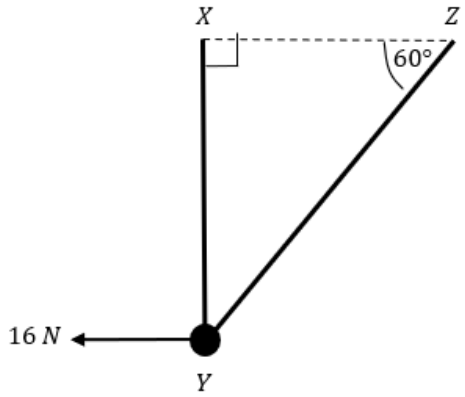
# 7.2) Modelling with statics

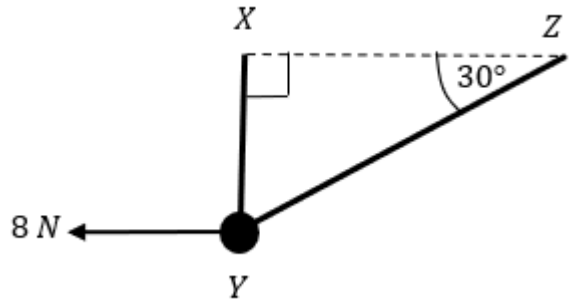
# Worked example

A smooth bead $Y$ is threaded on a light inextensible string. The ends of the string are attached to two fixed points, $X$ and $Y$, on the same horizontal level.
The bead is held in equilibrium by a horizontal force of magnitude 16 N acting parallel to $ZX$.
The bead $Y$ is vertically below $X$ and $\angle XZY = 60°$ as shown in the diagram.
Find the tension in the string and the weight of the bead.




# Your turn

A smooth bead $Y$ is threaded on a light inextensible string. The ends of the string are attached to two fixed points, $X$ and $Y$, on the same horizontal level.
The bead is held in equilibrium by a horizontal force of magnitude 8 N acting parallel to $ZX$.
The bead $Y$ is vertically below $X$ and $\angle XZY = 30°$ as shown in the diagram.
Find the tension in the string and the weight of the bead.




Tension $= 9.24\ N$ (3 sf)
Weight $= 13.9\ N$ (3 sf)

# Worked example

A mass of 6kg rests on the surface of a smooth plane which is inclined at an angle of $30°$ to the horizontal.
The mass is attached to a cable which passes up the plane along the line of greatest slope and then passes over a smooth pulley at the top of the plane.
The cable carries a mass of 2kg freely suspended at the other end.
The masses are modelled as particles, and the cable as a light inextensible string.
There is a force of $P$ N acting horizontally on the 6kg mass and the system is in equilibrium.

Calculate:
(a) the magnitude of $P$
(b) the normal reaction between the mass and the plane
(c) State how you have used the assumption that the pulley is smooth in your calculations.

# Your turn

A mass of 3kg rests on the surface of a smooth plane which is inclined at an angle of $45°$ to the horizontal.
The mass is attached to a cable which passes up the plane along the line of greatest slope and then passes over a smooth pulley at the top of the plane.
The cable carries a mass of 1kg freely suspended at the other end.
The masses are modelled as particles, and the cable as a light inextensible string.
There is a force of $P$ N acting horizontally on the 3kg mass and the system is in equilibrium.

Calculate:
(a) the magnitude of $P$
(b) the normal reaction between the mass and the plane

a) $P = 16$ (2 sf)
b) 32 (2 sf)

# Worked example

A particle of weight $4\ N$ is attached at $C$ to the ends of two light inextensible strings $AC$ and $BC$.
The other ends, $A$ and $B$, are attached to a fixed horizontal ceiling. The particle hangs at rest in equilibrium, with the strings in a vertical plane. The string $AC$ is inclined at $45°$ to the horizontal and the string $BC$ is inclined at $15°$ to the horizontal. Find:

a) The tension in the string $AC$
b) The tension in the string $BC$

# Your turn

A particle of weight $8\ N$ is attached at $C$ to the ends of two light inextensible strings $AC$ and $BC$.
The other ends, $A$ and $B$, are attached to a fixed horizontal ceiling. The particle hangs at rest in equilibrium, with the strings in a vertical plane. The string $AC$ is inclined at $35°$ to the horizontal and the string $BC$ is inclined at $25°$ to the horizontal. Find:

a) The tension in the string $AC$
b) The tension in the string $BC$

a) $8.4\ N$ (2 sf)
b) $7.6\ N$ (2 sf)