

Jema Lab 1

2. Determinati imaginea triumphiului ABC primtr-o scolare simplé meuniforms, de factori de scolo (2,1), relativ la punctul Q(2,2), urmato de o ratatio de umphi 30° foto de origina.

Tol: Îm capem en occlore simple menniformes de foctori acoló (2,1), relativ la punctul Q(2,2).

-mai întôi mutom punctul Pîn origina, facem ocolore și dupó mutom punctul Pîngroi

=) matricea emopeno sultrii se sorie:

$$S_{Q}(2,1) = T(2,2) \cdot S(2,1) \cdot T(-2,-2) \cdot 0$$

$$T(2,2) = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$$

$$S(2,1) = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \Rightarrow 0 = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$S(2,1) = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \Rightarrow 0 = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$T(-2,2) = \begin{cases} 1 & 0 & -2 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{cases}$$

$$= \begin{cases} 0 & (1-2) &$$

$$= S_{Q}(2,1) = \begin{bmatrix} 2 & 0 & (1-2) \cdot 2 \\ 0 & 1 & (1-1) \cdot 2 \end{bmatrix} = \begin{bmatrix} -2 & 0 & -2 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

 $S_{Q}(2,1) = \begin{cases} 2 & 0 & (1-2)\cdot 2 \\ 0 & 1 & (1-1)\cdot 2 \end{cases} = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 1 & (1-1)\cdot 2 \end{bmatrix} = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 0 & 1 \end{bmatrix}$ Retation de surpohi 30° fatio de origine sote. Ret $(\theta) = \begin{bmatrix} \cos \theta & -\sin \theta & 0 \\ \sin \theta & \cos \theta & 0 \end{bmatrix}$, unde $\theta = 30^{\circ}$ $S_{Q}(2,1) = \begin{bmatrix} 2 & 0 & (1-2)\cdot 2 \\ 0 & 0 & 1 \end{bmatrix}$ $S_{Q}(2,1) = \begin{bmatrix} 2 & 0 & (1-2)\cdot 2 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 0 & 1 \end{bmatrix}$ $S_{Q}(2,1) = \begin{bmatrix} 2 & 0 & (1-2)\cdot 2 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 0 & 1 \end{bmatrix}$ $S_{Q}(2,1) = \begin{bmatrix} 2 & 0 & (1-2)\cdot 2 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 0 & 1 \end{bmatrix}$ $S_{Q}(2,1) = \begin{bmatrix} 2 & 0 & (1-2)\cdot 2 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 0 & 1 \end{bmatrix}$ $S_{Q}(2,1) = \begin{bmatrix} 2 & 0 & (1-2)\cdot 2 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 0 & 1 \end{bmatrix}$

=) tromformoreo este epoló en
$$T = \text{Ret}(90^\circ)$$
. $S_Q(2,1) = \begin{bmatrix} 0 & -1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$. $\begin{bmatrix} 2 & 0 & -2 \\ 0 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 0 & -1 & 0 \\ 2 & 0 & -2 \\ 0 & 0 & 1 \end{bmatrix}$

=) Imaginea triumphuilui este dotte de:

The sime of the imphility is able de:

$$\begin{bmatrix} A' & B' & C' \end{bmatrix} = T_1 \cdot \begin{bmatrix} A & B & C \end{bmatrix} = \begin{bmatrix} 0 & -1 & 0 \\ 2 & 0 & -2 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 4 & 2 \\ 1 & 1 & 3 \end{bmatrix} = \begin{bmatrix} -1 & -1 & -3 \\ 0 & 6 & 2 \\ 1 & 1 & 1 \end{bmatrix}$$

$$= \begin{cases} Coordon dela cortesione sle of a A'B'C' sunt: \\ A'(-1,0), B'(-1,6), C'(-3,2)$$

3. Determinati imaginea friunghiubei ABC printr-o forficare de unali 45°, relativo la punatul Q(2,2), sin directio v-(2,1).

Sol: Avem formula:

There
$$(Q, v, p_0) = \begin{pmatrix} 1 + t_2 \Theta v_1 v_2 & -t_2 \Theta v_1^2 & t_2 \Theta v_1 (v_1 g_2 - v_2 g_1) \\ t_2 \Theta v_2^2 & 1 - t_2 \Theta v_1 v_2 & t_2 \Theta v_2 (v_1 g_2 - v_2 g_1) \end{pmatrix}$$

unde 31, 92 runt coordonatele punctului Q; v1, v2 sunt coordonatele versarelui v

=) Theor
$$(Q, v; 1) = \begin{cases} 1+2, & -4, & 2(4-2) \\ 1, & 1-2, & 4-2, \\ 0, & 0, & 1 \end{cases} = \begin{bmatrix} 3 & -4 & 4 \\ 1 & -1 & 2 \\ 0 & 0 & 1 \end{cases}$$

=) Imapinea - riunghiubui esta dato de:

Imagine o triumphiubui esta dato ele:

[A' B' C'] = Theor (Q, v, 1). [1 4 2] =
$$\begin{bmatrix} 3 & -4 & 4 \\ 1 & 1 & 3 \end{bmatrix}$$
 = $\begin{bmatrix} 1 & 4 & 2 \\ 4 & 1 & 3 \end{bmatrix}$ = $\begin{bmatrix} 1 & 4 & 2 \\$

=) Coordonatele contesiene de of. sa's'c' aunt:

4. Leterminati imaginea AABC prim reflexie relative la draopta 2×134-5=0

Yol: Formulo aste:
$$R_{\Delta} = T(0, -\frac{C}{4}) \cdot Rat(\Theta) \cdot R_{*} \cdot Rat(-\Theta) \cdot T(0, -\frac{C}{4}) = ... = C \cdot R_{\Delta}^{2} = 0$$

$$= \begin{pmatrix} \frac{b^2-a^2}{a^2+b^2} & -\frac{2ab}{a^2+b^2} & -\frac{2ac}{a^2+b^2} \\ -\frac{2ab}{a^2+b^2} & -\frac{b^2-a^2}{a^2+b^2} & -\frac{2bc}{a^2+b^2} \end{pmatrix}. \text{ Assem scentio fermulo pt. co and de replante nu tate reticolò, solicò b $\neq 0$.}$$

$$= \Re_{\Delta} = \begin{bmatrix} \frac{5}{13} & -\frac{12}{13} & \frac{20}{13} \\ -\frac{12}{2} & \frac{5}{30} \end{bmatrix} \Rightarrow \text{ Imagoinea triung higher este deto de:}$$

=)
$$R_{\Delta} = \begin{bmatrix} \frac{5}{13} & -\frac{12}{13} & \frac{20}{13} \end{bmatrix}$$
 =) Imagoinea triumphiului este deto de

$$[A'G'C'] = R_{\Delta} \cdot [ABC] = \begin{bmatrix} \frac{5}{13} & -\frac{12}{13} & \frac{20}{13} \\ -\frac{12}{13} & \frac{5}{13} & \frac{30}{13} \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} \frac{1}{1} & \frac{27}{13} & -\frac{6}{13} \\ \frac{1}{1} & \frac{23}{13} & -\frac{9}{13} \\ 1 & 1 & 1 \end{bmatrix}$$

=) boordonatele votosiene de 2/ DA's'c' runt:

$$A'(1,1)$$
, $G'(\frac{28}{13})$, $e'(\frac{6}{13})$, $e'(\frac{6}{13})$

5. Determinati imaginea triunghiului ABC prim ratalio eu 90° Den jurul punctalui C, urmato de reflexia relatir la dreapta AB.

In origine, rotatio si dupo mutorea punctului mapoi.

$$Ret(900) = \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$T(2,3) = \begin{cases} 1 & 0 & 2 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{cases}$$

$$T(-2,-3) = \begin{cases} 1 & 0 & -2 \\ 0 & 1 & -3 \\ 0 & 0 & 1 \end{cases}$$

$$Rat(900) = \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{cases}$$

$$=)Rat_{C}(900) = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & -2 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix} =$$

$$= \begin{bmatrix} 0 & -1 & 2+3 \\ 1 & 0 & -2+3 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & -1 & 5 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

Rontru oflores ecuatiei draptei AB, closerzóm có y A - 26=1=) AC sate orizontoló =) y=1=) y-1=0

$$=) R_{\Delta} = \begin{cases} \frac{b^{2}-a^{2}}{a^{2}+b^{2}} & -\frac{2ab}{a^{2}+b^{2}} & \frac{2a+b^{2}}{a^{2}+b^{2}} \\ -\frac{2ab}{a^{2}+b^{2}} & -\frac{2bc}{a^{2}+b^{2}} & -\frac{2bc}{a^{2}+b^{2}} \end{cases} = \begin{cases} 1 & 0 & 0 \\ 0 & -1 & 2 \\ 0 & 0 & 1 \end{cases}$$

$$=) \text{Trom firmotion interesting poly our } T = R_{\Delta} \cdot \text{Ret}_{C}(30^{\circ}) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 2 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 0 & -1 & 5 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

$$=) \text{Trom firmotion interesting poly our } \Delta Abc \text{ exite data de:}$$

=) Transformorea este egodo cu
$$T=R_{\Delta}$$
. Ret $C(30^\circ)=\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$. $\begin{bmatrix} 0 & -1 & 5 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

=> Imprimea DABC este doto de:

reprimed SABC este dato de:
$$[A'B'C'] = T. (ABC] = \begin{bmatrix} 0 & -1 & 5 \\ -1 & 0 & 1 \end{bmatrix} . \begin{bmatrix} 142 \\ 113 \\ 111 \end{bmatrix} = \begin{bmatrix} 442 \\ 0 & -3 & -1 \\ 0 & 0 & 1 \end{bmatrix}$$

=) Coordonatele cortosiene de y! DA'O'C' sunt: