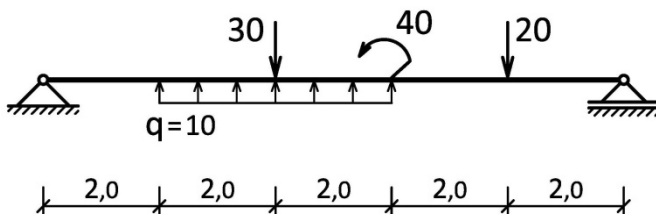


ГРАЂЕВИНСКИ ФАКУЛТЕТ УНИВЕРЗИТЕТА У БЕОГРАДУ
 Усмени (теоријски) део испита из **ТЕХНИЧКЕ МЕХАНИКЕ 1**
 (писмени део одржан 31.08.2020.)

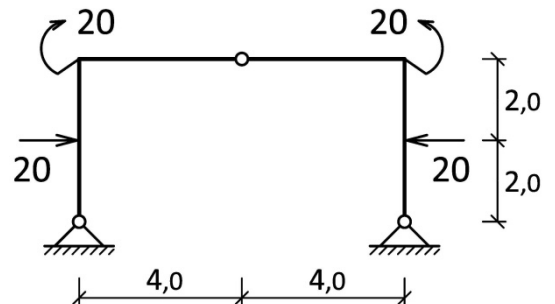
1. ЗАДАТАК (условни 50 %)

Нацртати дијаграме сила у пресеку за приказане носаче.

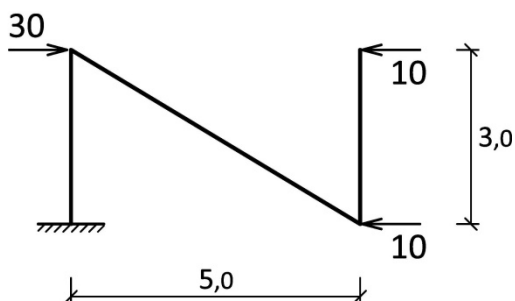
а)



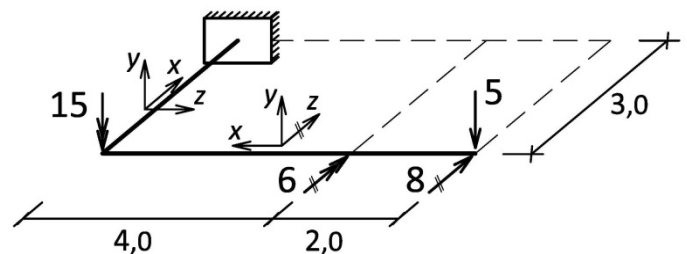
б)



в)



г)

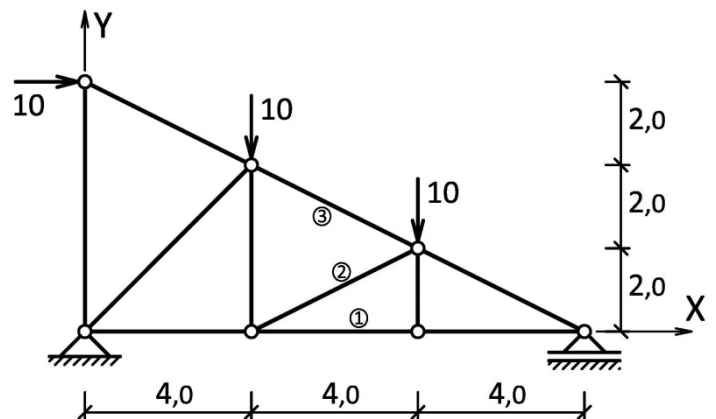


2. ЗАДАТАК (30 %)

а) Укратко објаснити Кремонин поступак за одређивање сила у штаповима решеткастог носача.

б) Применом Ритеровог поступка одредити силе у штаповима 1, 2 и 3 приказаног решеткастог носача.

в) Одредити резултанту (вектор и једначину нападне линије у систему x-y) спољашњих активних сила које делују на приказани решеткасти носач.

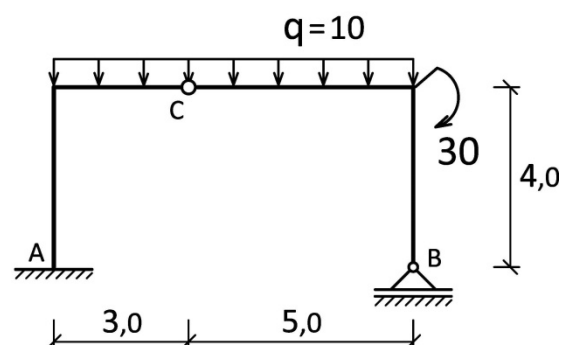


3. ЗАДАТАК (20 %)

а) За које везе се каже да су идеалне?

б) Применом опште једначине статике, код приказаног носача одредити:

- * моменат у укљештењу А,
- * реакцију везе у ослонцу В.

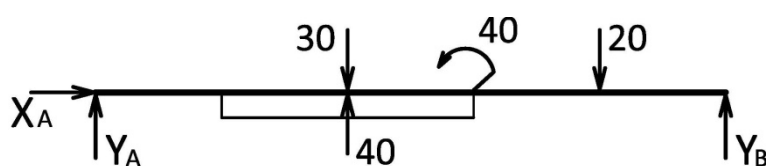
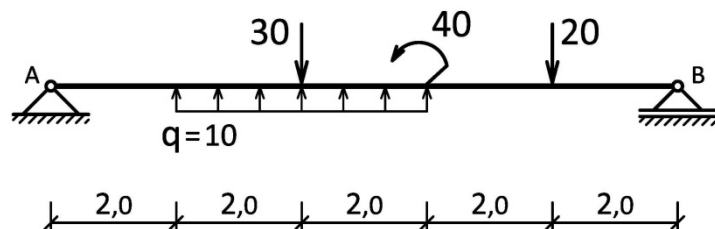


Напомена: У свим задацима димензије за дужине и силе су: m, kN

- Р Е Ш Е Њ А -

1. ЗАДАТАК (условни 50 %)

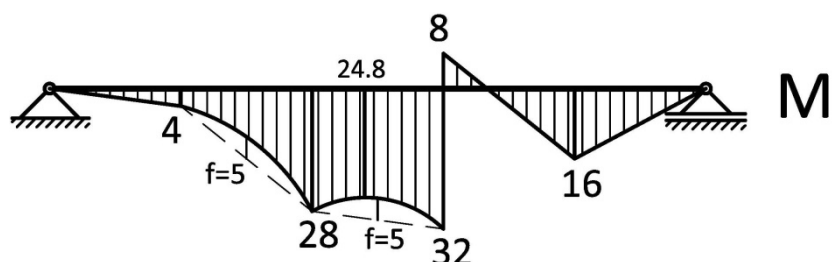
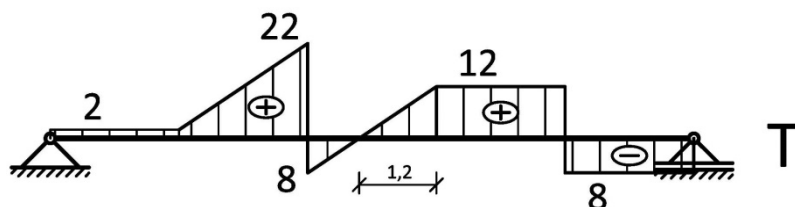
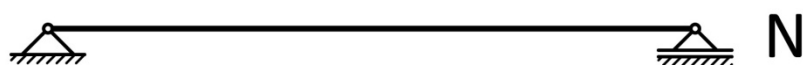
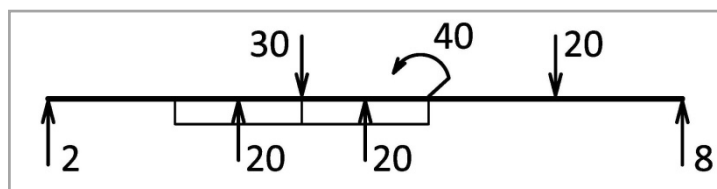
a)



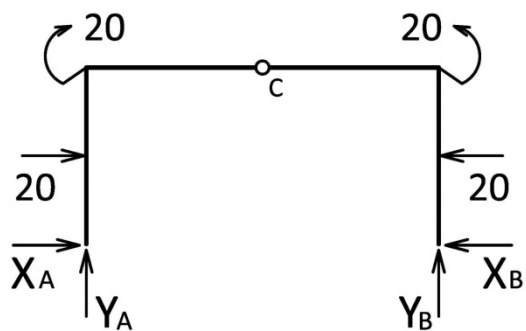
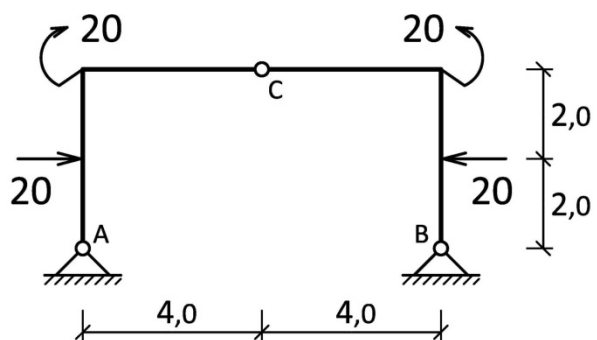
$$\sum F_X = 0 : \underline{X_A = 0}$$

$$\sum M_A = 0 : Y_B \cdot 10 - 30 \cdot 4 + 40 \cdot 4 + 40 - 20 \cdot 8 = 0 \rightarrow \underline{Y_B = 8}$$

$$\sum F_Y = 0 : Y_A + Y_B - 30 + 40 - 20 = 0 \rightarrow \underline{Y_A = 2}$$



6)

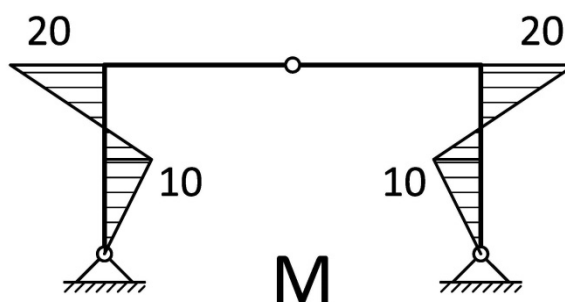
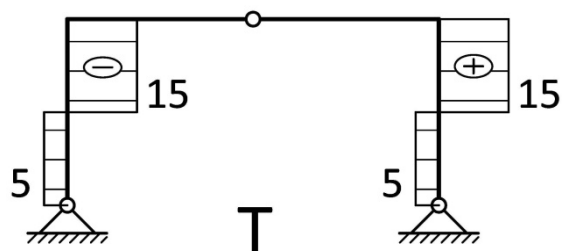
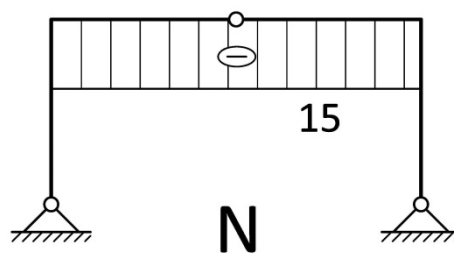
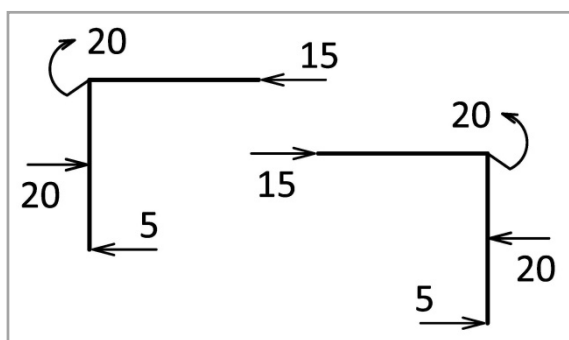


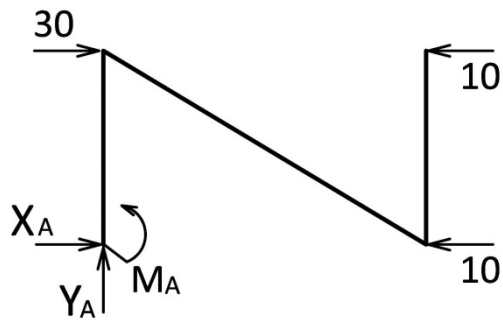
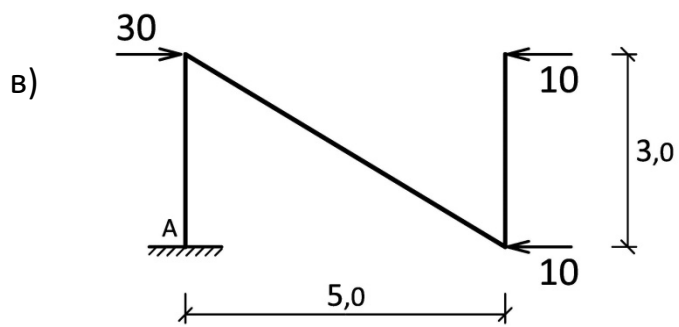
$$\sum M_A = 0 : Y_B \cdot 8 + 20 \cdot 2 + 20 - 20 - 20 \cdot 2 = 0 \rightarrow \underline{Y_B = 0}$$

$$\sum F_Y = 0 : Y_A + Y_B = 0 \rightarrow \underline{Y_A = 0}$$

$$\sum M_{C,dec} = 0 : -X_B \cdot 4 + Y_B \cdot 4 - 20 \cdot 2 + 20 = 0 \rightarrow \underline{X_B = -5}$$

$$\sum F_X = 0 : X_A - X_B + 20 - 20 = 0 \rightarrow \underline{X_A = -5}$$

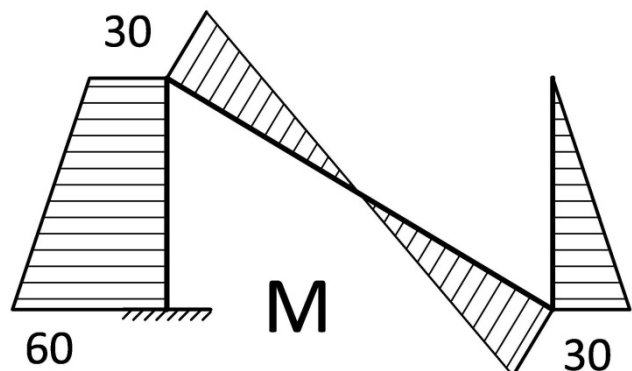
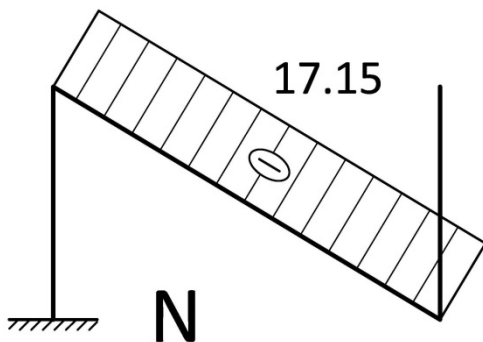
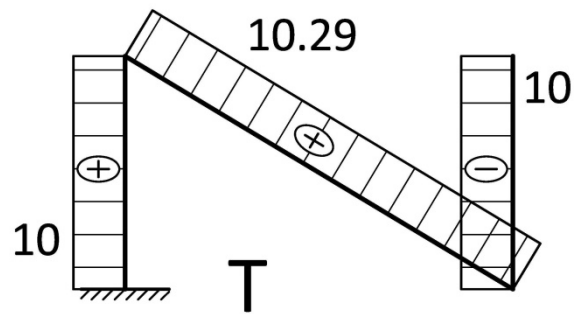
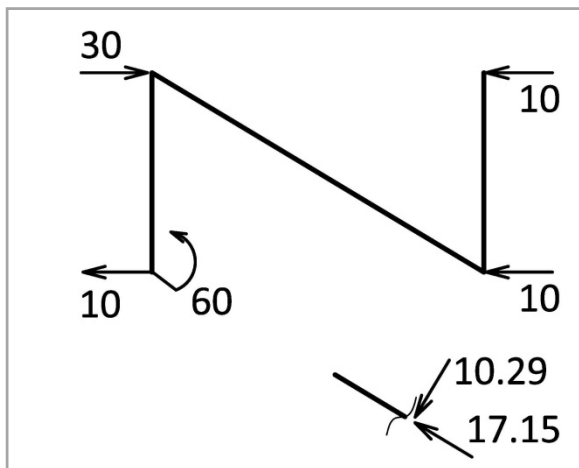




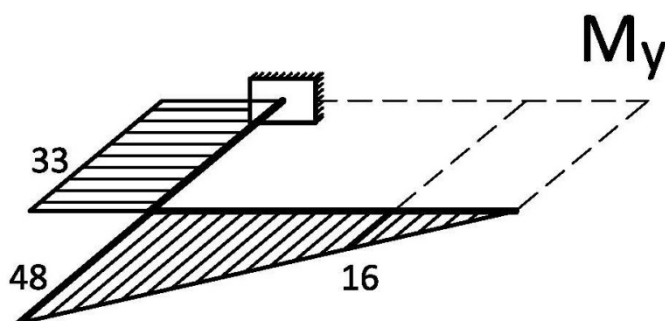
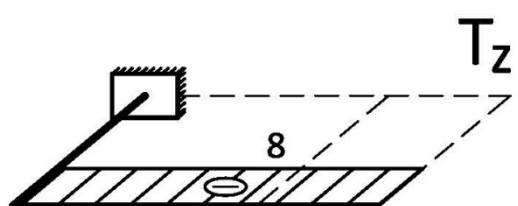
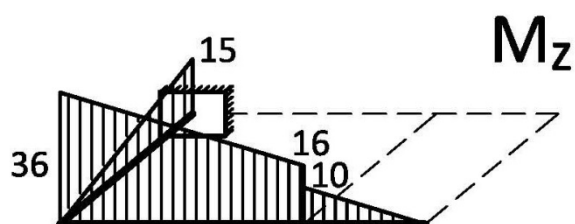
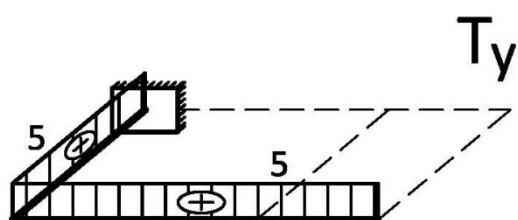
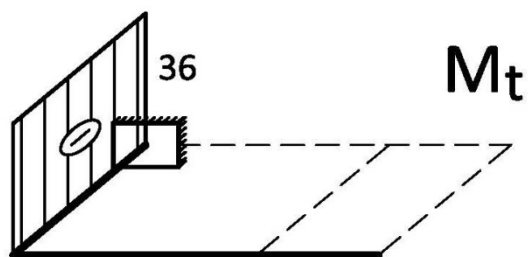
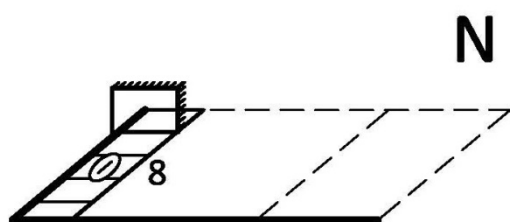
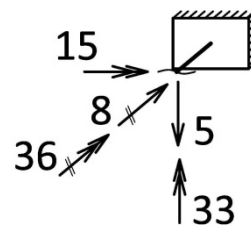
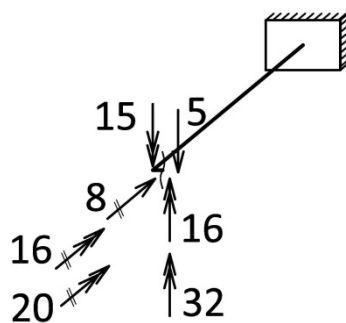
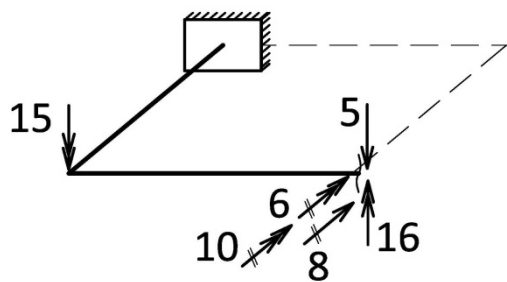
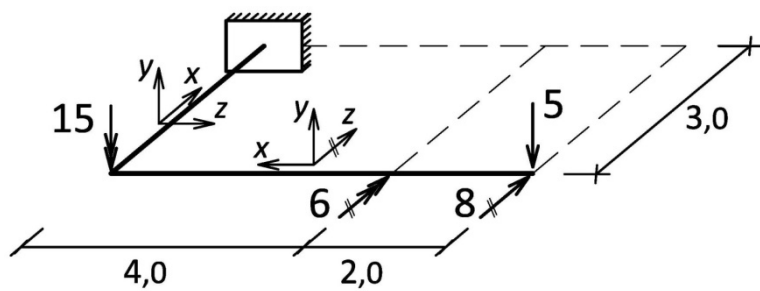
$$\sum F_X = 0 : X_A + 30 - 10 - 10 = 0 \rightarrow \underline{X_A = -10}$$

$$\sum F_Y = 0 : \rightarrow \underline{Y_A = 0}$$

$$\sum M_A = 0 : M_A - 30 \cdot 3 + 10 \cdot 3 = 0 \rightarrow \underline{M_A = 60}$$

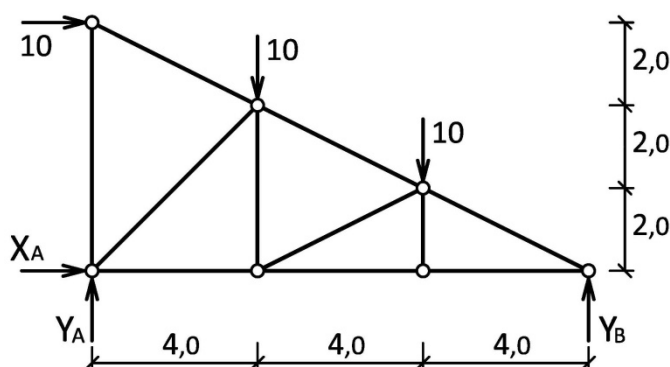


г)



2. ЗАДАТАК (30 %)

б)

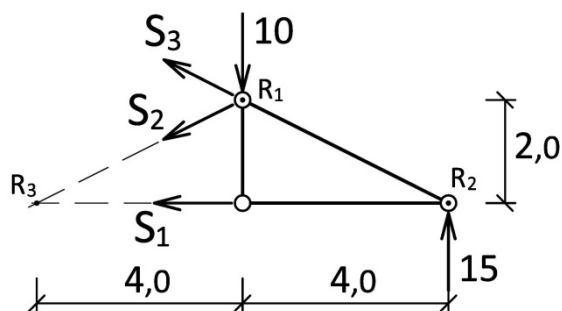


$$\sum F_X = 0 : X_A + 10 = 0 \rightarrow \underline{X_A = -10}$$

$$\sum M_A = 0 : Y_B \cdot 12 - 10 \cdot 8 - 10 \cdot 4 - 10 \cdot 6 = 0 \rightarrow \underline{Y_B = 15}$$

$$\sum F_Y = 0 : Y_A + Y_B - 10 - 10 = 0 \rightarrow \underline{Y_A = 5}$$

Ритеров поступак:



$$\sum M_{R1} = 0 : S_1 \cdot 2 - 15 \cdot 4 = 0 \rightarrow \underline{S_1 = 30}$$

$$\sum M_{R2} = 0 : 0.894 \cdot S_2 \cdot 2 + 0.447 \cdot S_2 \cdot 4 + 10 \cdot 4 = 0 \rightarrow \underline{S_2 = -11.18}$$

$$\sum M_{R3} = 0 : 0.894 \cdot S_3 \cdot 2 + 0.447 \cdot S_3 \cdot 4 - 10 \cdot 4 + 15 \cdot 8 = 0 \rightarrow \underline{S_3 = -22.37}$$

в) Нападна линија резултанте:

$$x \cdot F_{RY} - y \cdot F_{RX} = \sum M_Z \text{ (Варињонова теорема)}$$

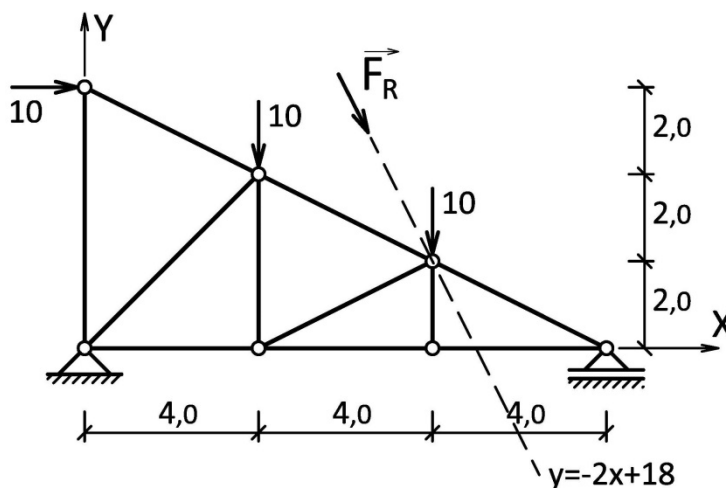
$$\vec{F}_R = \{F_{RX}, F_{RY}\} = \{10, -20\}$$

$$x \cdot (-20) - y \cdot (10) = -10 \cdot 6 - 10 \cdot 4 - 10 \cdot 8$$

$$|\vec{F}_R| = 22.36$$

$$-20 \cdot x - 10 \cdot y = -180$$

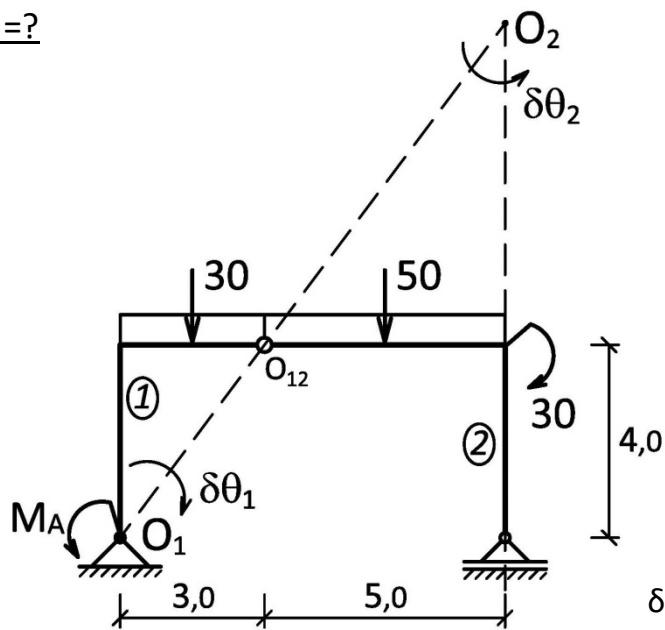
$$\underline{y = -2 \cdot x + 18}$$



3. ЗАДАТАК (20 %)

6)

$M_A = ?$



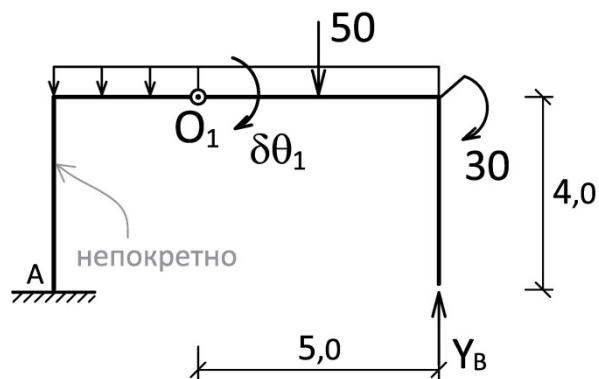
$$\delta r_{O_{12}} = \delta \theta_1 \cdot 3 = \delta \theta_2 \cdot 5 \rightarrow \delta \theta_2 = 0.6 \cdot \delta \theta_1$$

$$\delta A = -M_A \cdot \delta \theta_1 + 30 \cdot (1.5 \cdot \delta \theta_1) + 50 \cdot (2.5 \cdot \delta \theta_2) - 30 \cdot \delta \theta_2 = 0$$

$$-M_A \cdot \delta \theta_1 + 45 \cdot \delta \theta_1 + 95 \cdot \delta \theta_2 = 0$$

$$-M_A \cdot \delta \theta_1 + 102 \cdot \delta \theta_1 = 0 \rightarrow \underline{M_A = 102}$$

$Y_B = ?$



$$\delta A = -Y_B \cdot (5 \cdot \delta \theta_1) + 50 \cdot (2.5 \cdot \delta \theta_1) + 30 \cdot \delta \theta_1 = 0$$

$$-5 \cdot Y_B \cdot \delta \theta_1 + 155 \cdot \delta \theta_1 = 0 \rightarrow \underline{Y_B = 31}$$