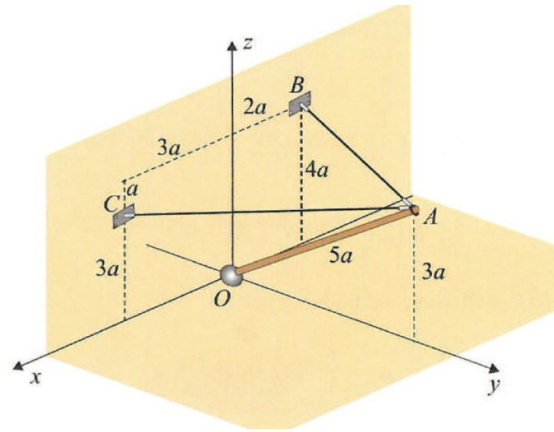


Pre-test

1) For the system in the picture, the moment with respect to the origin O, of a force with modulus S_{AB} applied at A and directed towards B, can be written as:

- a) $\bar{M}_O = \frac{S_{AB}a}{\sqrt{21}} (2,0,4) \times (-2,-4,1)$
- b) $\bar{M}_O = \frac{S_{AB}a}{\sqrt{21}} (-2,0,4) \times (2,-4,1)$
- c) $\bar{M}_O = \frac{S_{AB}a}{\sqrt{21}} (-2,0,4) \times (-2,-4,1)$
- d) $\bar{M}_O = \frac{S_{AB}a}{\sqrt{21}} (-2,0,-4) \times (-2,-4,1)$
- e) $\bar{M}_O = \frac{S_{AB}a}{\sqrt{21}} (-2,0,4) \times (-2,4,1)$
- f) $\bar{M}_O = \frac{S_{AB}a}{\sqrt{21}} (2,0,-4) \times (-2,4,1)$



Correct answer in bold face.



Appendix

Pre-test solution

Position vectors for points A and B: $\vec{r}_A = (0,4,3)a$ and $\vec{r}_B = (-2,0,4)a$

Direction of $\vec{S}_{AB}$:

$$\vec{r}_{AB} = \vec{r}_B - \vec{r}_A = (-2, -4, 1)a$$

$$|\vec{r}_{AB}| = \sqrt{21}a$$

$$\vec{e}_{AB} = \frac{\vec{r}_{AB}}{|\vec{r}_{AB}|} = \frac{1}{\sqrt{21}}(-2, -4, 1)$$

The force vector $\vec{S}_{AB} = S_{AB}\vec{e}_{AB}$

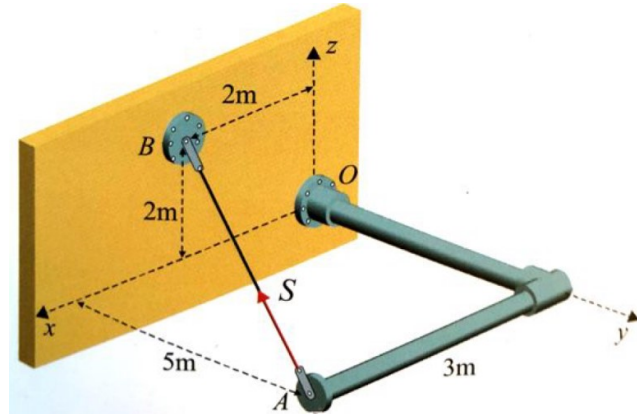
We can move the force $\vec{S}_{AB}$ along its line of action to point B. Then the moment is calculated as:

$$\vec{M}_O = \vec{r}_{AB} \times \vec{S}_{AB} = \frac{S_{AB}a}{\sqrt{21}}(-2, 0, 4) \times (-2, -4, 1)$$

Post-test questions

- 1) **(Task 2)** A wire AB holds the pipe system in the figure in equilibrium. The modulus of the force S in the wire is 500 N. Calculate the moment of the force with respect to the y -axis:

- a) $M_y = \frac{3000}{\sqrt{30}} \text{ Nm}$
- b) $M_y = -\frac{3000}{\sqrt{30}} \text{ Nm}$**
- c) $M_y = 0 \text{ Nm}$
- d) $M_y = \frac{2 \cdot 500}{\sqrt{30}} \text{ Nm}$
- e) $M_y = -\frac{15 \cdot 500}{\sqrt{30}} \text{ Nm}$
- f) $M_y = \frac{15 \cdot 500}{\sqrt{30}} \text{ Nm}$

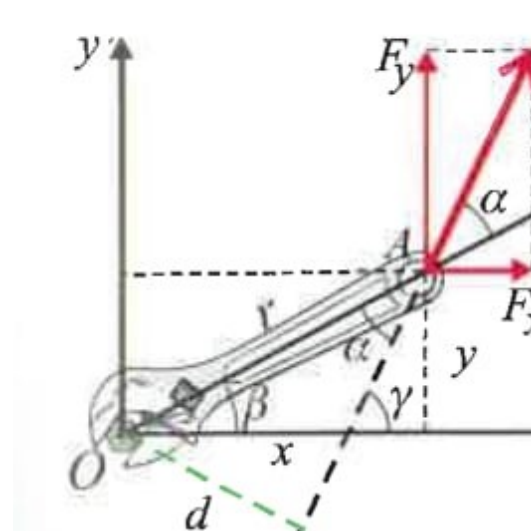


- 2) **(Task 3)** We have a system of forces with the following resultant at the origin: $\{\bar{F}_0; \bar{M}_0\} = \{(0, 100, 0) \text{ N}; (0, 0, -20) \text{ Nm}\}$. If we want to replace the system of forces with a single force, which of the following options is correct:
- a) $\bar{F}_0$ located at: $(x, y, z) = (0.2, 0.8, 0) \text{ m}$
 - b) $-\bar{F}_0$ located at: $(x, y, z) = (-0.2, 1.2, 0) \text{ m}$
 - c) $\bar{F}_0$ located at: $(x, y, z) = (-0.2, 1.2, 0) \text{ m}$**
 - d) $\bar{F}_0$ located at: $(x, y, z) = (0.2, 0.2, 0) \text{ m}$
 - e) $\bar{F}_0$ located at: $(x, y, z) = (0.8, 0.2, 0) \text{ m}$
 - f) $\bar{F}_0$ located at: $(x, y, z) = (0.8, 0.8, 0) \text{ m}$

Correct answers in bold face.

AR Session

1. Torque with respect to a point



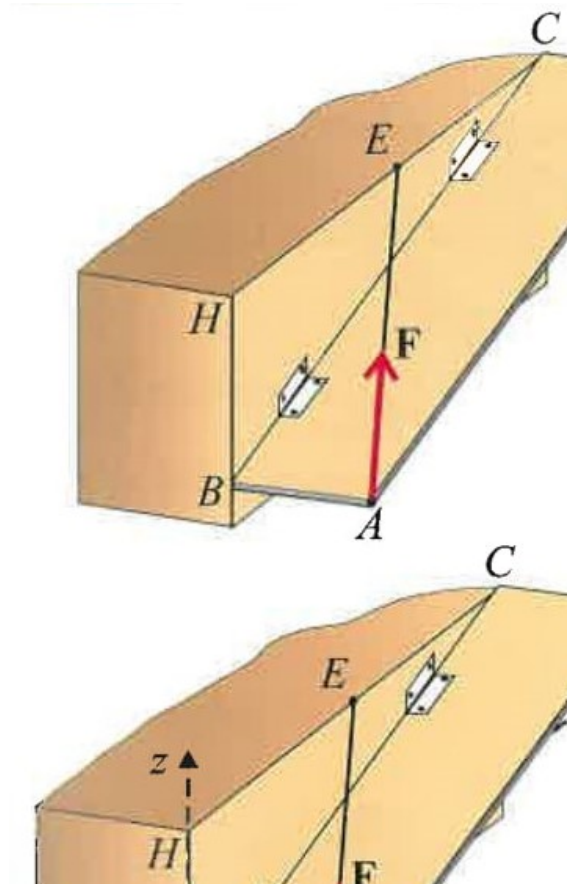
Try to change the value and direction of the force.

How does the torque get affected?

When is the maximum rotation of the tool in the figure obtained?

- How does the distance and value affect the torque?
See equation (3.1) in the book.
- Which components are important for the torque?
See equation (3.2) in the book.
- How can you use the vector product to calculate the torque?
See equation (3.3) in the book.

2. Torque with respect to an axis



Try to change the value and direction of the force.

How does the torque get affected?

Can you open the door?

- How does the distance and value affect the torque?
- Which components are important for the torque?
- How can you use the vector product to calculate the torque?

See example (3.5) in the book.



Appendix

AR Mechanics

Questionnaire

*Obligatorisk

How hard do you find the Mechanics course so far? *

	1	2	3	4	
Very easy	☐	☐	☐	☐	Very hard

Did the app contribute to your understanding of torque? *

	1	2	3	4	
Nothing	☐	☐	☐	☐	Very much

Please motivate your response. *

Ditt svar

Which of the two examples did you prefer? *

☐ Wrench

☐ Door

Please motivate your response. *

Ditt svar

Do you have any other comments?

Ditt svar

Skicka