$f(1)=f(2) \Rightarrow$ zobrazení je jednoznačně dáno surjekcí mn. $\{2,3,4,5\}$ na $\{1,2,3\}$.

Tedy je

$$\underline{\underline{3^5 - \binom{3}{2} 2^4 + 3}}$$

2, $\Omega = \{(1,1),(1,2),\ldots(6,1),\ldots,(6,6)\}$

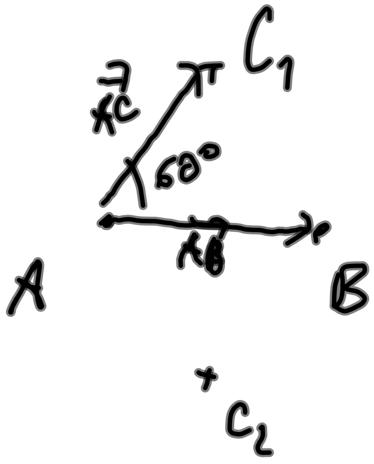
$|\Omega| = 36$

A.... na některé kostce padlo č. 2

B.... padl sudý součet

$A \cap B = \{(2,2),(2,4),(2,6),(4,2),(6,2)\}$

$$p(A/B) = \frac{p(A\cap B)}{p(B)} = \frac{\frac{|A\cap B|}{|\Omega|}}{\frac{|B|}{|\Omega|}} = \frac{|A\cap B|}{|B|} = \frac{5}{18}$$



$$\underline{C = A + \vec{AC}} = $$
$$= A + R_{60°}(\vec{AB})$$

$$R_{60°} = \begin{pmatrix} \cos 60° & -\sin 60° \\ \sin 60° & \cos 60° \end{pmatrix} =$$

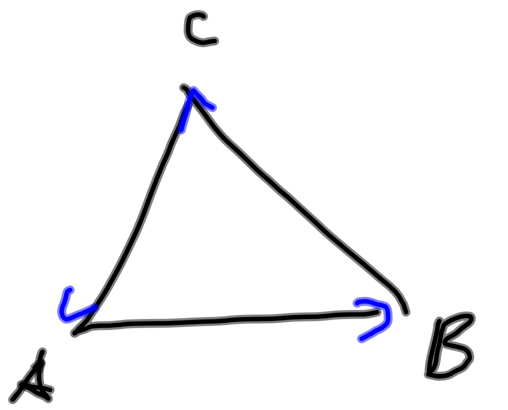
$A = [1,2]$
$B = [4,1]$, $\vec{AB} = (3,-1)$

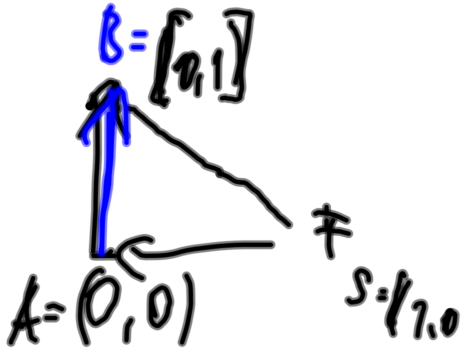
$$= \begin{pmatrix} \frac{1}{2} & -\frac{\sqrt{3}}{2} \\ \frac{\sqrt{3}}{2} & \frac{1}{2} \end{pmatrix}.$$

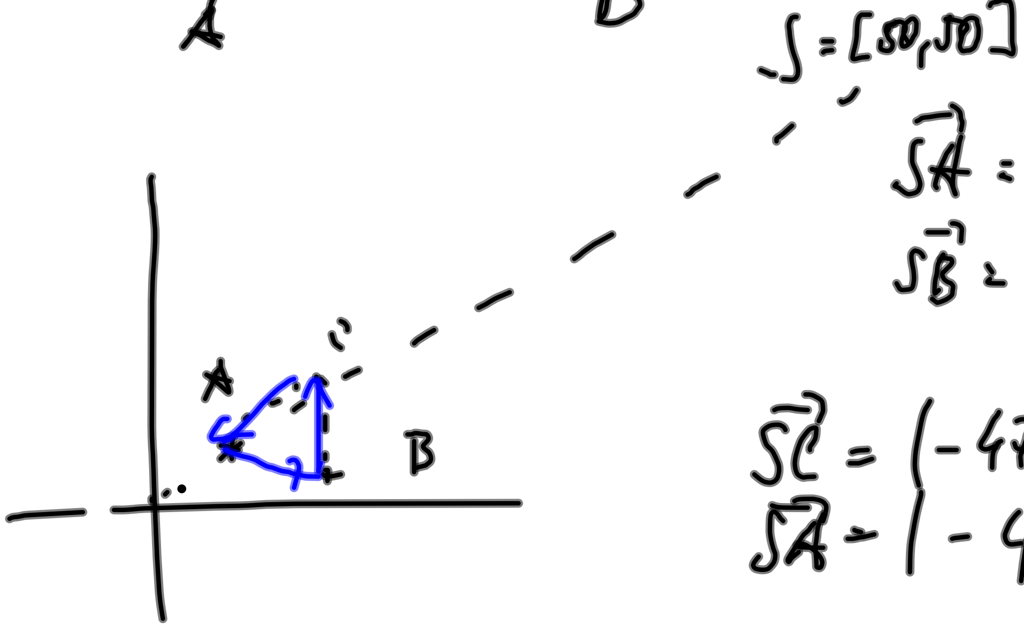
$$\vec{AC} = R_{60°}(\vec{AB}) = \begin{pmatrix} \frac{1}{2} & -\frac{\sqrt{3}}{2} \\ \frac{\sqrt{3}}{2} & \frac{1}{2} \end{pmatrix} \begin{pmatrix} 3 \\ -1 \end{pmatrix} = \begin{pmatrix} \frac{3}{2} + \frac{\sqrt{3}}{2} \\ \frac{3\sqrt{3}}{2} - \frac{1}{2} \end{pmatrix}$$

$$C = [1,2] + \left(\frac{3}{2} + \frac{\sqrt{3}}{2}, \frac{3\sqrt{3}}{2} - \frac{1}{2}\right) = \left[\frac{5}{2} + \frac{\sqrt{3}}{2}, \frac{3}{2} + \frac{3\sqrt{3}}{2}\right]$$

$+ S$







$$\vec{SA} = (-1,0)$$
$$\vec{SB} = (-1,1)$$
$$\begin{vmatrix} -1 & 0 \\ -1 & 1 \end{vmatrix} < 0$$

$$\vec{SC} = \left(-47{,}5 + \frac{\sqrt{3}}{2},\ -48{,}5 + \frac{3\sqrt{3}}{2}\right)$$
$$\vec{SA} = (-49,\ -48)$$

$$\begin{vmatrix} \vec{SC} \\ \vec{SA} \end{vmatrix} = \begin{vmatrix} -47{,}5 + \frac{\sqrt{3}}{2} & -48{,}5 + \frac{3\sqrt{3}}{2} \\ -49 & -48 \end{vmatrix} =$$

$$= 48\left(47{,}5 - \frac{\sqrt{3}}{2}\right) - 49\left(48{,}5 - \frac{3\sqrt{3}}{2}\right) =$$

$$\cancel{48\left(47{,}5-\frac{\sqrt{3}}{2}\right)}-(48+1)\left(\underbrace{\cancel{47{,}5-\frac{\sqrt{3}}{2}}}\underbrace{-\sqrt{3}+1}\right)=$$

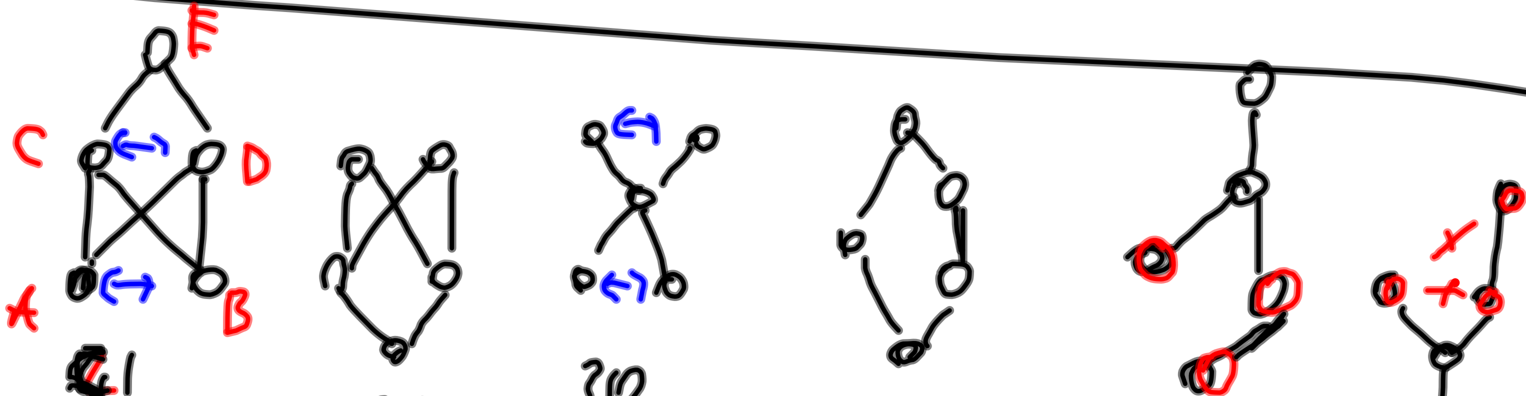
$$=+\,48\cdot\left(\sqrt{3}-1\right)-\left(48{,}5-\frac{3\sqrt{3}}{2}\right)<$$

$$<+\underbrace{48\cdot 0{,}8}_{\overset{\wedge}{40}}-\left(\underset{\overset{\vee}{40}}{58{,}5-\frac{3\sqrt{3}}{2}}\right)<0$$

$$\begin{array}{r} 18 \\ 18 \\ \hline 144 \\ 18 \\ \hline 324 \end{array}$$

AC vidím z $[50, 50]$.

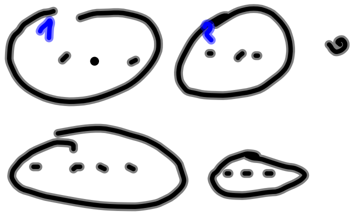
$2^5 - 2$



$\frac{5!}{4} = 30$ $\quad$ 30 $\quad$ 30 $\quad$ $5! = 120$ $\quad$ $5!$ $\quad$ $5!$

$\Sigma = 450$

a) 1 není v relaci s 2

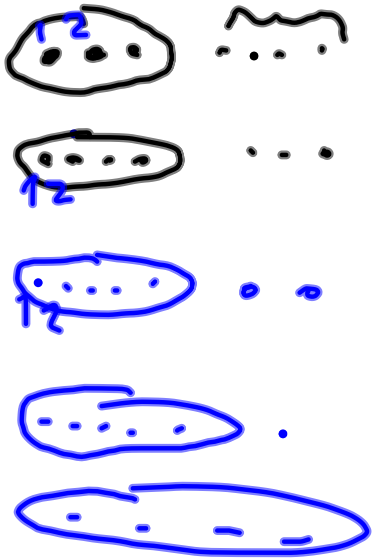


$\binom{5}{2} \cdot 3 = 30$

$2 \cdot \binom{5}{2} = 20$

b) 1 je v relaci s 2

libovolné



$5 \cdot 15 = 75$

$\binom{5}{2} \cdot 5 = 50$

$\binom{5}{3} \cdot 2 = 20$

5

1

151

201

$203 - 52 = 151$

Všech relací ekvivalence na 6-ti prvkové mn. je 203.

Těch, které obsahují některou ze zakázaných dvojic je

$$\binom{3}{2}\cdot 52 - 2\cdot 15.$$

Celkem $203 - \left(\binom{3}{2}\cdot 52 - 2\cdot 15\right) =$

$= 77$

$$\begin{pmatrix} \frac{1}{3} & 0 & -\frac{2}{3} \\ 1 & -1 & 0 \\ -\frac{2}{3} & 1 & \frac{1}{3} \end{pmatrix} \begin{pmatrix} 1 \\ -1 \\ 3 \end{pmatrix} = \begin{pmatrix} -\frac{5}{3} \\ 2 \\ -\frac{2}{3} \end{pmatrix}$$

$$x + 2y - z = 5\;0 \Rightarrow z = x + 2y - 5$$

$$(t, s, t + 2s - 5), \quad t, s \in \mathbb{R}$$

$$x = t, \quad y = s, \quad z = t + 2s - 5$$

$$\cancel{(0, 0, -5)} + t(1, 0, 1) + s(0, 1, 2), \quad t, s \in \mathbb{R}$$

$f: \mathbb{R}^2 \to \mathbb{R}^2$

$$[x, y] \longmapsto [f_1(x,y), f_2(x,y)]$$

$$[ax+by+c, dx+ey+f]$$

$a, b, c, d, e, f \in \mathbb{R}$

$$f[x, y] = \underbrace{\begin{pmatrix} a & b \\ d & e \end{pmatrix}}_{A} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{bmatrix} c \\ f \end{bmatrix}$$

$c = f = 0 \rightsquigarrow f(\vec{u} + \vec{v}) = f(\vec{u}) + f(\vec{v})$

$g \sim B$

$f \circ g \sim A \cdot B$

$f \circ g(\vec{u}) = f(g(\vec{u}))$

$$\begin{pmatrix} \frac{1}{2} & -\frac{\sqrt{3}}{2} \\ \frac{\sqrt{3}}{2} & \frac{1}{2} \end{pmatrix}^3 = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$$

$R_{180} = S$ … středová souměrnost

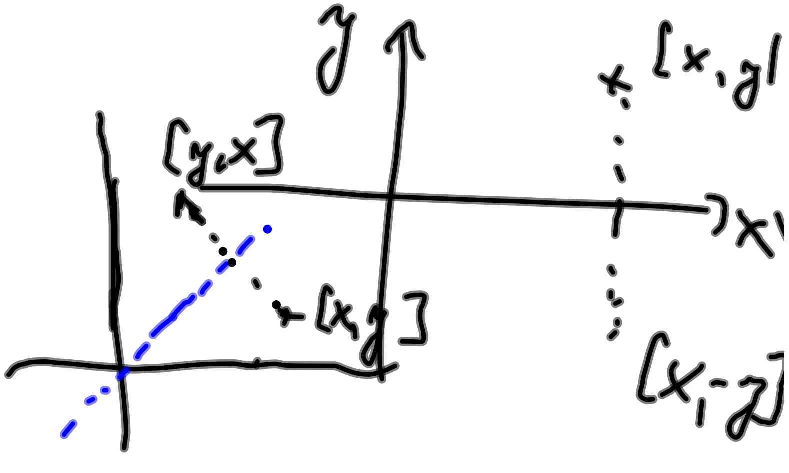
$$\sim \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -x \\ -y \end{pmatrix}$$

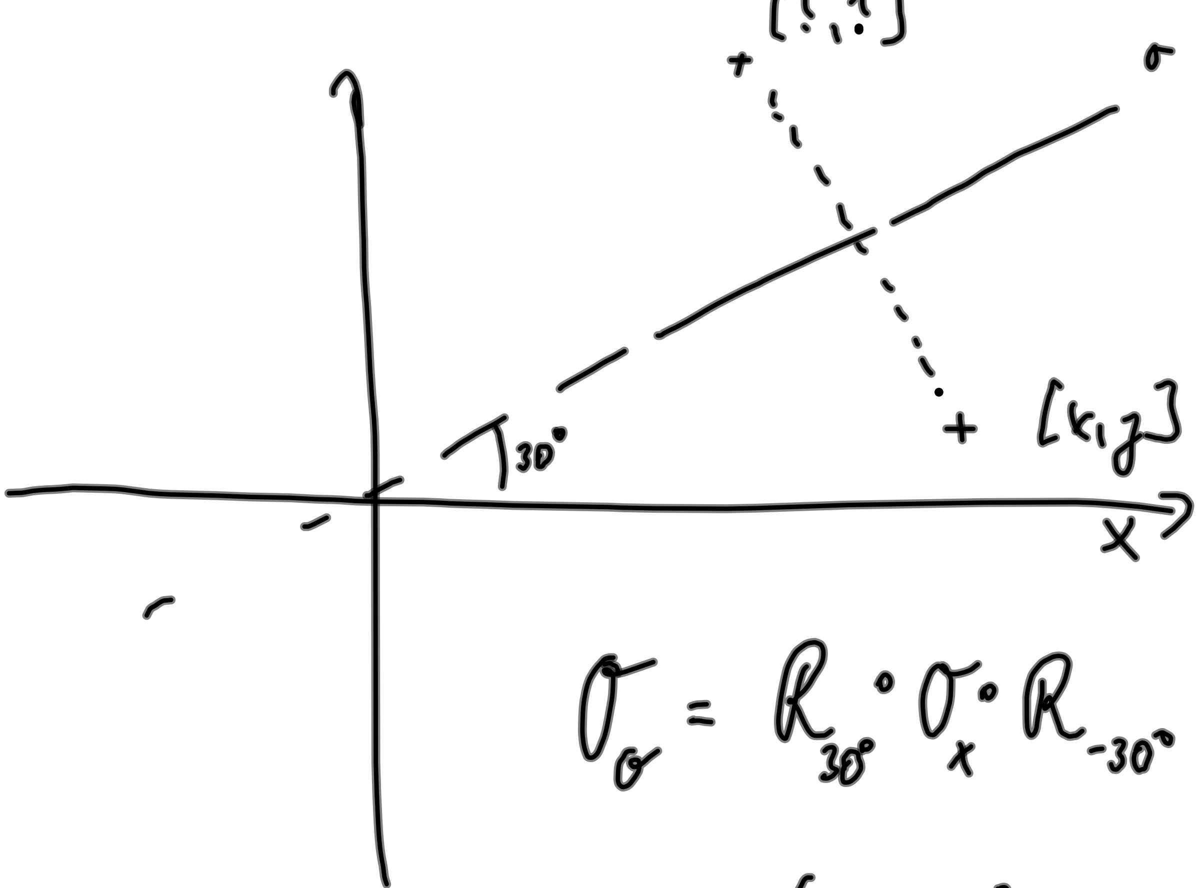
$[x,y] \mapsto [x,-y]$

$$\sim \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

$[x,y] \mapsto [y,x]$

$$\sim \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$





$$\sigma_a = R_{30^\circ} \circ \sigma_x \circ R_{-30^\circ}$$

$$R_{-30^\circ} \sim \begin{pmatrix} \cos 30^\circ & \sin 30^\circ \\ -\sin 30^\circ & \cos 30^\circ \end{pmatrix} = \begin{pmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ -\frac{1}{2} & \frac{\sqrt{3}}{2} \end{pmatrix}$$

$$\sigma_a = \begin{pmatrix} \frac{\sqrt{3}}{2} & -\frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2} \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ -\frac{1}{2} & \frac{\sqrt{3}}{2} \end{pmatrix} =$$

$$\begin{pmatrix} \frac{\sqrt{3}}{2} & -\frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2} \end{pmatrix} \begin{pmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ \frac{1}{2} & -\frac{\sqrt{3}}{2} \end{pmatrix} = \begin{pmatrix} \frac{3}{4} - \frac{1}{4} & \frac{\sqrt{3}}{4} + \frac{\sqrt{3}}{4} \\ \frac{\sqrt{3}}{4} + \frac{\sqrt{3}}{4} & \frac{1}{4} - \frac{3}{4} \end{pmatrix} =$$

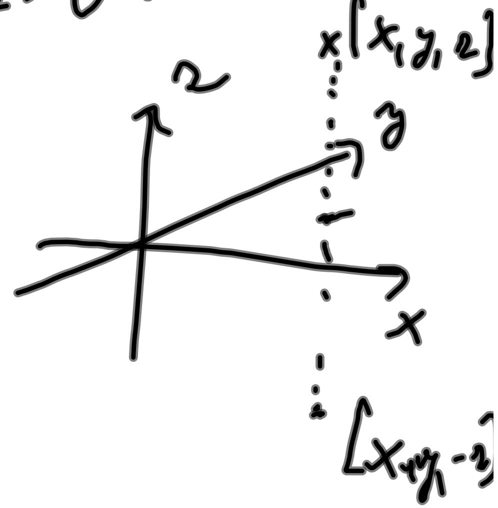
$$= \begin{pmatrix} \frac{1}{2} & \frac{\sqrt{3}}{2} \\ \frac{\sqrt{3}}{2} & -\frac{1}{2} \end{pmatrix}$$

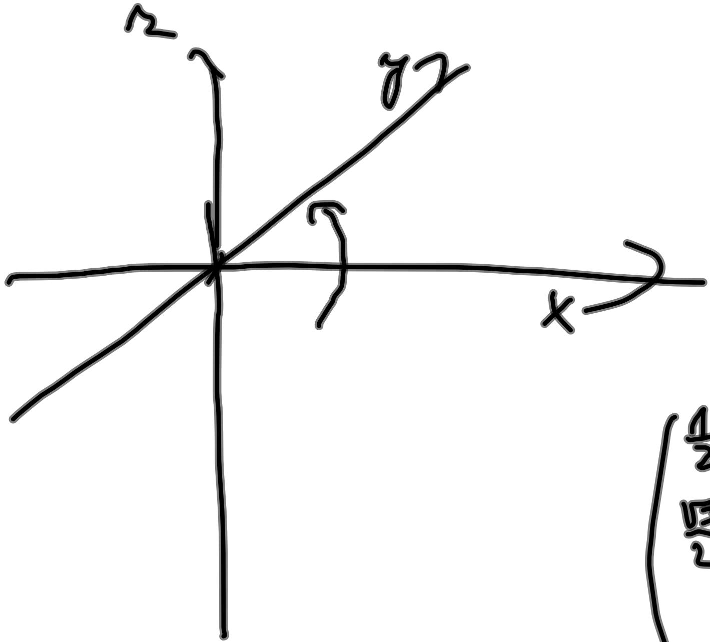
---

v $\mathbb{R}^3$: zrcadlení podle roviny $z = 0$:

$$[x, y, z] \longmapsto [x, y, -z]$$

$$\sim \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{pmatrix}$$





Rotace kolem osy z

v kladném smyslu o 60°

$$\begin{pmatrix} \frac{1}{2} & -\frac{\sqrt{3}}{2} & 0 \\ \frac{\sqrt{3}}{2} & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

$$[x, y, z] \mapsto \left[\frac{1}{2}x - \frac{\sqrt{3}}{2}y,\ \frac{\sqrt{3}}{2}x + \frac{1}{2}y,\ z\right]$$