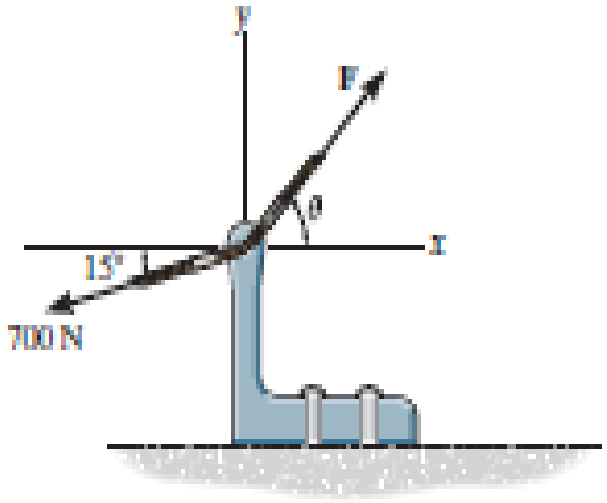
ENGINEERING MECHANICS
BAA1113

TUTORIAL 2 (CO2)

by
Rokiah Bt Othman
Faculty of Civil Engineering & Earth Resources
nadrah@ump.edu.my

TUTORIAL 2

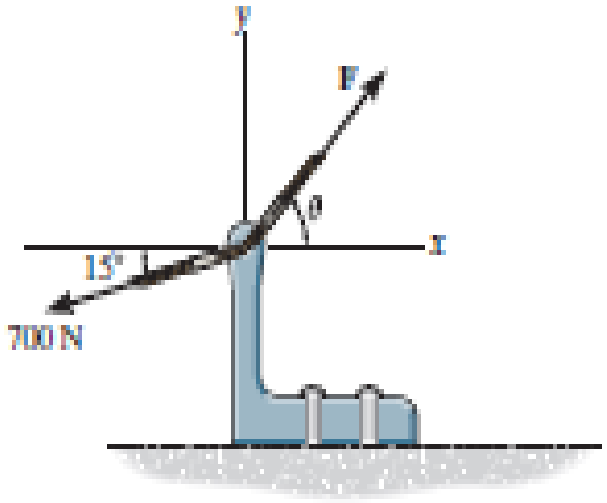
T1) Determine the magnitude of the resultant force and its direction (measured counterclockwise from the positive x axis). Given F = 450 N and $\theta = 60°$



ans: $F_R = 497$ N , $\phi = 155°$

TUTORIAL 2

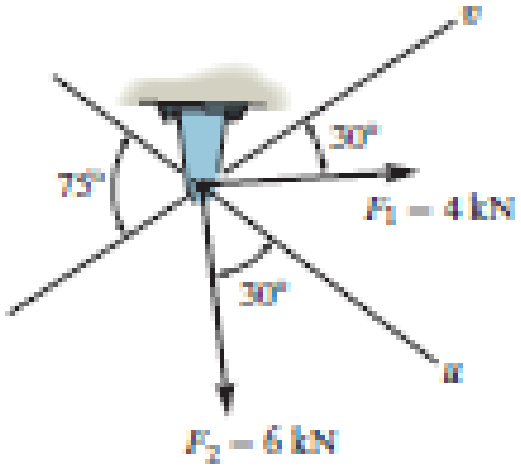
T2) Determine the magnitude of the force F and its direction.
Given F_R = 500 and directed along the positive y axis



ans: F = 960 N , θ = 45.2°

TUTORIAL 2

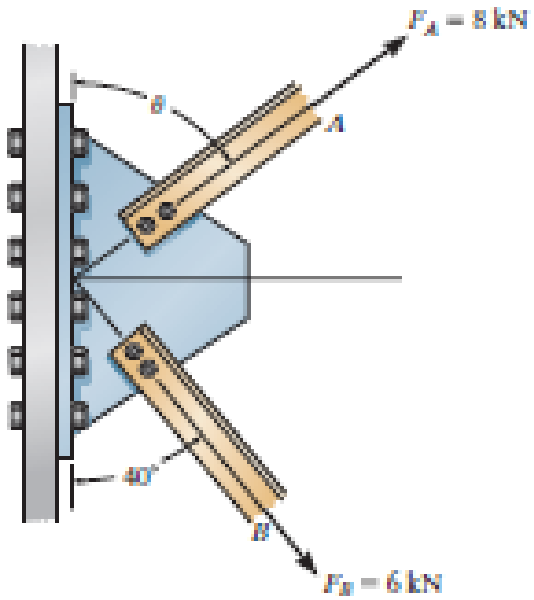
T3) Determine the magnitude of the resultant force and its direction (measured clockwise from the positive u axis). $F_R = F_{1+} F_2$



ans: $F_R = 8.03$ kN , $\phi = 1.22°$

TUTORIAL 2

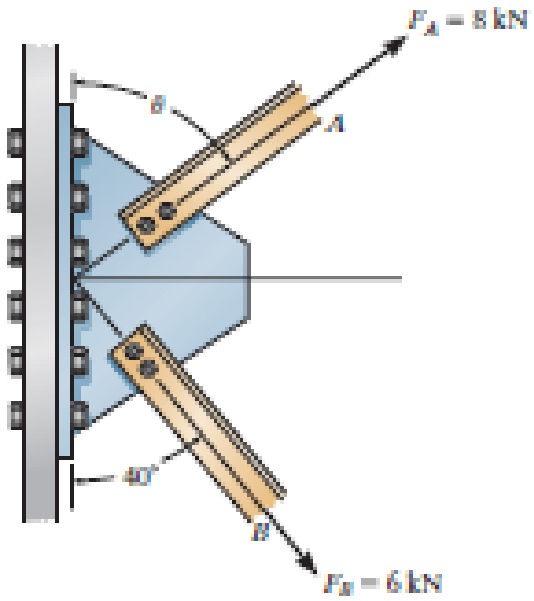
T4) The plate is subjected to the two forces at A and B as shown. Determine the magnitude of the resultant force and its direction (measured clockwise from the horizontal axis). Given $\theta = 60°$



ans: $F_R = 10.8$ kN , $\phi = 31.6°$

TUTORIAL 2

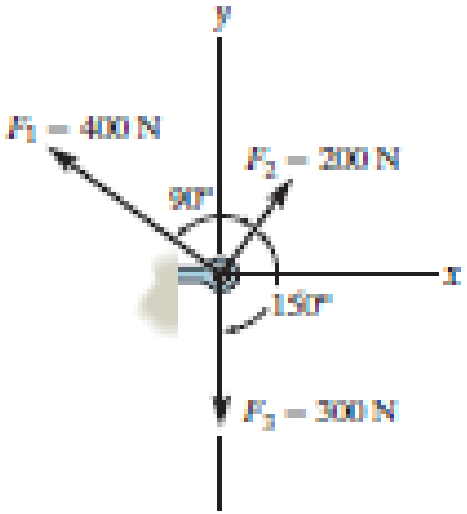
T5) Determine the angle of θ which connecting member A to the plate so that the resultant force of F_A and F_B is directed horizontally to the right. Also, determine the magnitude of the resultant force



ans: θ = 54.9° F_R = 10.4 kN

TUTORIAL 2

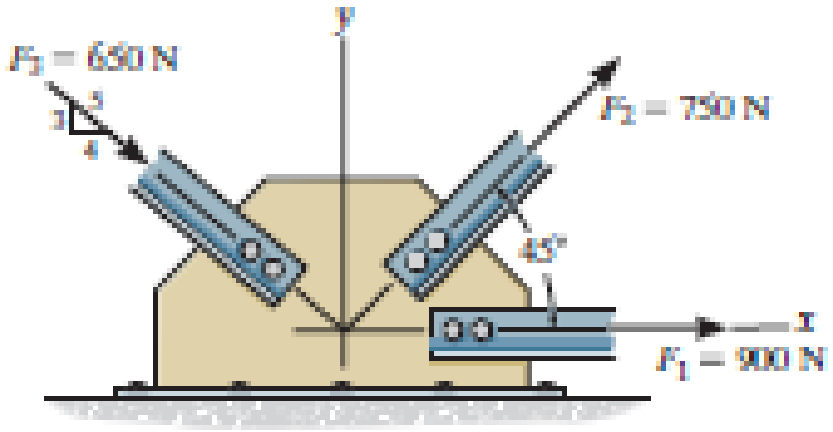
T6) Determine the magnitude of the resultant force and its direction (measured counterclockwise from the positive x axis)



ans: $F_R = 257$ kN , $\phi = 163°$

TUTORIAL 2

T7) Resolve each force acting on the gusset plate into its x and y components, and express each force as a Cartesian vector



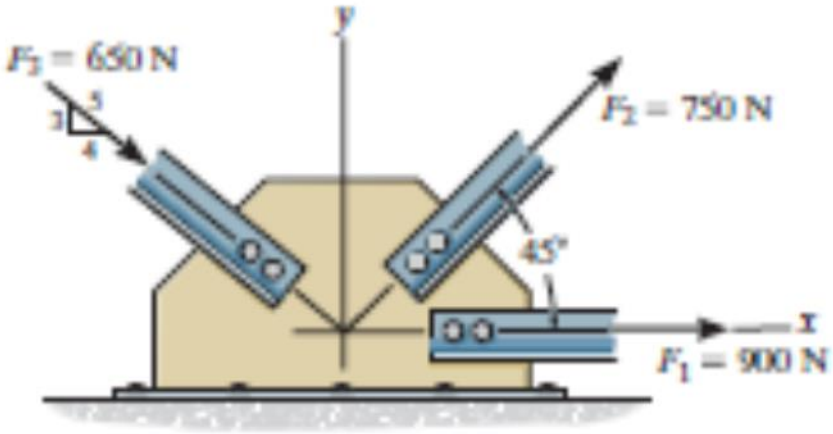
ans: $F_1 = \{900\mathbf{i}\}$ N

$F_2 = \{530\mathbf{i} + 530\mathbf{j}\}$ N

$F_3 = \{520\mathbf{i} - 390\mathbf{j}\}$ N

TUTORIAL 2

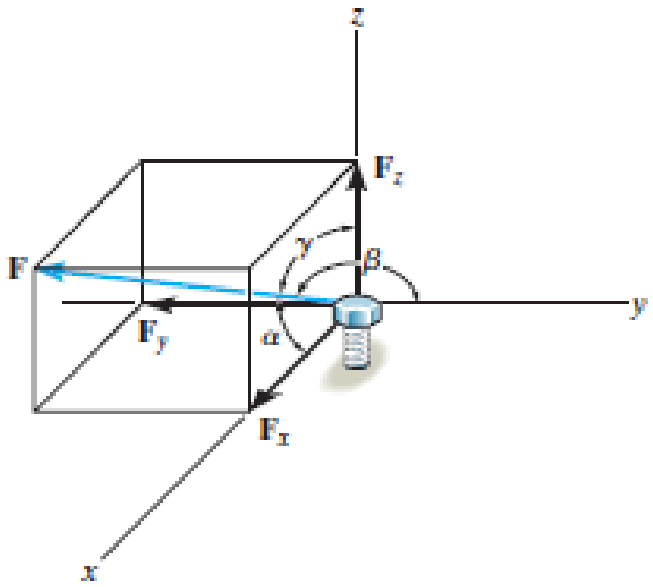
T8) Determine the magnitude of the resultant force and its direction (measured counterclockwise from the positive x axis)



ans: $F_R = 1.96$ kN , $\theta = 4.12°$

TUTORIAL 2

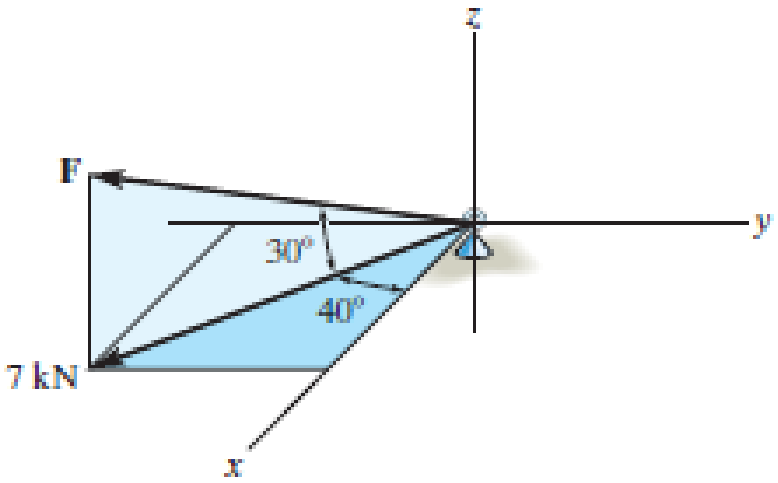
T9) The bolt is subjected to the force F, which has components acting along the x,y,z axes as shown. If the magnitude of F is 80N and $\alpha = 60°$ and $\gamma = 45°$, determine the magnitude of its componets. (F_X,F_Y,F_Z)



ans: F_X = 40 N, F_Y = 40 N, F_Z = 56.6 N

TUTORIAL 2

T10) Determine the magnitude and coordinate direction angles of the force F acting on the support. The component F in the x-y plane is 7 kN



ans: F = 8.08 kN

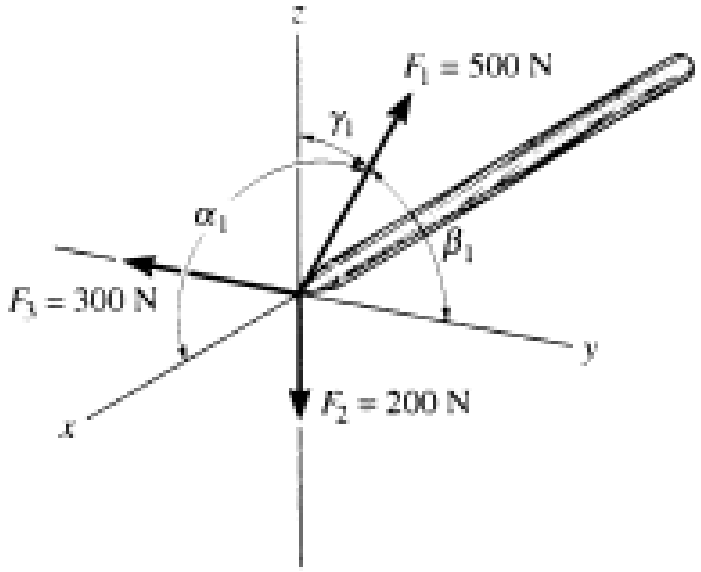
$\alpha = 48.4°$

$\beta = 124°$

$\gamma = 60°$

TUTORIAL 2

T11) The mast is subjected to the three forces. Determine the coordinate direction angles of F_1 so that the force acting on the mast is $F_R = \{350i\}$ N



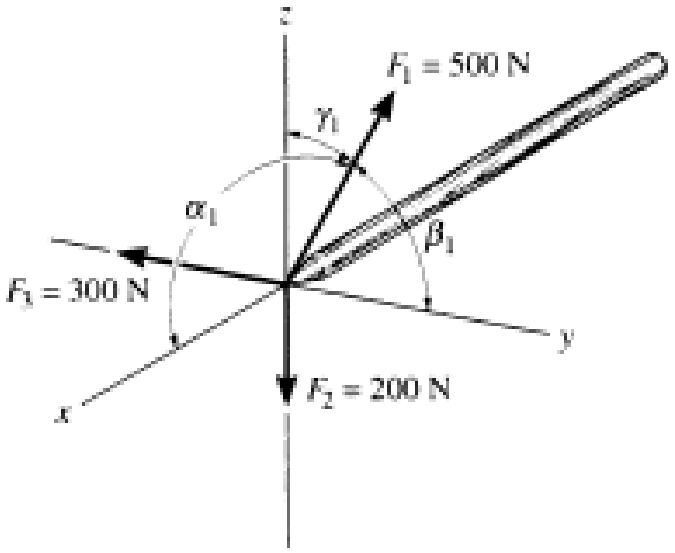
$\alpha = \cos^{-1}(F_{Rx} / F_R) = \underline{45.6°}$

$\beta = \cos^{-1}(F_{Ry} / F_R) = \underline{53.1°}$

$\gamma = \cos^{-1}(F_{Rz} / F_R) = \underline{66.4°}$

TUTORIAL 2

T12) The mast is subjected to the three forces. Determine the coordinate direction angles of F_1 so that the force acting on the mast is zero. $F_R = 0$ N



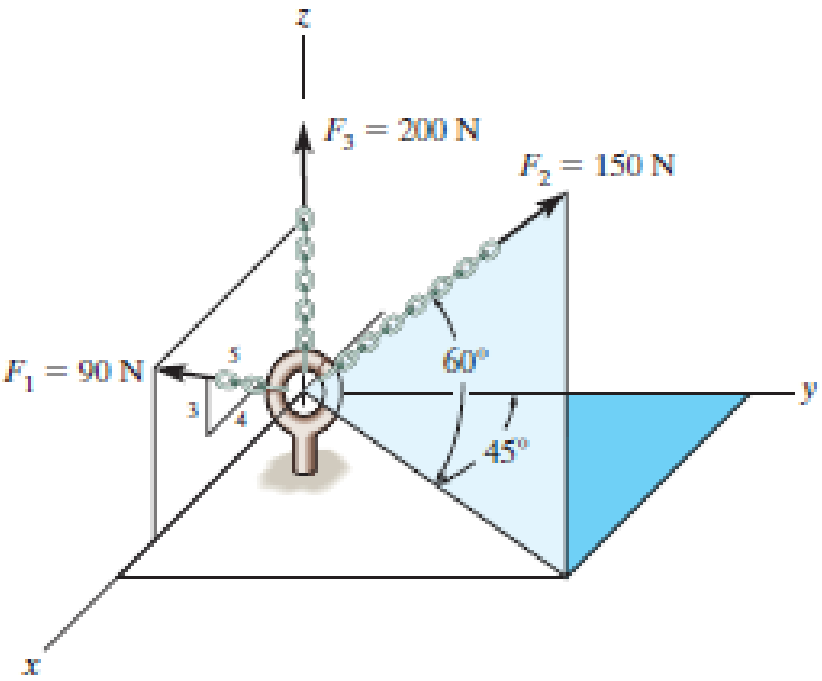
$\alpha = \cos^{-1}(F_{Rx} / F_R) = 90°$

$\beta = \cos^{-1}(F_{Ry} / F_R) = 53.1°$

$\gamma = \cos^{-1}(F_{Rz} / F_R) = 66.4°$

TUTORIAL 2

T13) Determine the magnitude of the resultant force and its direction



ans: $F_R = 407$ N

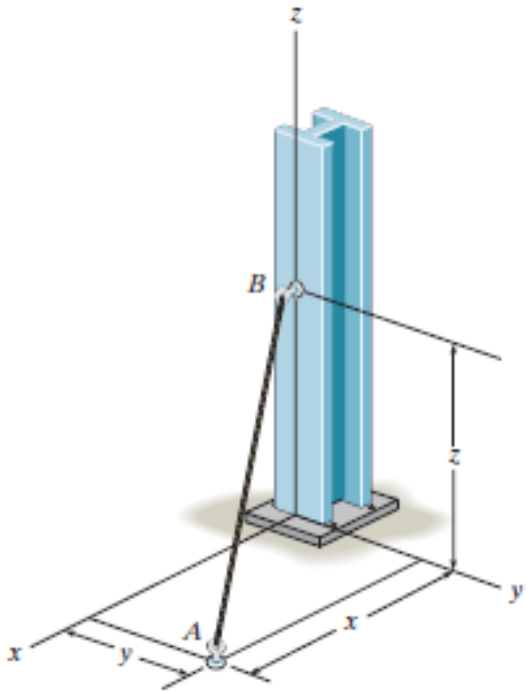
$\alpha = 72.1°$

$\beta = 82.5°$

$\gamma = 19.5°$

TUTORIAL 2

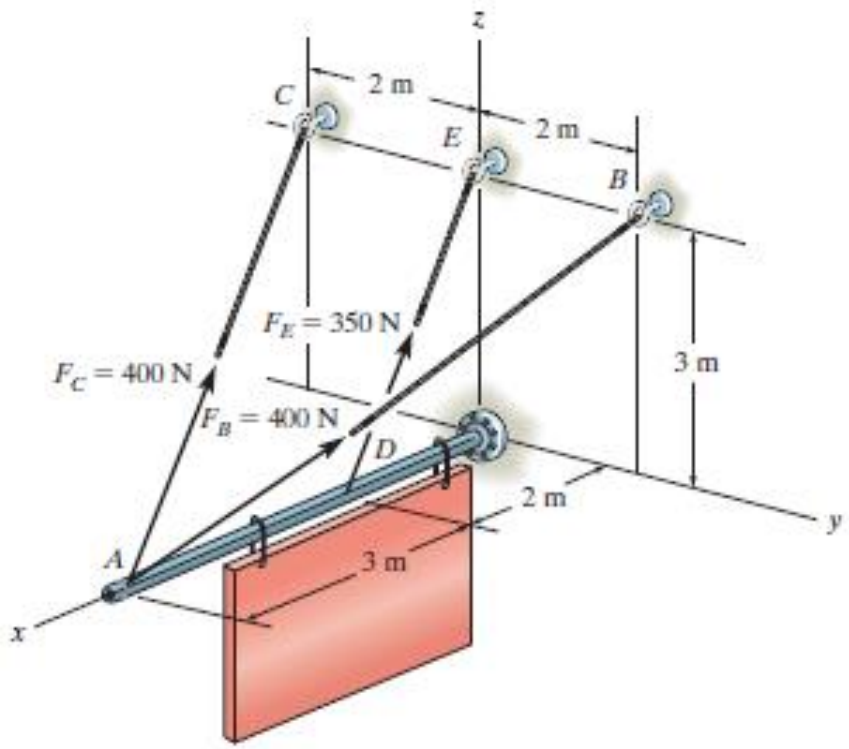
T14) The 8 m long cable is anchored to the ground at A. If the x= 4m and y = 2m, determine the coordinate z to the highest point of attachment along the column



ans: z = 6.63 m

TUTORIAL 2

T15) The three supporting cables exert the forces shown on the signboard. Represent each force in Cartesian Vector



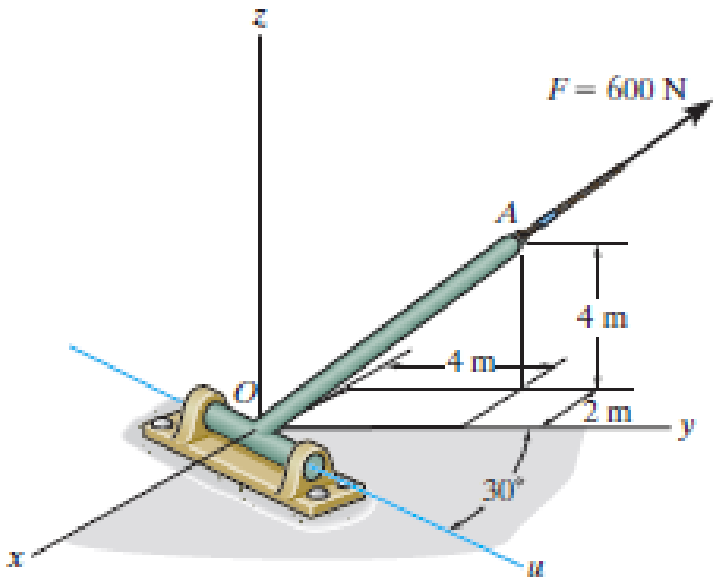
ans: $F_C = \{-324\mathbf{i} - 130\mathbf{j} + 195\mathbf{k}\}$ N

$F_B = \{-324\mathbf{i} + 130\mathbf{j} + 195\mathbf{k}\}$ N

$F_E = \{-194\mathbf{i} + 291\mathbf{k}\}$ N

TUTORIAL 2

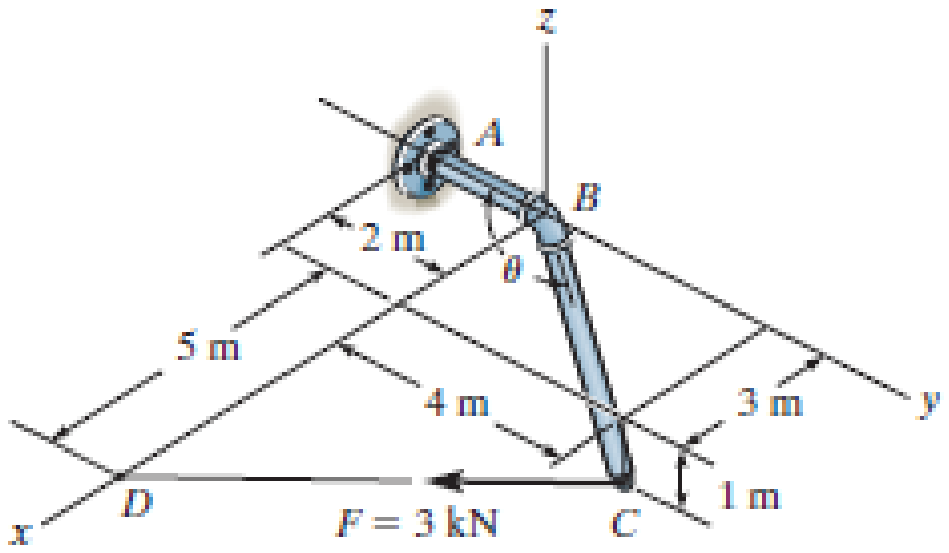
T16) Determine the magnitude of the projection force .



ans: F_U = 246 N

TUTORIAL 2

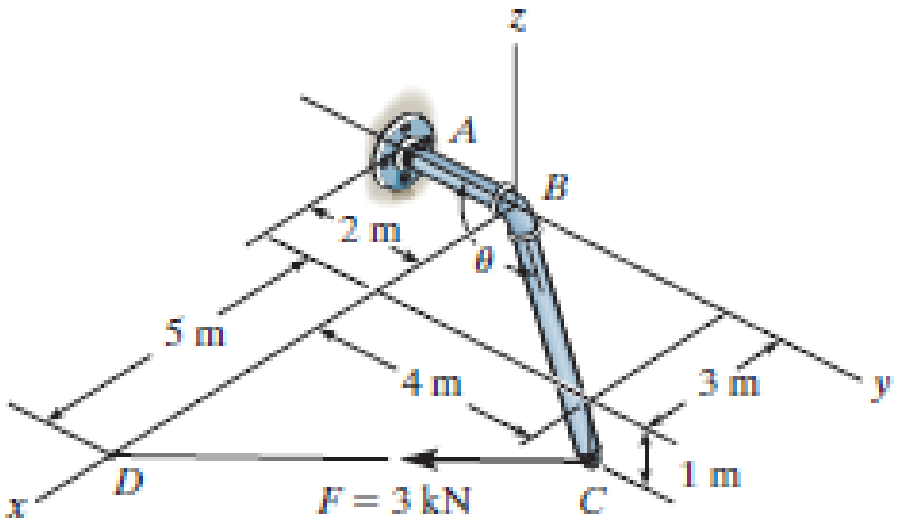
T17) Determine the angle θ between BA and BC



ans: $\theta = 142°$

TUTORIAL 2

T18) Determine the magnitude of the projected component of the 3 kN force acting along the axis BC of the pipe



ans: $|F.UBC|$ =0.182 kN