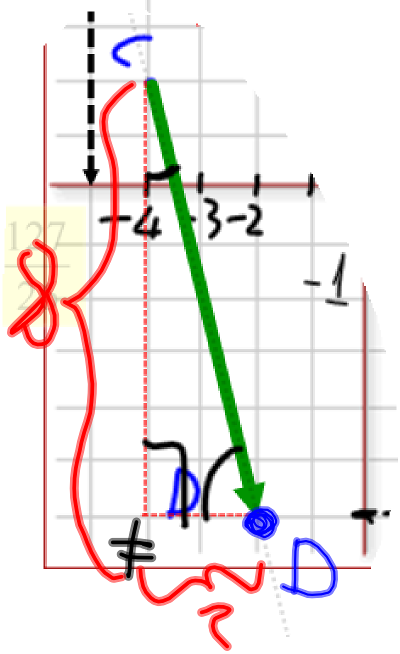
$y = -x + 2$

$y = -x + 1$

$y = -x$



$y = -x + q$



$$\frac{CD}{\text{Sen } 90} = \frac{DF}{\text{Sen } \hat{C}}$$

$$\sqrt{68} = \frac{2}{\text{Sen } \hat{C}}$$

$$\text{Sen } C = \frac{2}{\sqrt{68}} \cdot \frac{\sqrt{68}}{\sqrt{68}}$$

$$= 14°$$

$AB = \sqrt{53}$

$CP = \sqrt{68}$

(1) $\boxed{\dfrac{-2x+29}{7}=y}$

$$\frac{x-x_D}{x_C-x_D}=\frac{y-y_D}{y_A-y_D}$$

A(-3;5)
B(4;3)
C(-4;2)
D(-2;-6)
O(2;-1)

$$\frac{x+2}{-4+2}=\frac{y+6}{2+6}$$

$$\frac{x+2}{-2}=\frac{y+6}{8}$$

$$\frac{-4(x+2)-y-6}{8}=0 \longrightarrow -4x-8-y-6=0$$

$$-4x-14=y$$

(1) $\boxed{y=-4x-14}$

$$\begin{cases} y = -4x - 14 \\ y = -\dfrac{2}{7}x + \dfrac{29}{7} \end{cases}$$

$$-4x - 14 = -\frac{2}{7}x + \frac{29}{7} \quad \Big| \quad x = \ldots = -\frac{127}{26}$$

$$y = -4\left(-\frac{127}{26}\right) - 14$$

1 $\boxed{\dfrac{-2x+29}{7}=y}$

$$\begin{cases} y = -\dfrac{2}{7}x + \dfrac{29}{7} \\ -y = \cancel{+}4x \cancel{+} 14 \quad (-1) \end{cases}$$

$$0 = \left(4-\frac{2}{7}\right)x + \frac{29}{7} + 14 \Rightarrow x = \ldots$$

$$0 = \frac{26}{7}x + \frac{127}{7} \Rightarrow x = -\frac{127}{26}$$

1 $\boxed{y = -4x - 14}$

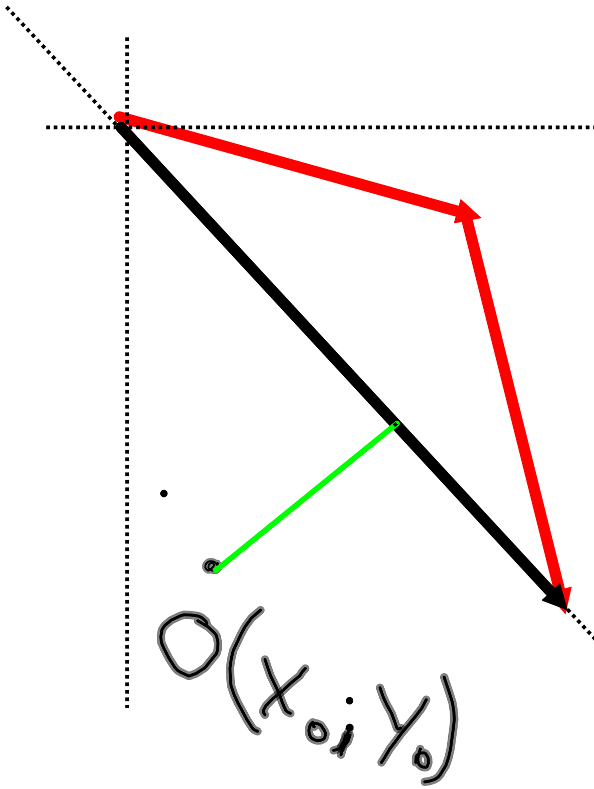
$$y = -4\left(-\frac{127}{26}\right) - 14$$

$$y = -2\left(-\frac{127}{13}\right) - 14$$

$$= \frac{254}{13} - \frac{182}{13}$$

$$= \boxed{\frac{72}{13}}$$

$$\begin{cases} y = 5x + 7 \\ y = -x - 2 \end{cases}$$



$$d = \frac{|Ax_0 + By_0 + c|}{\sqrt{a^2 + b^2}}$$

$y = mx + q$

$y - mx - q = 0$

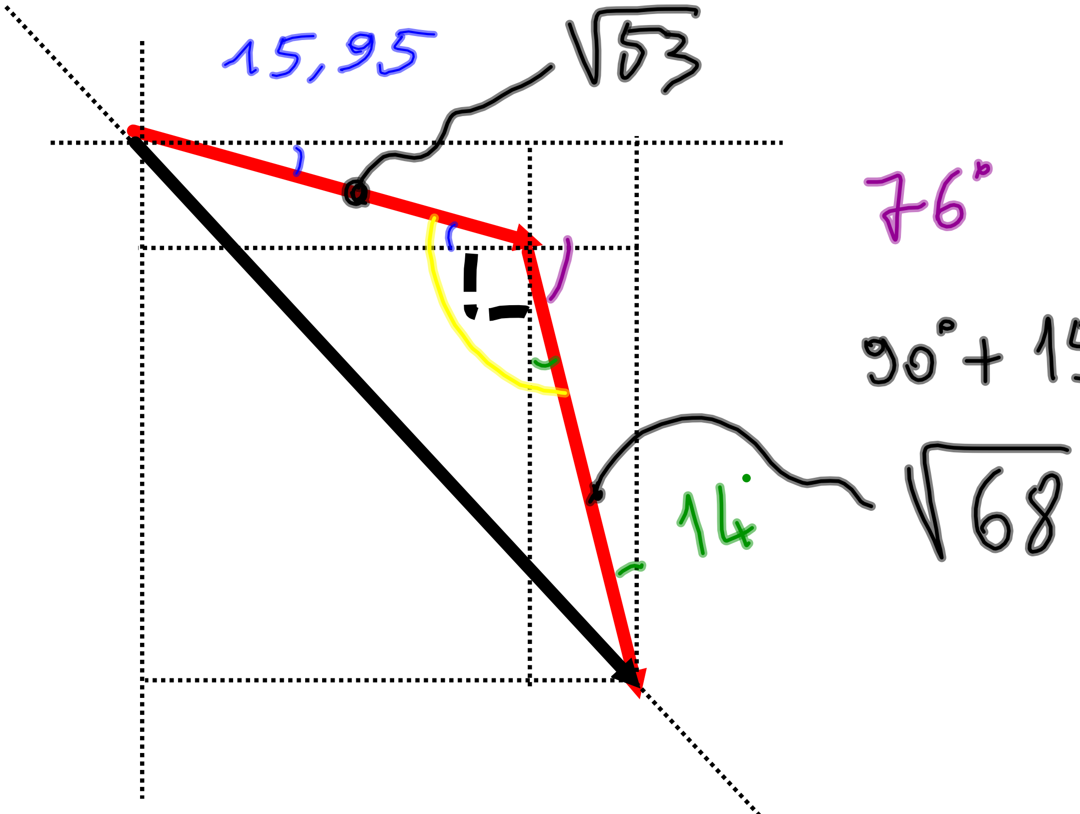
$y = -2x + 5$

$2x + y - 5 = 0$

$A = 2$

$B = 1$

$C = -5$

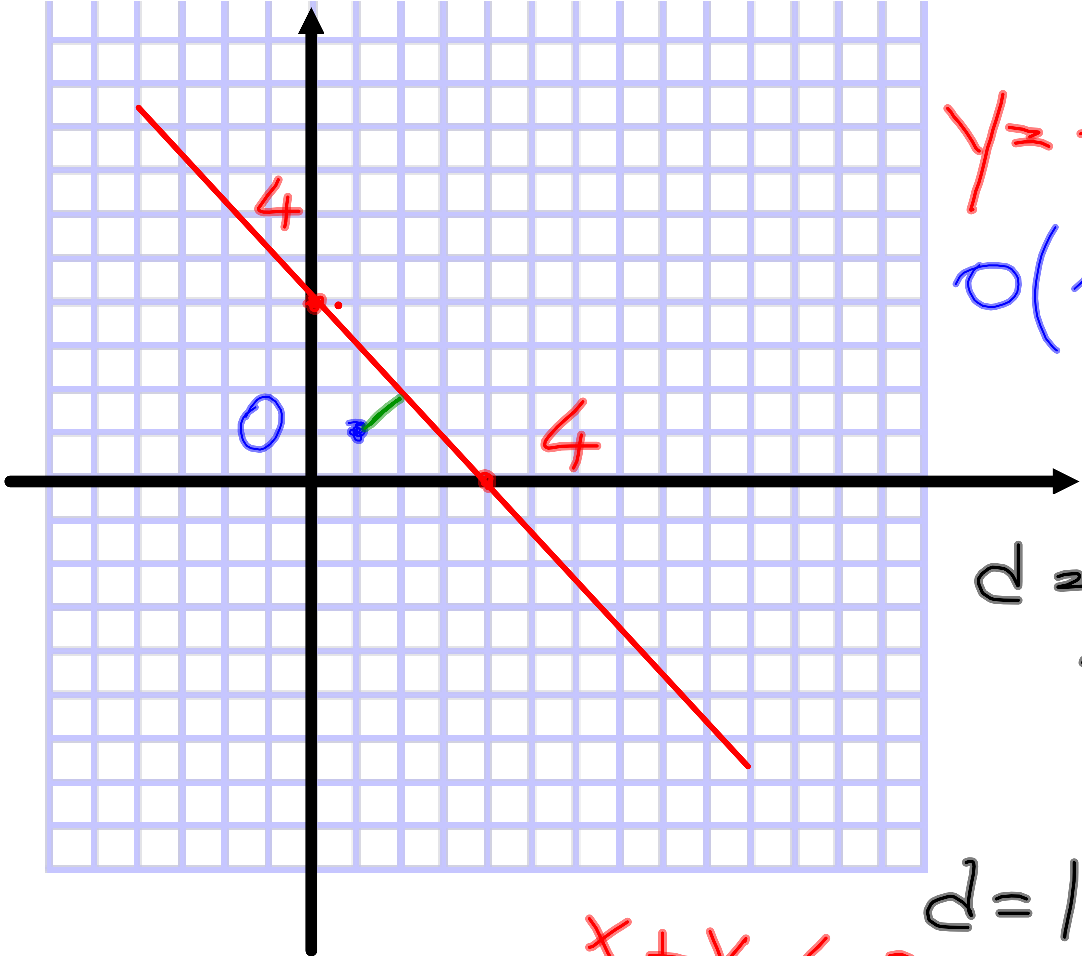


76°

$90° + 15,95 + 14$

$$F_R = \sqrt{(\sqrt{53})^2 + (\sqrt{68})^2 - 2(\sqrt{53})(\sqrt{68}) \cdot \cos(119°)}$$

$$F_R = 13,45$$



$y = -x + 4$

$O(1;1)$

$x + y - 4 = 0$

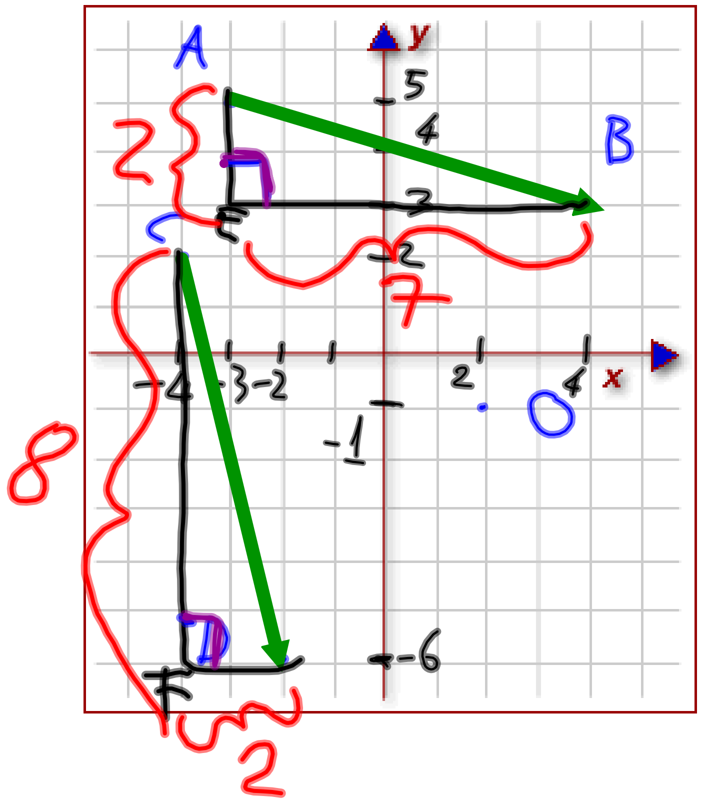
$$d = \frac{|ax_0 + by_0 + c|}{\sqrt{a^2 + b^2}}$$

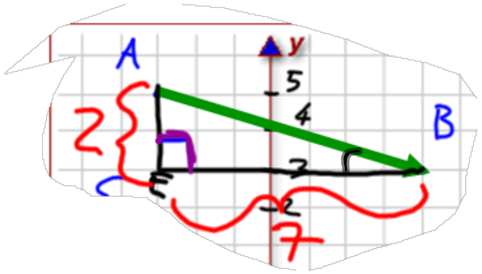
$$d = \frac{|1\cdot 1 + 1\cdot 1 - 4|}{\sqrt{1+1}}$$

$$d = \frac{4}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\cancel{4}\sqrt{2}}{\cancel{4}} = \sqrt{2}$$

$$AB = \sqrt{4+49}$$
$$= \sqrt{53}$$
$$CD = \sqrt{4+64}$$
$$= \sqrt{68}$$

A(-3;5)
B(4;3)
C(-4;2)
D(-2;-6)
O(2;-1)





$AB = \sqrt{53}$
$CP = \sqrt{68}$

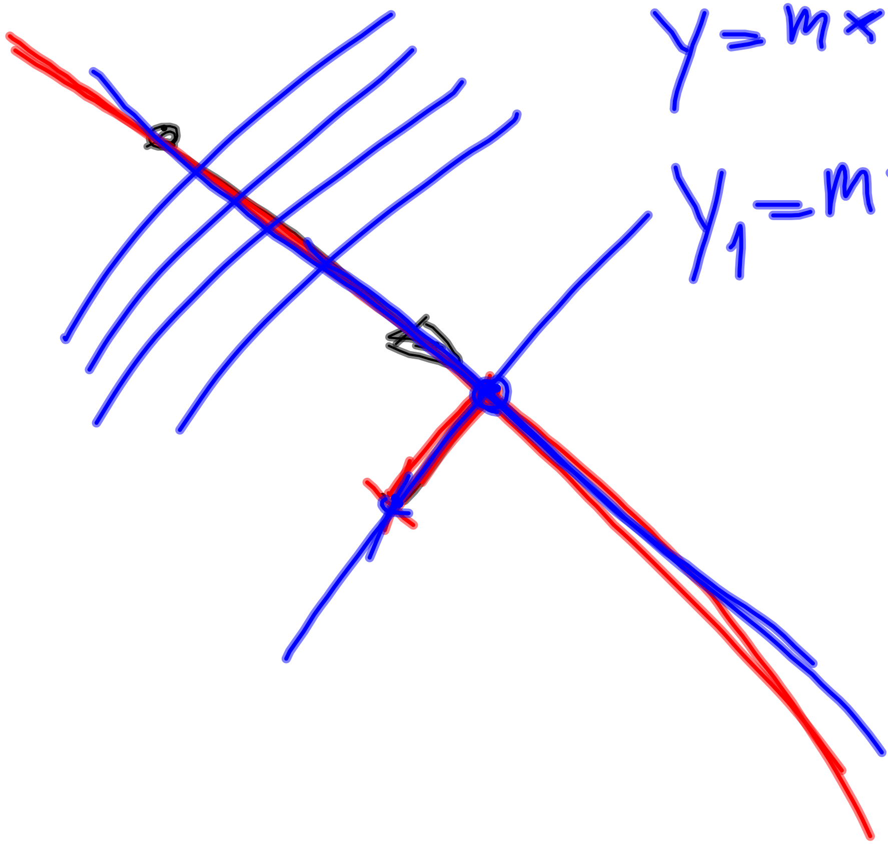
$$\frac{AB}{\text{Sen } \hat{E}} = \frac{AC}{\text{Sen } \hat{B}} \rightarrow \frac{\sqrt{53}}{\text{Sen } 90} = \frac{2}{\text{Sen } \hat{B}} \leftarrow X$$

$$\sqrt{53} = \frac{2}{\text{sen } \hat{B}}$$

$$\text{Sen } \hat{B} = \frac{2}{\sqrt{53}} \cdot \frac{\sqrt{53}}{\sqrt{53}}$$

$$\hat{B} = 15{,}95^\circ$$

$$\hat{A} = 180^\circ - (90 + 15{,}95)$$
$$= 180^\circ - 105{,}95$$
$$= 74{,}05^\circ$$



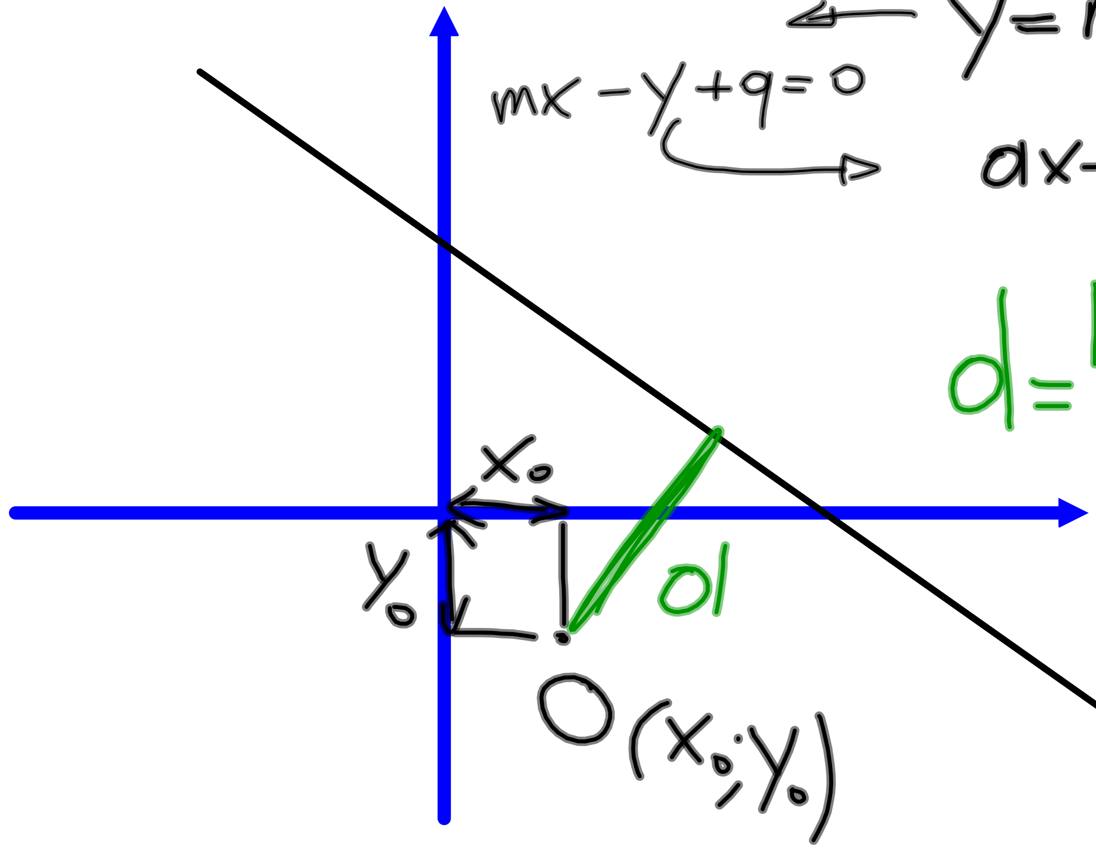
$$y = mx + q$$

$$y_1 = m x_1 + q + K_1$$

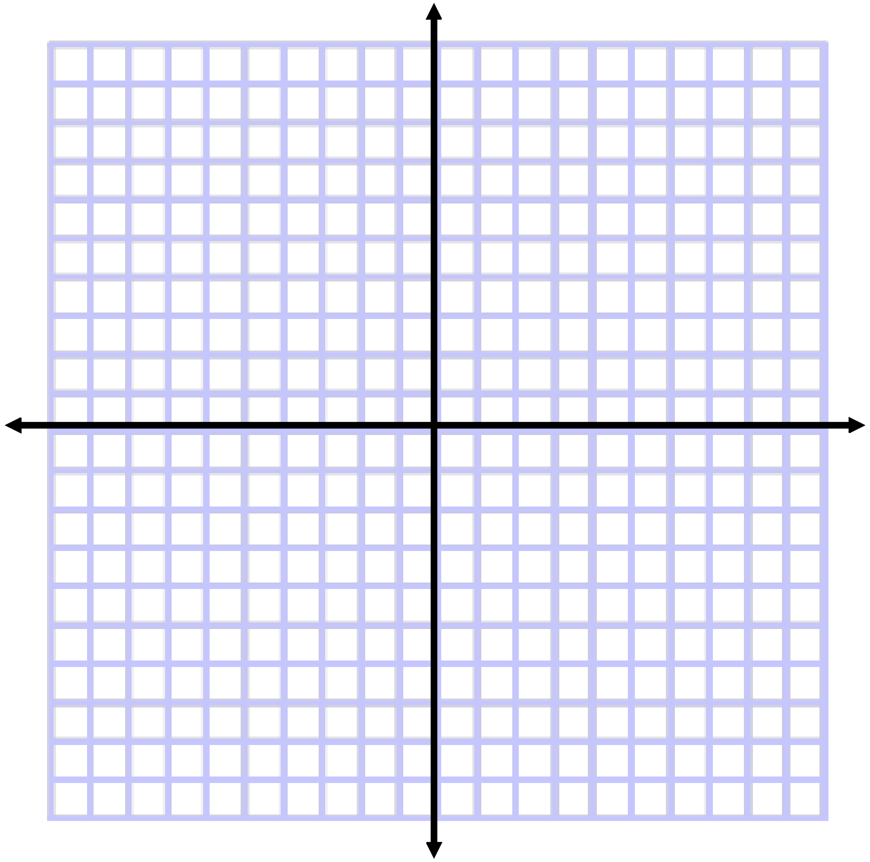
$$y = mx + q$$

$$mx - y + q = 0$$

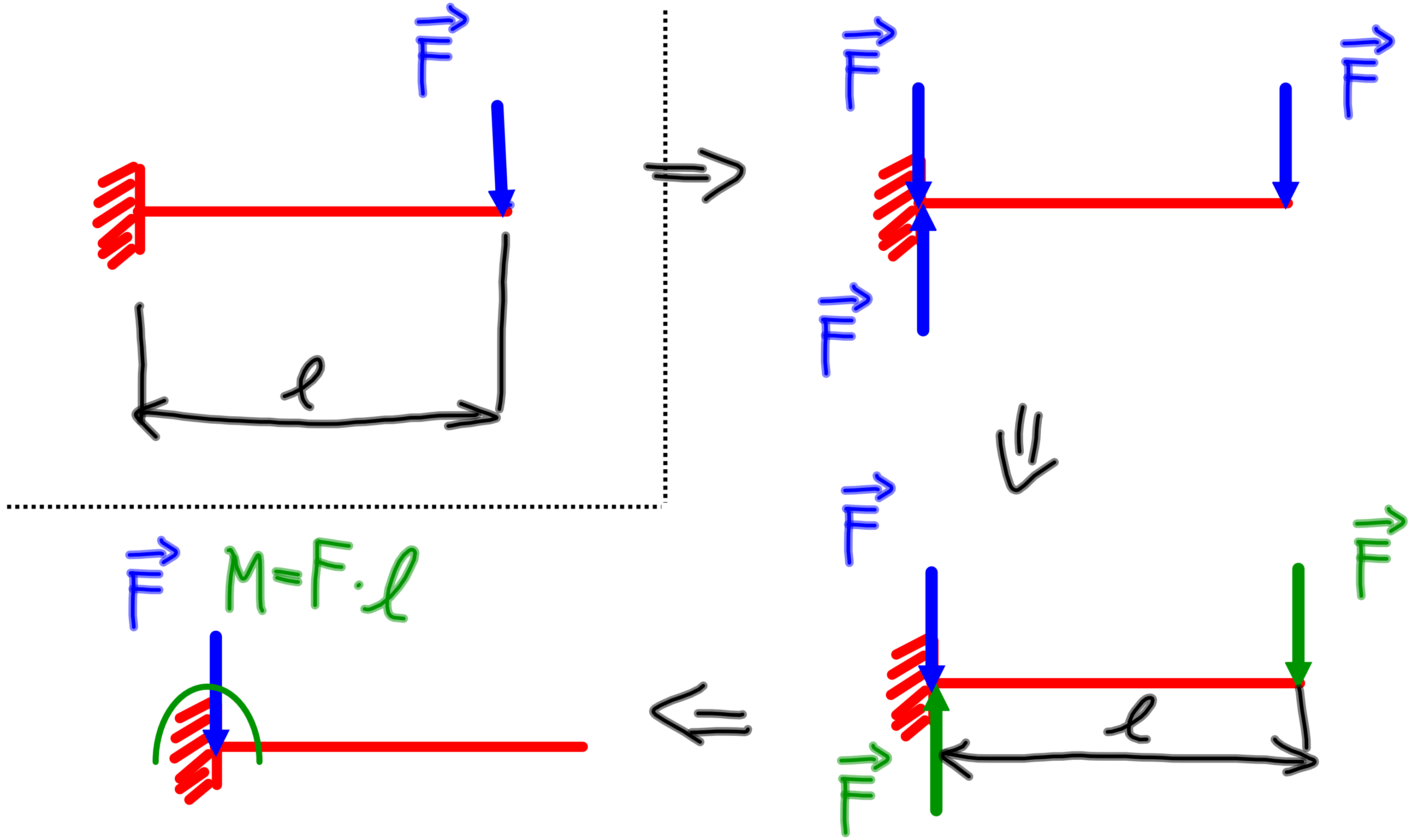
$$ax + by + c = 0$$



$$d = \frac{|ax_0 + by_0 + c|}{\sqrt{a^2 + b^2}}$$



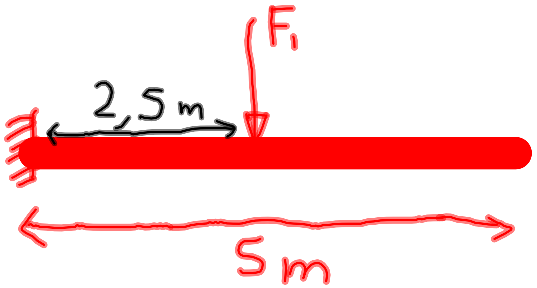
TRASPOSIZIONE DI UNA FORZA

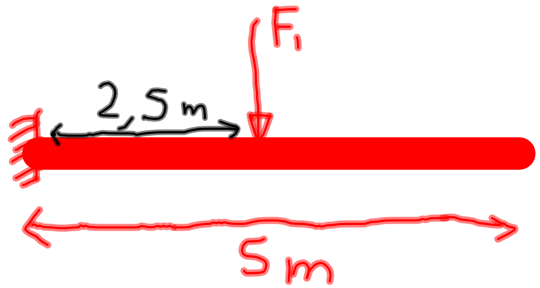


esercizio

= METÀ

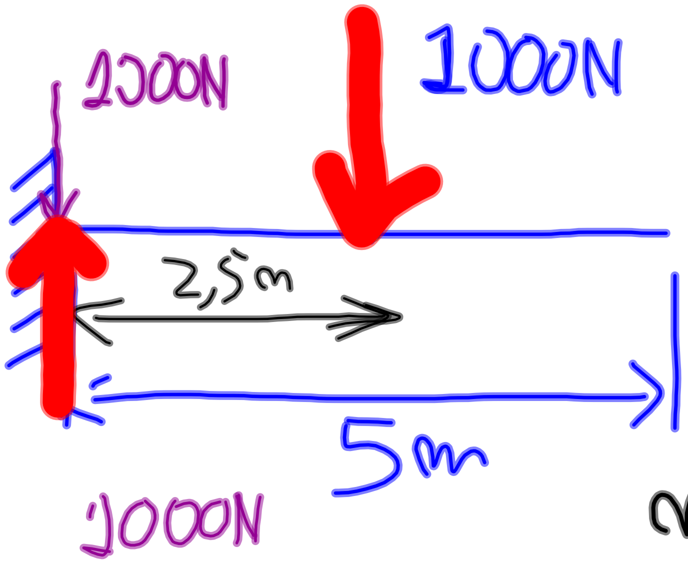
una forza di 1000N è applicata (verso il basso) ~~in~~ ~~mezzeria~~ di una trave lunga 5m. Calcolare il sistema forza-coppia equivalente

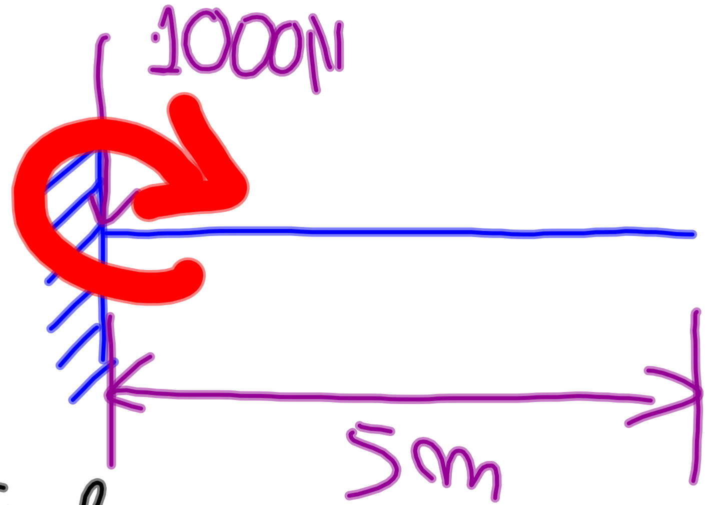




esercizio

una forza di 1000N è applicata (verso il basso) in mezzeria di una trave lunga 5m. Calcolare il sistema forza-coppia equivalente





$$m = F \cdot l = 1000 \cdot 2,5 = 2500\ N \cdot m$$