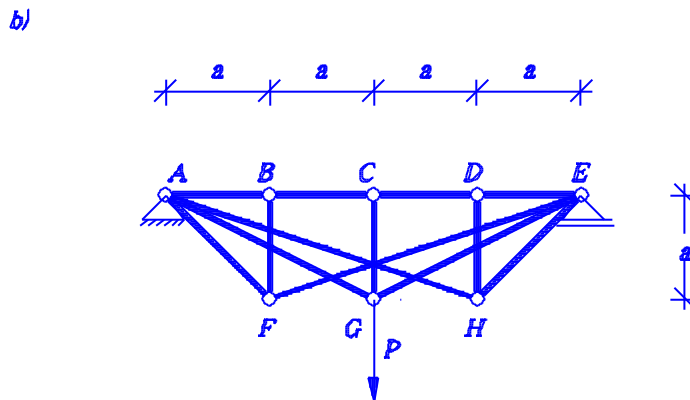
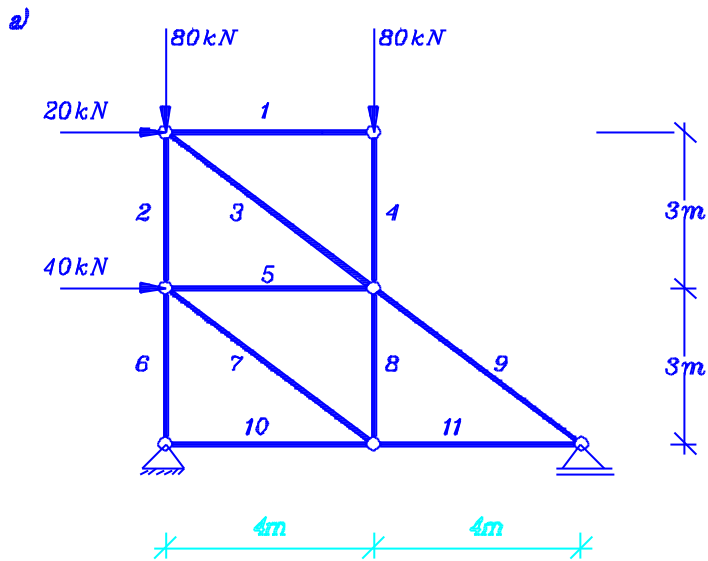


Lista de exercícios nº 4

Treliças

1 - Resolver as treliças abaixo:



Respostas: Treliça (a)

$$N_1 = 0$$

$$N_2 = -65kN$$

$$N_3 = -25kN$$

$$N_4 = -80kN$$

$$N_5 = -73,33kN$$

$$N_6 = -90kN$$

$$N_7 = 41,67kN$$

$$N_8 = -25kN$$

$$N_9 = -116,67kN$$

$$N_{10} = 60kN$$

$$N_{11} = 93,33kN$$

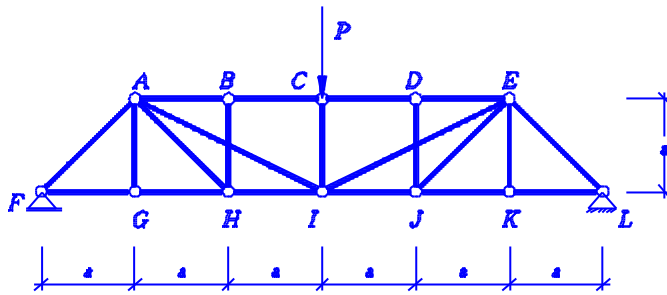
Treliça (b)

$$N_{AG} = N_{EG} = \frac{P\sqrt{5}}{2}$$

$$N_{AB} = N_{BC} = N_{CD} = N_{DE} = -P$$

As demais forças normais são nulas

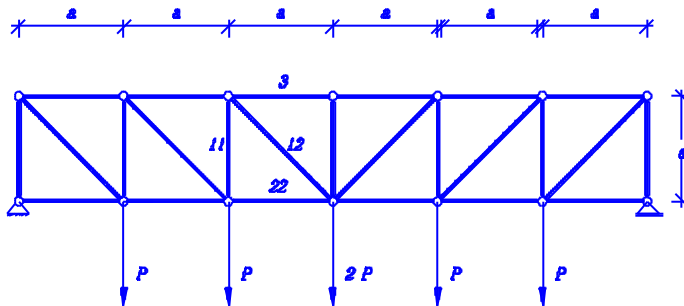
2 - Resolver a treliça da figura abaixo:



$$\begin{aligned}
 N_{CI} &= -P \\
 N_{FG} &= N_{GH} = N_{HI} = N_{IJ} = N_{JK} = N_{KL} = \frac{P}{2} \\
 N_{AI} &= N_{EI} = \frac{P\sqrt{5}}{2} \\
 N_{AB} &= N_{BC} = N_{CD} = N_{DE} = -\frac{3P}{2} \\
 N_{AF} &= N_{EL} = -\frac{P\sqrt{2}}{2}
 \end{aligned}$$

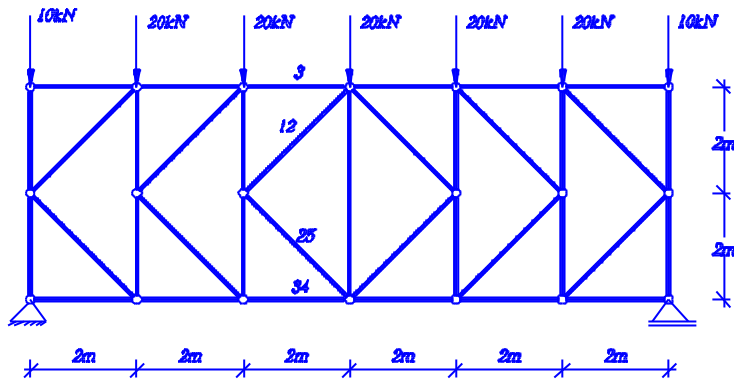
As demais forças normais são nulas

3 - Determinar as forças normais nas barras 3, 11, 12 e 22:



$$\begin{aligned}
 N_3 &= -6P & N_{12} &= P\sqrt{2} \\
 N_{11} &= -P & N_{22} &= 5P
 \end{aligned}$$

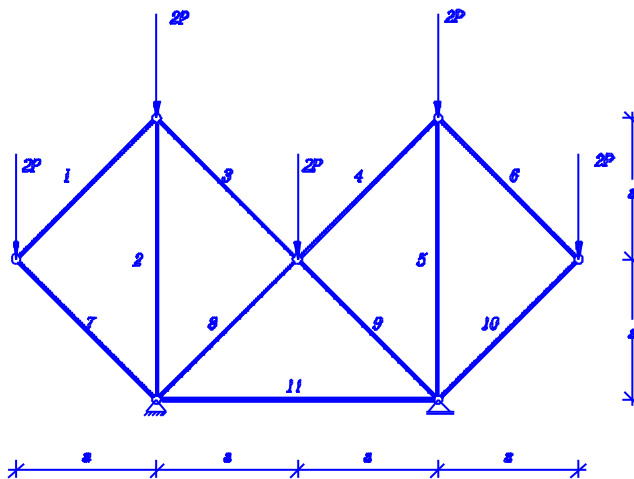
4 - Determinar as forças normais nas barras 3, 12, 25 e 34:



$$N_3 = -40 \text{ kN} \quad N_{12} = -5\sqrt{2} \text{ kN}$$

$$\text{R: } N_{25} = 5\sqrt{2} \text{ kN} \quad N_{34} = 40 \text{ kN}$$

5 - Resolver a treliça da figura utilizando o método de Cremona:

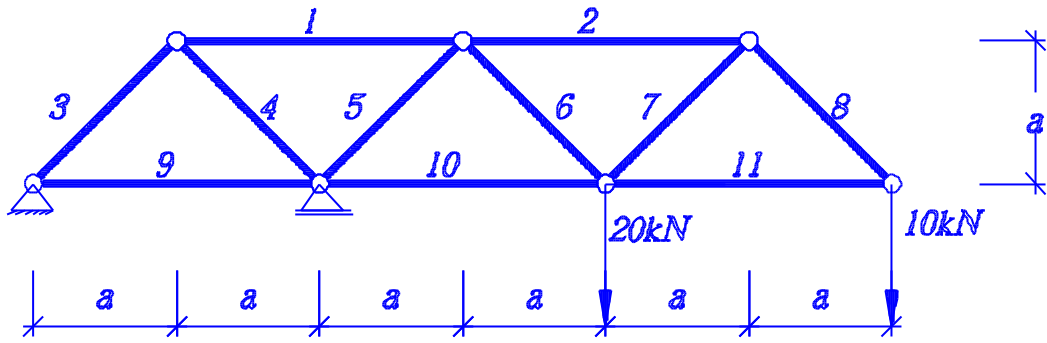


$$N_1 = N_6 = P\sqrt{2} \quad N_2 = N_5 = -4P$$

$$\text{R: } N_3 = N_4 = P\sqrt{2} \quad N_7 = N_{10} = -P\sqrt{2}$$

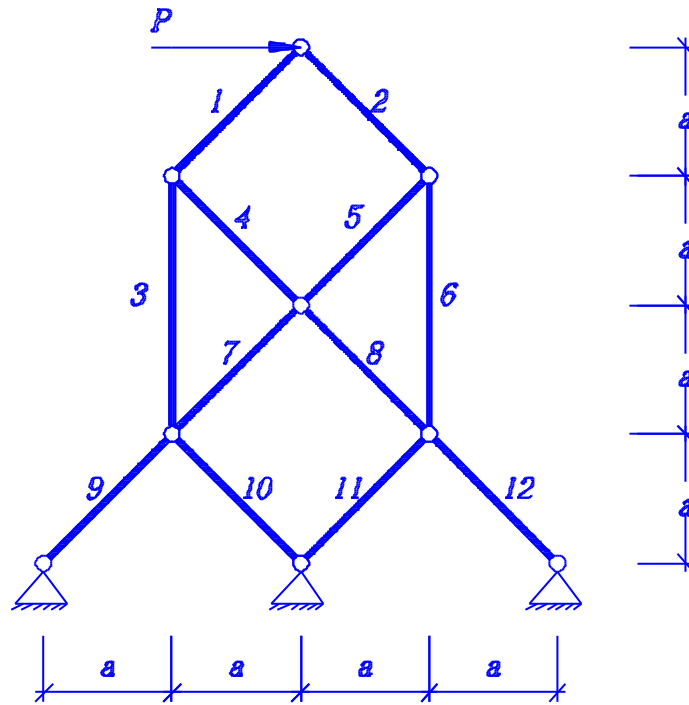
$$N_8 = N_9 = 0 \quad N_{11} = -P$$

6 - Resolver as treliças abaixo, utilizando o método de Cremona:



R:

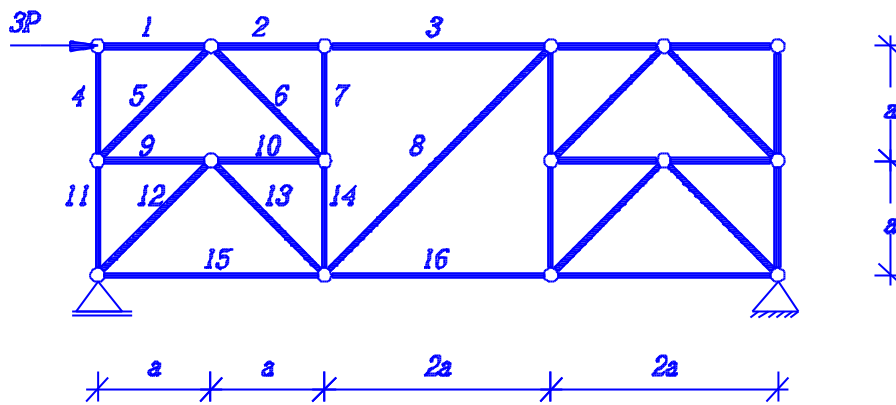
$N_1 = 80kN$	$N_5 = -30\sqrt{2}kN$	
$N_2 = 20kN$	$N_6 = 30\sqrt{2}kN$	$N_9 = -40kN$
$N_3 = 40\sqrt{2}kN$	$N_7 = -10\sqrt{2}kN$	$N_{10} = -50kN$
$N_4 = -40\sqrt{2}kN$	$N_8 = 10\sqrt{2}kN$	$N_{11} = -10kN$



R:

$N_1 = \frac{P\sqrt{2}}{2}$	$N_3 = P$	$N_5 = P\frac{\sqrt{2}}{2}$	$N_7 = P\frac{\sqrt{2}}{2}$	$N_9 = P\sqrt{2}$	$N_{11} = -P\frac{\sqrt{2}}{2}$
$N_2 = -P\frac{\sqrt{2}}{2}$	$N_4 = -P\frac{\sqrt{2}}{2}$	$N_6 = -P$	$N_8 = -P\frac{\sqrt{2}}{2}$	$N_{10} = P\frac{\sqrt{2}}{2}$	$N_{12} = -P\sqrt{2}$

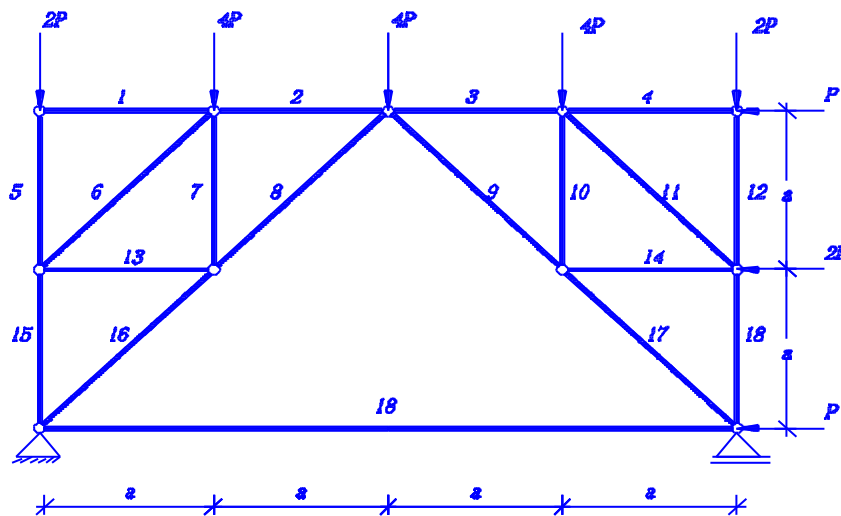
7 - Determinar as forças normais nas barras 1 a 16:



R:

$N_1 = -3P$	$N_5 = P \frac{\sqrt{2}}{2}$	$N_9 = -\frac{P}{2}$	$N_{12} = P \frac{\sqrt{2}}{2}$	$N_{15} = -\frac{P}{2}$
$N_2 = -2P$	$N_6 = -P \frac{\sqrt{2}}{2}$	$N_{10} = \frac{P}{2}$	$N_{13} = -P \frac{\sqrt{2}}{2}$	$N_{16} = -2P$
$N_3 = -2P$	$N_7 = 0$	$N_{11} = \frac{P}{2}$	$N_{14} = -\frac{P}{2}$	
$N_4 = 0$	$N_8 = P\sqrt{2}$			

8 - Determinar as forças normais nas barras da treliça da figura:



R:

$N_1 = 0$	$N_5 = -2P$	$N_9 = -P\sqrt{2}$	$N_{13} = 2P$	$N_{17} = -2P\sqrt{2}$
$N_2 = -2P$	$N_6 = -2P\sqrt{2}$	$N_{10} = -P$	$N_{14} = P$	$N_{18} = -5P$
$N_3 = -4P$	$N_7 = -2P$	$N_{11} = -3P\sqrt{2}$	$N_{15} = -4P$	$N_{19} = P$
$N_4 = -P$	$N_8 = -3P\sqrt{2}$	$N_{12} = -2P$	$N_{16} = -5P\sqrt{2}$	