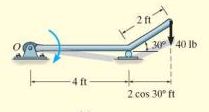
1

(Static) Tutorial

1. **Force System Resultants**
   1. **Moment of a Force - Scalar Formulation**

Example 1

The line of action of the force is illustrate as shown in the figure, the force tend to rotate the member, orbit of the force about O is shown as colored curl.

Solution:

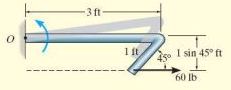
MO= F\*d (N.m) or (Ib ft)

F= 40Ib , d= 4ft → MO= F\*d = 40 \* (4+2cos30) = 160

MO= 40 Ib \* (4+ 2\*0.86) ft=229 Ib ft

Example 2

The line of action of the force is illustrate as shown in the figure, the force tend to rotate the member, orbit of the force about O is shown as colored curl.

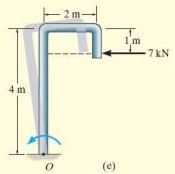
Solution:

MO= F\*d (N.m)

F= 60Ib , d= 1 sin45 ft

MO= 60 \* (1 sin45)=60 Ib \* (1\* ) ft =60 \* 0.707= 42.42 Ib ft

Example 3

The line of action of the force is illustrate as shown in the figure, the force tend to rotate the member, orbit of the force about O is shown as colored curl.

Solution:

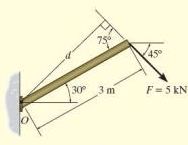
MO= F\*d (N.m)

F= 7 kN , d= 4-1=3

MO= F\*d = 7 kN \* 3ft=21 kN ft

* 1. **Moment of a Force - Vector Formulation**

Example 1 :

Determine the moment of the force in the following figure about point O

Solution 1 : MO= F\*d

45

30

45

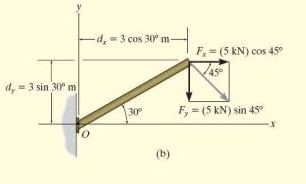
d= 3 sin θ

30

θ=45 + 30 =75o

d= 3 sin 75=2.898m

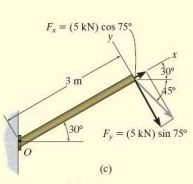
MO= F\*d = 5 kN \* 2.898m=14.5 kN m

C:\Users\Aseel\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\Untitled.pngSolution 2

Mo=Fxdy-Fydx

C:\Users\Aseel\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\Untitled.png = - (5 cos45o kN)(3sin30om)-(5 sin45okN)(3 cos30om)

=-14.5KN.m=14.5KN.m

C:\Users\Aseel\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\Untitled.pngSolution 3

Mo=-Fydx

= -(5 sin 75okN)(3m)

= -14.5kN.m=14.5kN.m 