(a) \[ \vec{r} = d_1 \hat{i} + d_2 \hat{j} \]
\[ \vec{F} = F \cos \theta \hat{j} - F \sin \theta \hat{k} \]
\[ M = \vec{r} \times \vec{F} \]
\[ = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ d_1 & d_2 & 0 \\ 0 & F \cos \theta & -F \sin \theta \end{vmatrix} = -d_2 F \sin \theta \hat{i} + d_1 F \cos \theta \hat{j} + d_1 F \cos \theta \hat{k} \]

(b) No explanation

c) \[ \theta = 30^\circ, \quad d_1 = d_2 = 0.1 \text{m} \]
\[ \Rightarrow d_2 |F| \sin \theta = -25 \text{ Nm} \]
\[ \Rightarrow |F| = 500 \text{ N} \]

d) \[ 90^\circ \Rightarrow |F| = 250 \text{ N} \]

e) Stability, ... (explanation)

Apply additional torque on the other side using your hand, etc.

Any contraption they can come up with.

<table>
<thead>
<tr>
<th>Force due to rod</th>
<th>( F_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( F )</td>
<td>nut end</td>
</tr>
<tr>
<td>( F )</td>
<td>Force due to foot</td>
</tr>
</tbody>
</table>