# Engineering Statics - 02 Force Vectors Handout

### Example 1

A truck drives due east on a straight road for 40 km, then drives north on a straight road for 30 km before stopping.

What is the resultant displacement of the truck?
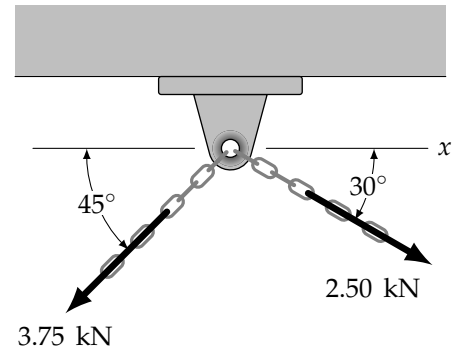
### Example 2

A plane flies NNW (i.e., 22.5° west of north) with a velocity of 275 km/h. There is a wind blowing at 55 km/h from the NW (i.e., 45° west of north).

Determine the resultant velocity of the plane relative to the ground.

Determine the wind speed that would cause the plane to fly due north. What is the ground speed in this case?
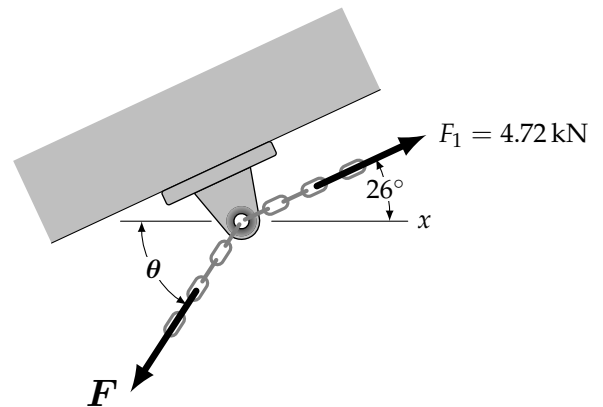
## Example 3

Determine the magnitude and the direction (measured clockwise from the the positive $x$-axis) of the resultant of the two forces.



45°

30°

2.50 kN

3.75 kN

## Exercise 1

The resultant of the forces $F$ and $F_1$ is 3.14 kN at 37° clockwise from the positive $x$ axis.

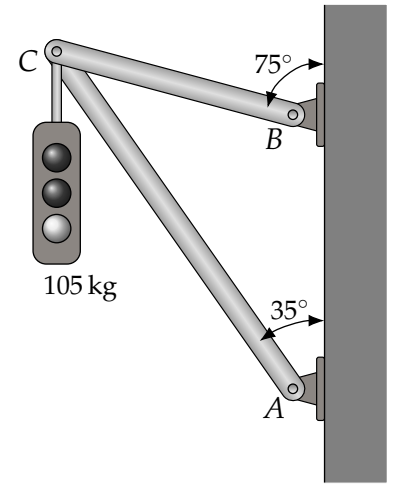Determine $F$ and $\theta$.



$F_1 = 4.72\,\text{kN}$

26°

$x$

$\theta$

$F$

## Example 4

The weight, $W$, of the traffic lights (with mass 105 kg) acts vertically downward.

Find the value of $W$ and use it to determine the magnitudes of its two components directed along the axes of $AC$ and $BC$.



## Exercise 2

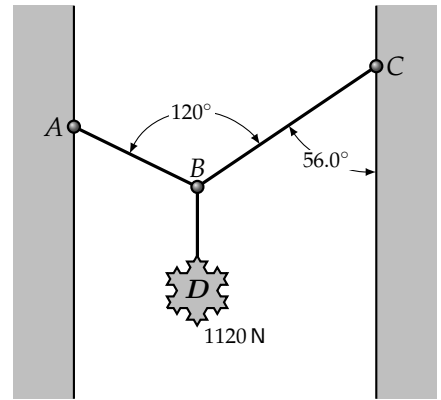Resolve the 4.20 kN load suspended from $A$ into components parallel to the truss members $AB$ and $AG$.

Give the magnitude of the components and their direction measured counter-clockwise from the positive $x$ axis.
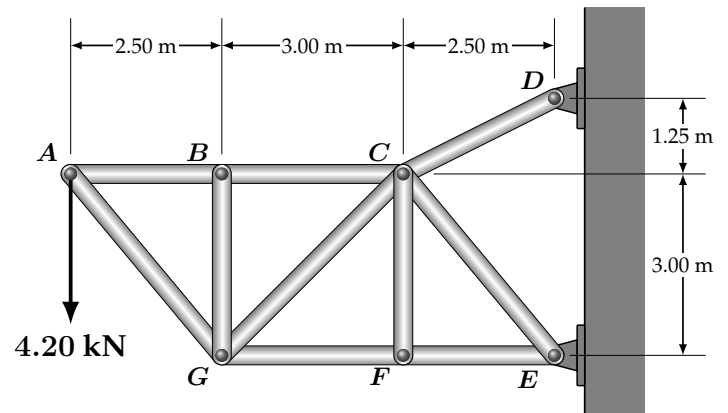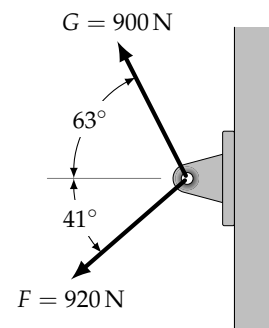
## Exercise 3

The decoration suspended at $D$ weighs 1120 N.

Determine the magnitudes of the two force components of the weight of $D$, in the direction of $AB$ and $BC$.
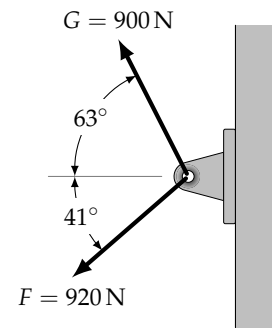
### Example 5

a) Determine the resultant $R$ of the two vectors $F$ and $G$.

b) Determine the $x$-component of $R$
   (i.e., the horizontal component).

c) Determine the $x$-component of $F$.

d) Determine the $x$-component of $G$.

e) Add the two previous results.

$G = 900\,\text{N}$

$63°$

$41°$

$F = 920\,\text{N}$

## Exercise 4



a) Determine the magnitude of the component of **R** along the $y$ axis (i.e., the vertical component).

b) Determine the magnitude of the component of **F** along the $y$ axis.

c) Determine the magnitude of the component of **G** along the $y$ axis.

d) Add the two previous results.

## Example 9

Determine the resultant (magnitude and direction counterclockwise from the positive $x$ axis) of the three forces $F_1$, $F_2$ and $F_3$ acting at a single point.
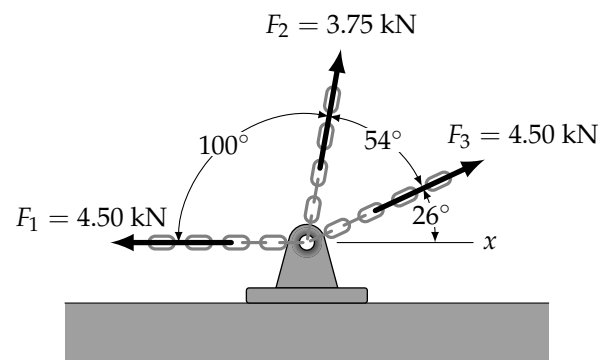
## Example 10

The resultant of the forces $F$, $F_1$ and $F_2$ acting upon the eye-bolt is 3.07 kN at 197° measured counter-clockwise from the positive $x$ axis. Determine $F$ and $\theta$.