<http://www.mathalino.com/reviewer/engineering-mechanics/resultant-non-concurrent-force-system>

The resultant of non-concurrent force system is defined according to magnitude, inclination, and position.

The magnitude of the resultant can be found as follows

$ R_x = \Sigma F_x $

$ R_y = \Sigma F_y $

$ R = \sqrt{{R_x}^2 + {R_y}^2} $

The inclination from the horizontal is defined by

$ \tan \theta_x = \dfrac{R_y}{R_x} $

The position of the resultant can be determined according to the principle of moments.

$ M_R = \Sigma M_O $

$ Rd = M_R $

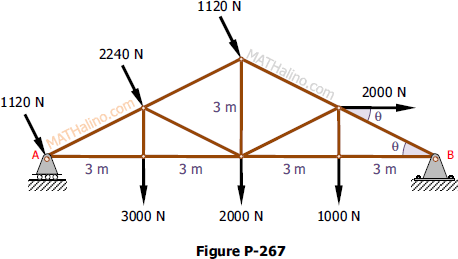
$ R_yi_x = M_R $

$ R_xi_y = M_R $

Where,  
Fx = component of forces in the x-direction  
Fy = component of forces in the y-direction  
Rx = component of thew resultant in x-direction  
Ry = component of thew resultant in y-direction  
R = magnitude of the resultant  
θx = angle made by a force from the x-axis  
MO = moment of forces about any point O  
d = moment arm  
MR = moment at a point due to resultant force  
ix = x-intercept of the resultant R  
iy = y-intercept of the resultant R

<http://www.mathalino.com/reviewer/engineering-mechanics/problem-267-resultant-non-concurrent-force-system>

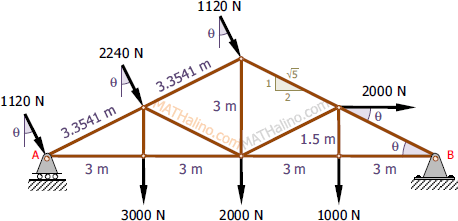
**Problem 267**  
The Howe roof truss shown in [Fig. P-267](http://www.mathalino.com/image/mech-042-howe-truss) carries the given loads. The wind loads are perpendicular to the inclined members. Determine the magnitude of the resultant, its inclination with the horizontal, and where it intersects AB.



**Solution 267**  
$ R_x = \Sigma F_x $

$ R_x = (1120 + 2240 + 1120)(\frac{1}{\sqrt{5}}) + 2000 $

$ R_x = 4003.52 \, \text{ N to the right} $



$ R_y = \Sigma F_y $

$ R_y = (1120 + 2240 + 1120)(\frac{2}{\sqrt{5}}) + 3000 + 2000 + 1000 $

$ R_y = 10 007.03 \, \text{ N downward} $

$ R = \sqrt{{R_x}^2 + {R_y}^2} $

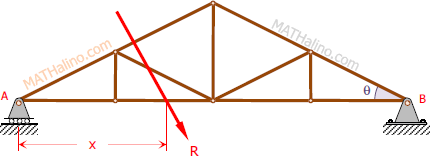
$ R = \sqrt{4003.52^2 + 10007.03^2} $

$ R = 10\,778.16 \, \text{ N} $

$ \tan \theta_x = \dfrac{R_y}{R_x} $

$ \tan \theta_x = \dfrac{10007.03}{4003.52} $

$ \theta_x = 68.2^\circ $



$ M_A = \Sigma Fd $

$ M_A = 2240(3.354) + 1120(3.354)(2) + 2000(1.5) + 3000(3) + 2000(6) + 1000(9) $

$ M_A = 48\,026.37 \, \text{ N}\cdot\text{m clockwise} $

$ R_yx = M_A $

$ 10\,778.16x = 48\,026.37 $ wrong equation

10007.03 x =48026.37

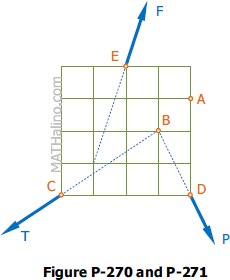
X =4.8 m to the right of A

$ x = 4.46 \, \text{ m to the right of A} $ wrong equation

Thus, R = 10 778.16 N downward to the right at θx = 68.2° passing 4.8 m to the right of A.

<http://www.mathalino.com/reviewer/engineering-mechanics/problem-271-resultant-non-concurrent-force-system>

**Problem 271**  
The three forces in Fig. P-270 create a vertical resultant acting through point A. If T is known to be 361 lb, compute the values of F and P.



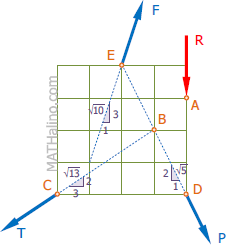
**Solution 271**  
For vertical resultant, Rx = 0 and Ry = R

$ M_R = \Sigma M_E $

$ R(2) = T_x(4) - T_y(2) $

$ R(2) = 361(\frac{3}{\sqrt{13}})(4) - 361(\frac{2}{\sqrt{13}})(2) $

$ R = 800.99 \, \text{ lb downward at point A} $



$ \Sigma M_B = M_R $

$ F_x(2) + F_y(1) = R(1) $

$ F(\frac{1}{\sqrt{10}})(2) + F(\frac{3}{\sqrt{10}})(1) = 800.99(1) $

$ F = 506.59 \, \text{ lb} $*answer*

$ \Sigma F_V = R $

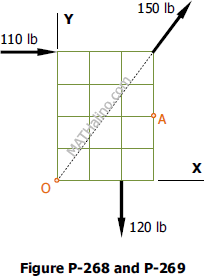
$ P_y + T_y - F_y = R $

$ P(\frac{2}{\sqrt{5}}) + T(\frac{2}{\sqrt{13}}) - F(\frac{2}{\sqrt{10}}) = R $

$ P(\frac{2}{\sqrt{5}}) + 361(\frac{2}{\sqrt{13}}) - 506.59(\frac{2}{\sqrt{10}}) = 800.99 $

$ P = 1208.34 \, \text{ lb} $ *answer*

<http://www.mathalino.com/reviewer/engineering-mechanics/problem-268-resultant-non-concurrent-force-system>

**Problem 268**  
The resultant of four forces, of which three are shown in [Fig. P-268](http://www.mathalino.com/image/mech-043-three-forces-planar-space), is a couple of 480 lb·ft clockwise in sense. If each square is 1 ft on a side, determine the fourth force completely.

**Solution 268**  
Let F4 = the fourth force and for couple resultant, R is zero.

$ R_x = 0 $

$ 110 + 150(\frac{3}{5}) + F_{4x} = 0 $

$ F_{4x} = -200 \, \text{ lb} $

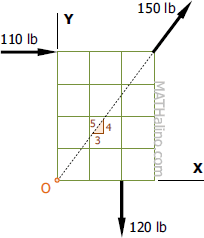
$ F_{4x} = 200 \, \text{ lb to the left} $

$ R_y = 0 $

$ 150(\frac{4}{5}) - 120 + F_{4y} = 0 $

$ F_{4y} = 0 $

Thus, $ F_4 = 200 \, \text{ lb to the left} $



Assuming F4 is above point O  
$ M_O = C $

$ F_4d - 110(4) - 120(2) = 480 $

$ 200d - 110(4) - 120(2) = 480 $

$ d = 5.8 \, \text{ ft} $

d is positive, thus, the assumption is correct that F4 is above point O.

Therefore, the fourth force is 200 lb acting horizontally to the left at 5.8 ft above point O. answer