

### Description:

$p$  = pressure on the piston.

$F$  = the force on the piston

$N$  = Guideway Force

$S$  = Force on the connecting rod

$r$  = Crank radius

$F_t$  = Tangential force

$T$  = torque produced at the center of the crank.

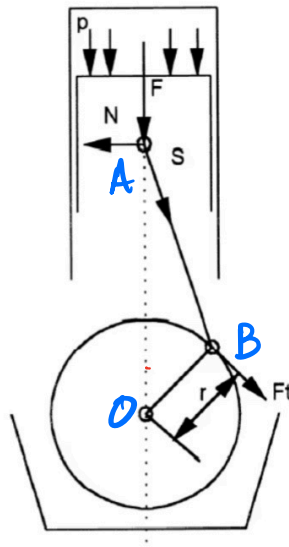
Q: Create a function which calculates  $T$  given  $\theta, F$

Q: Use this function to create a plot of  $T$  vs.  $\theta$ .

Data:

- ① You can assume reasonable values of  $r$  and  $l$ . Take  $l$  to be  $3r$  and assume some realistic value of  $r$ .
- ② The plot should be for  $0 \leq \theta \leq 2\pi$ .
- ③ To create the plot, you will need to assume some value of  $F$ . Assume a reasonable value.

# HINTS.



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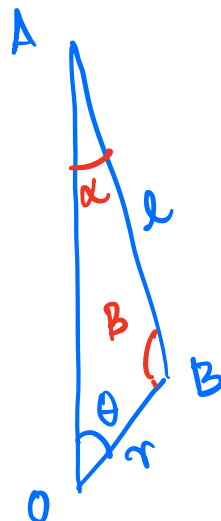
$N$  = Guideway Force

$S$  = Force on the connecting rod

$r$  = Crank radius

$F_t$  = Tangential force

- ① By considering B,  $T = F_t r$ .
- ② Write the FBD of B to relate  $F_t$  to  $S$ .
- ③ Write the FBD of A to relate  $S$  to  $F$ .
- ④ You will need to find the angles  $\alpha, \beta$  in terms of  $\theta, l, r$



- ⑤ Use law of cosines and the law of sines.