

Lesson 2a - Moments and Balance

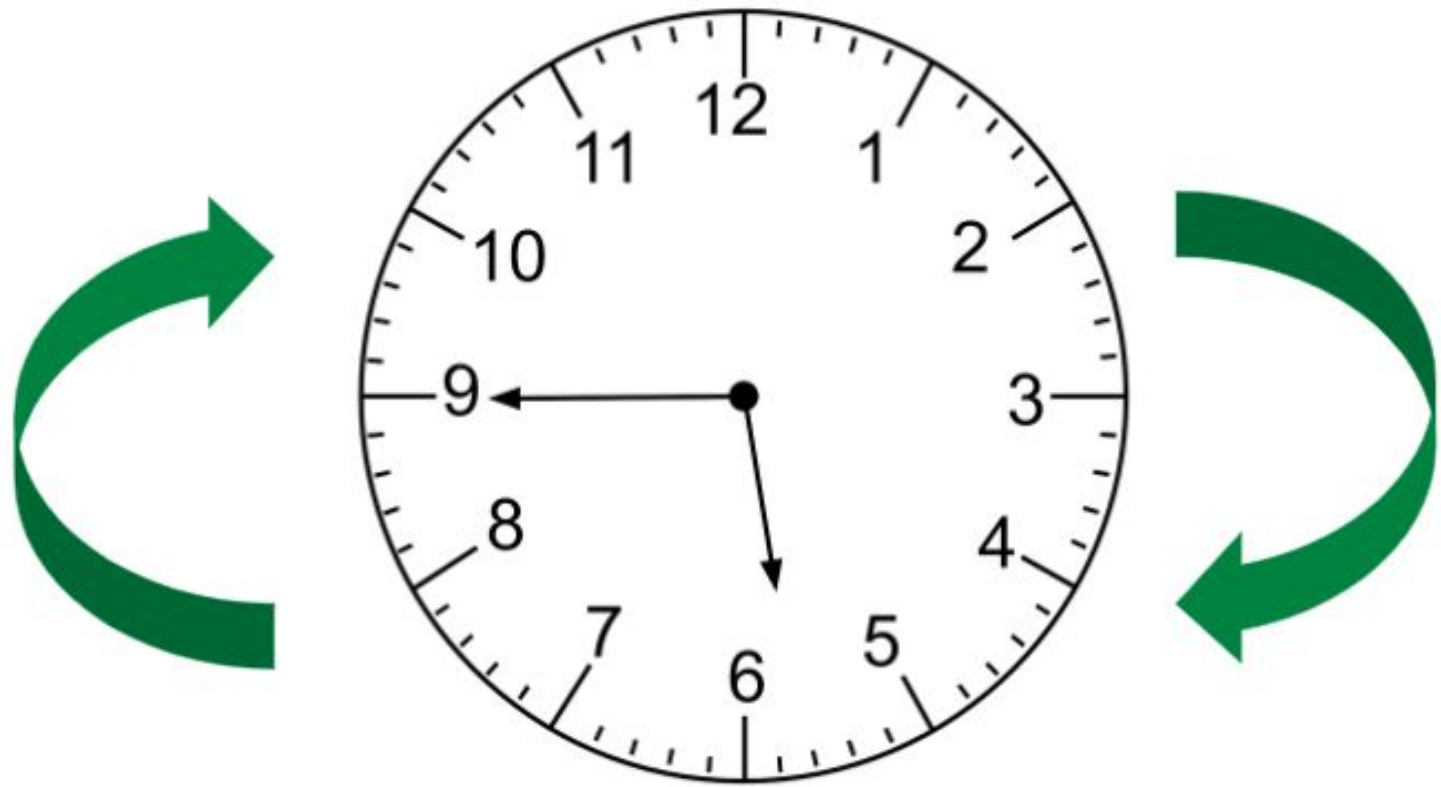
Physics - KS3

Forces In Action

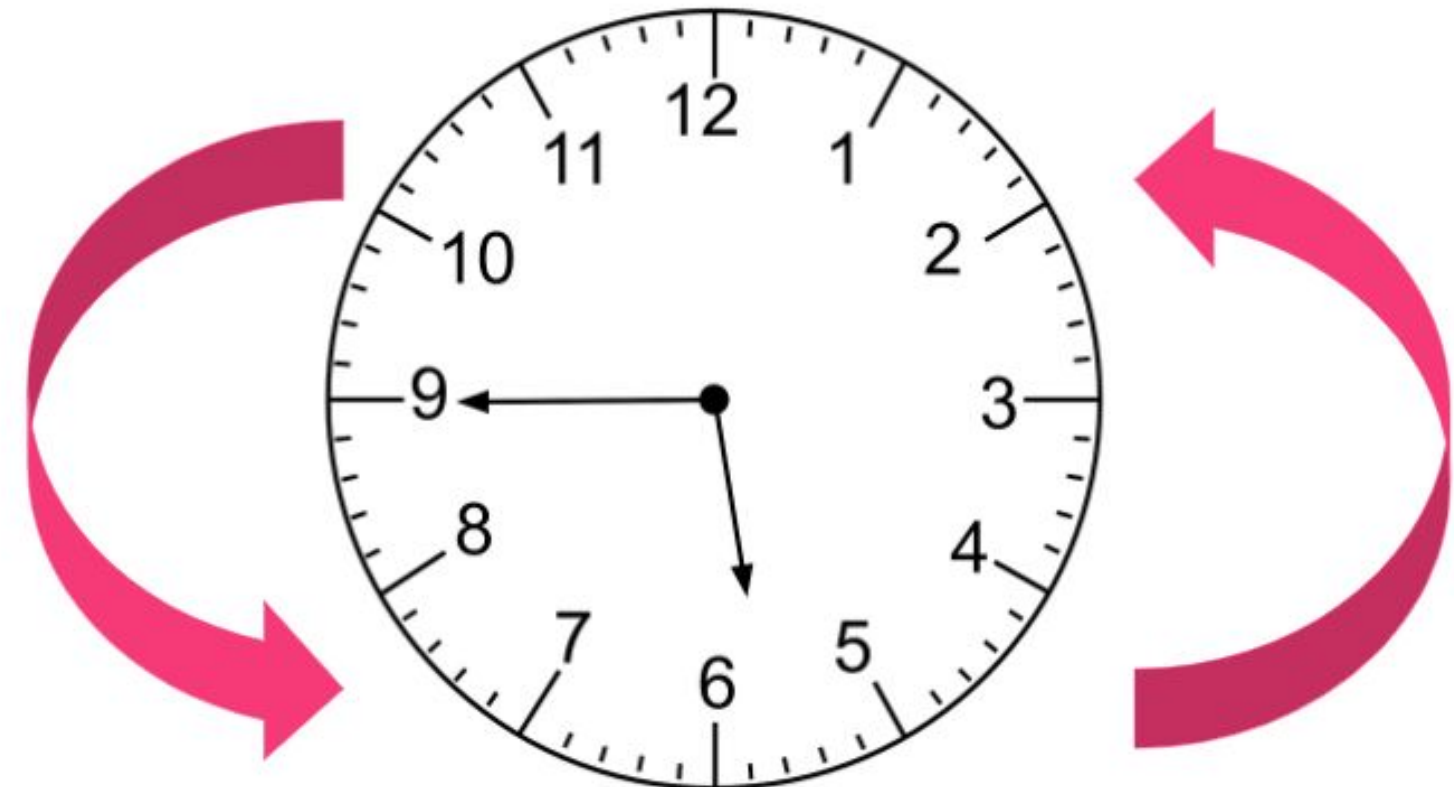
Mrs Wolstenholme



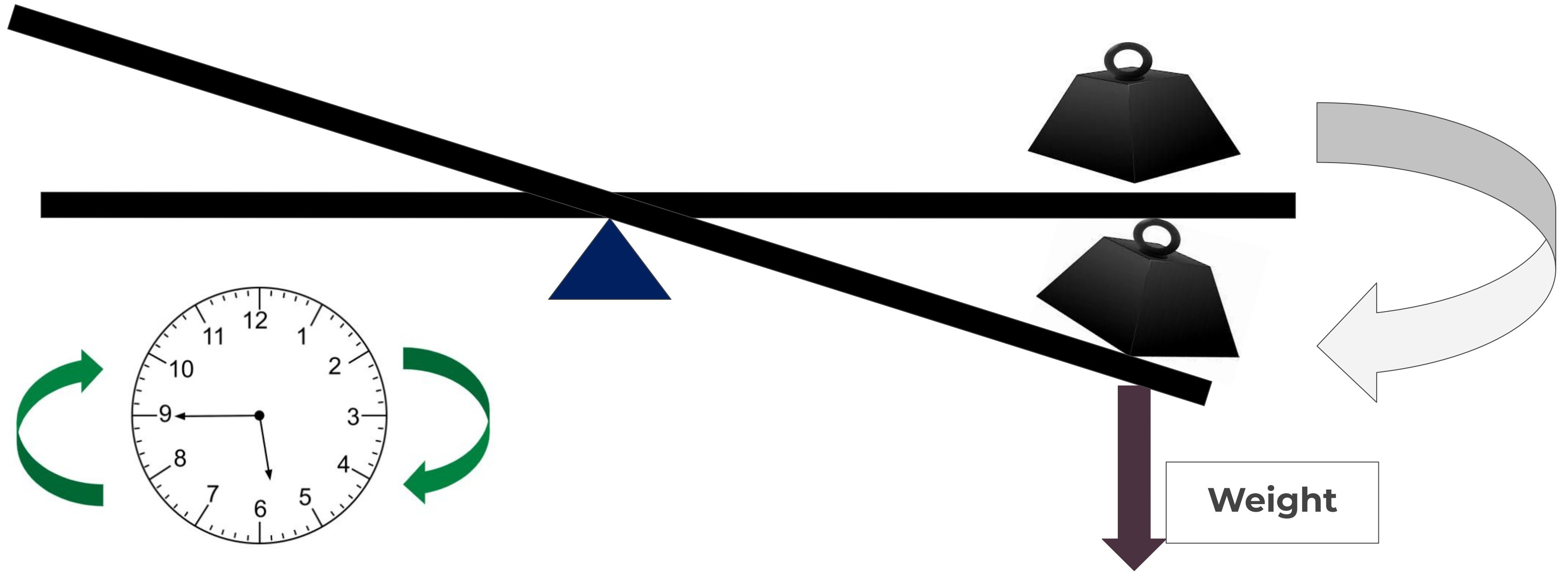
Clockwise



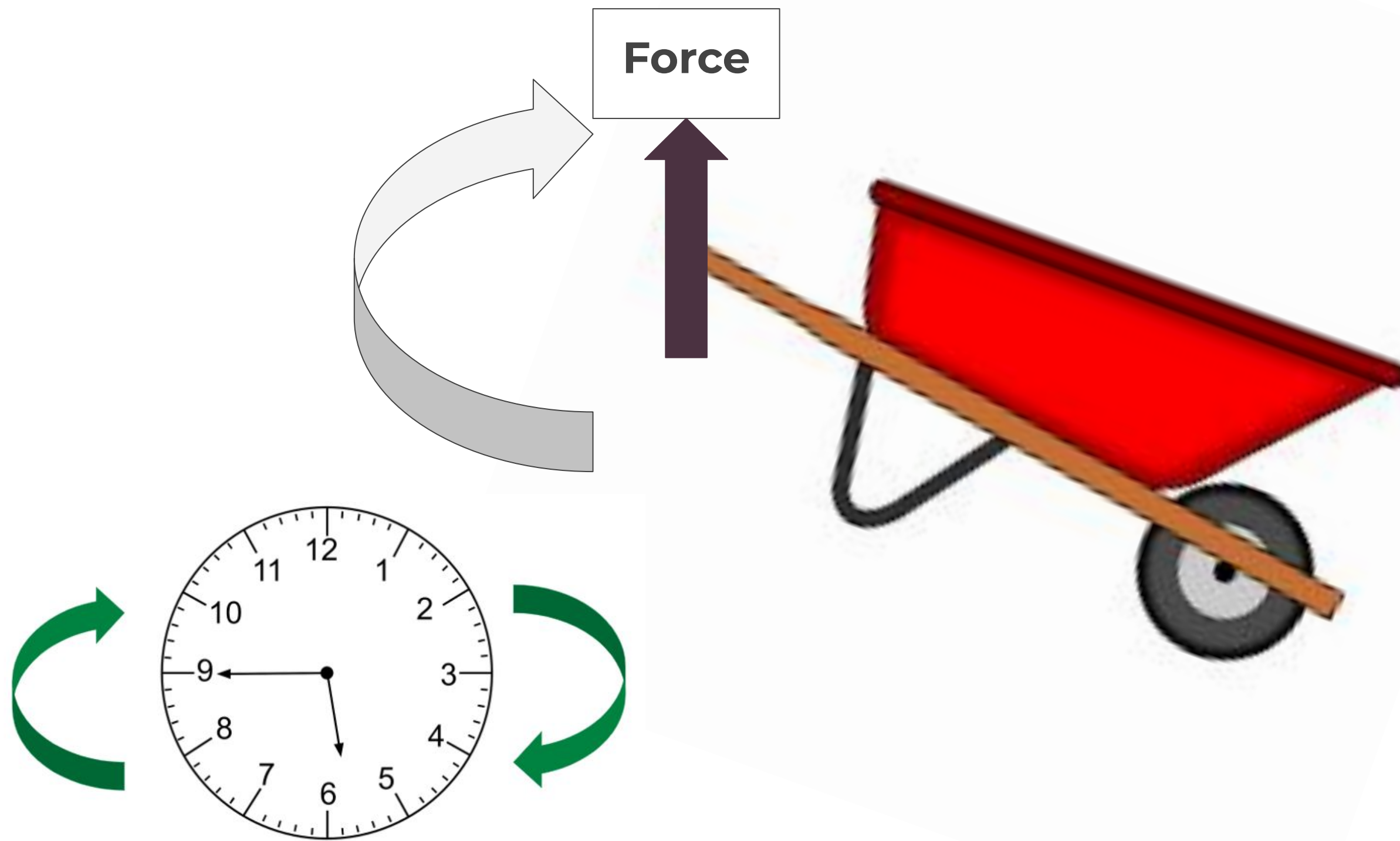
Anticlockwise



Clockwise moment



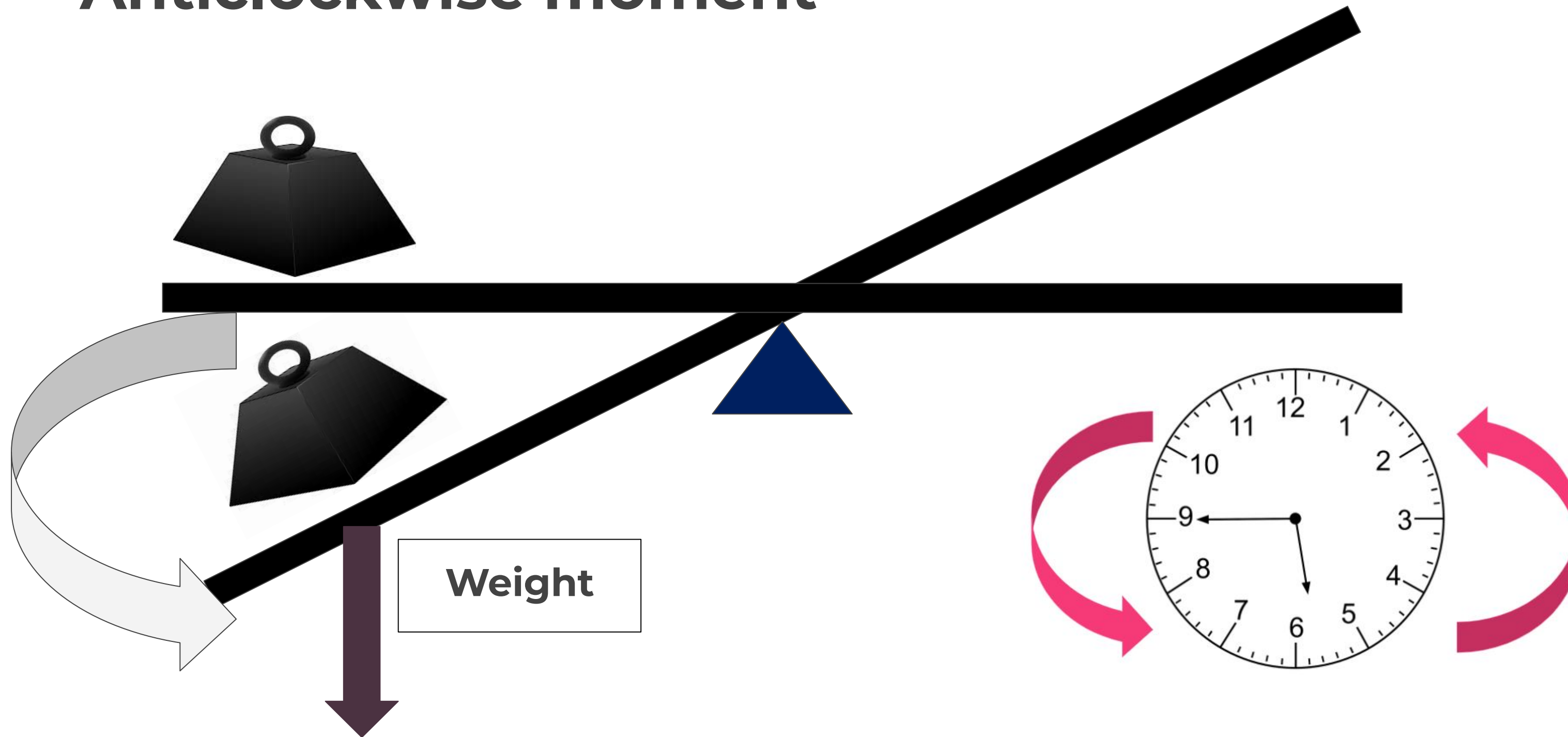
Clockwise Moment

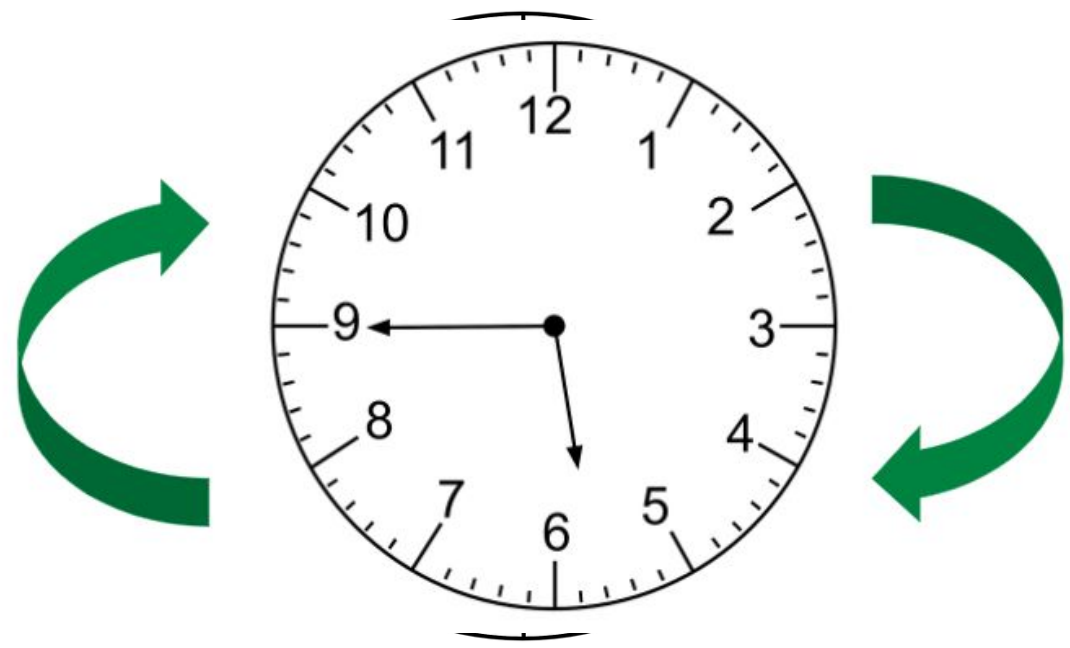


Credit: no attribution required

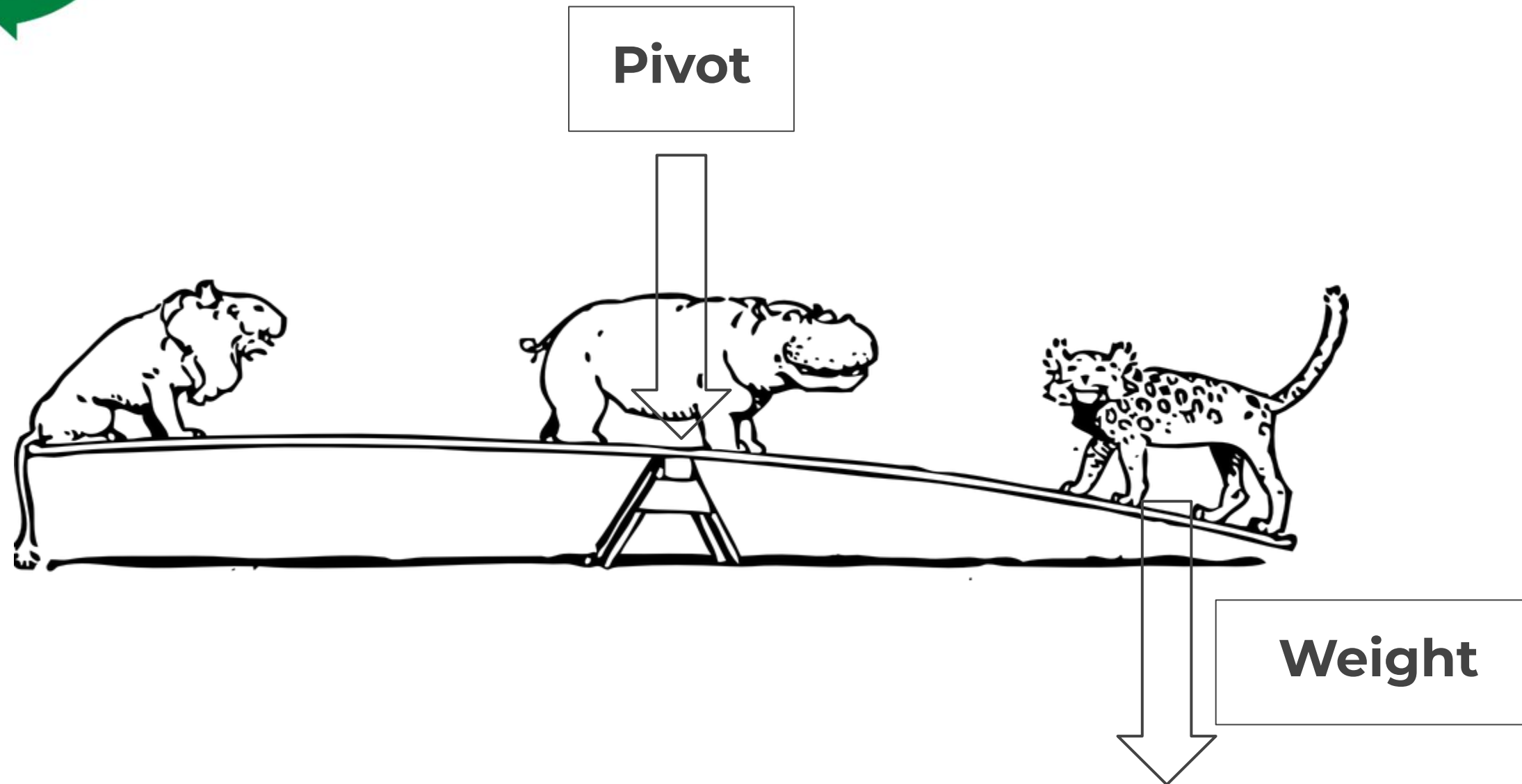


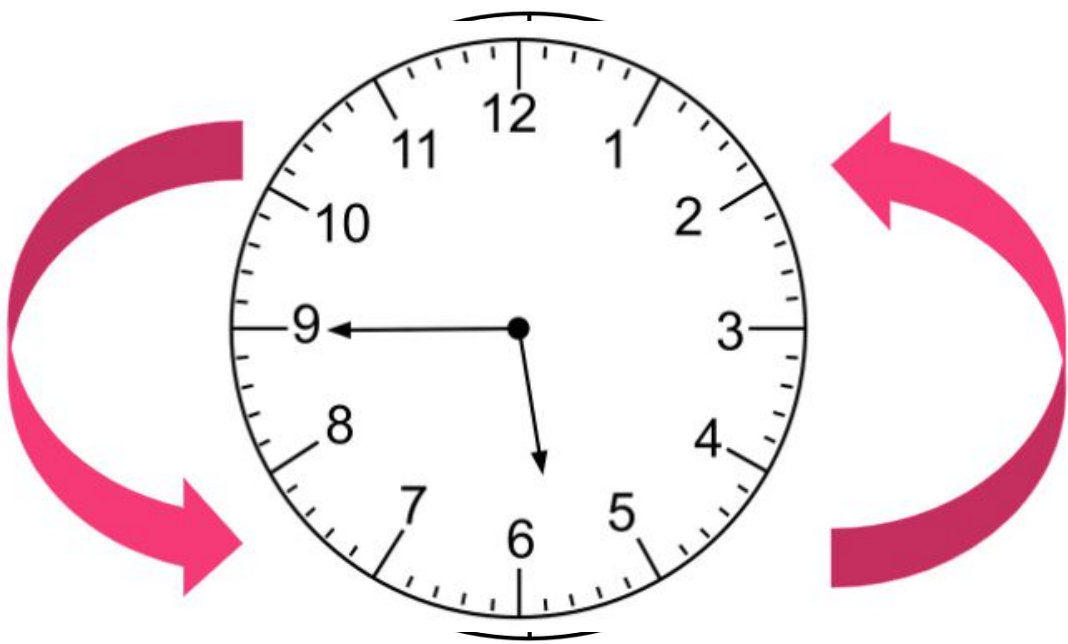
Anticlockwise moment



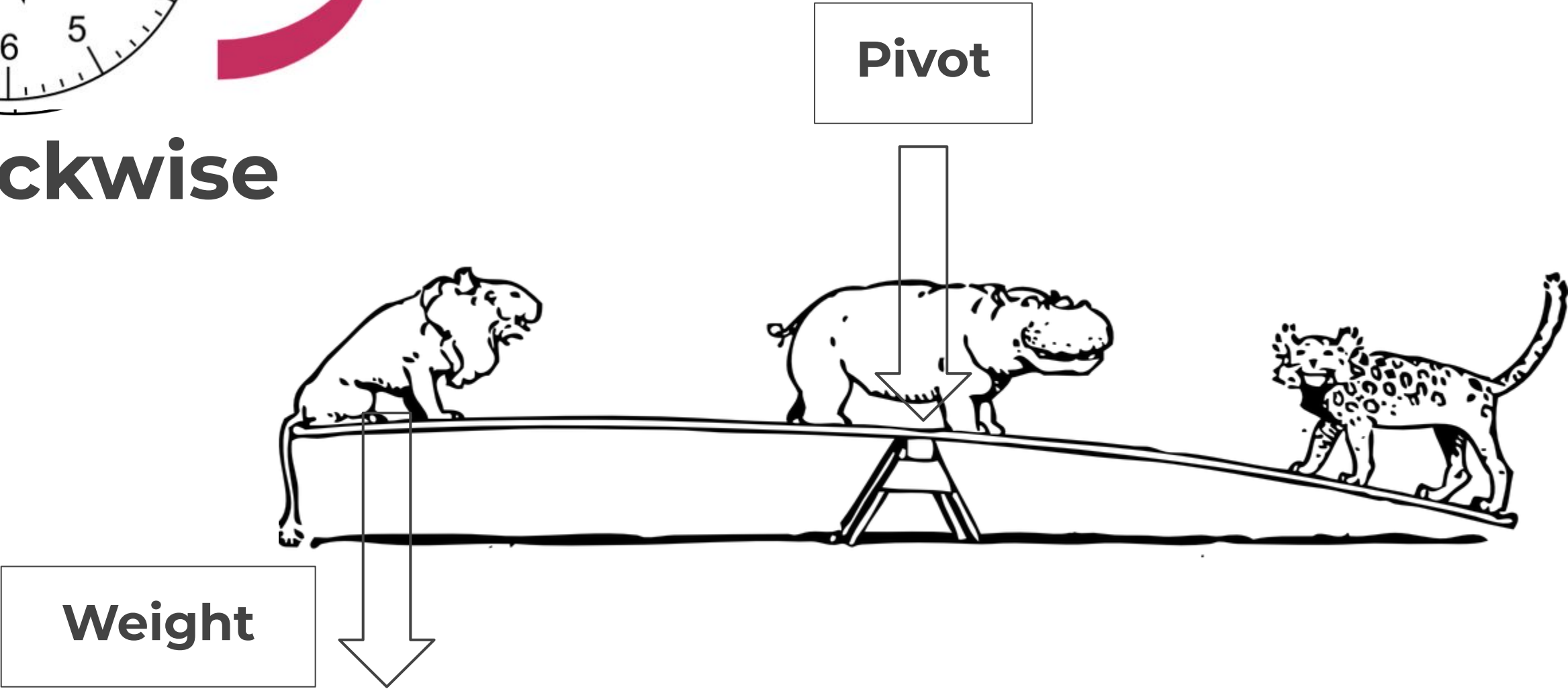


Clockwise





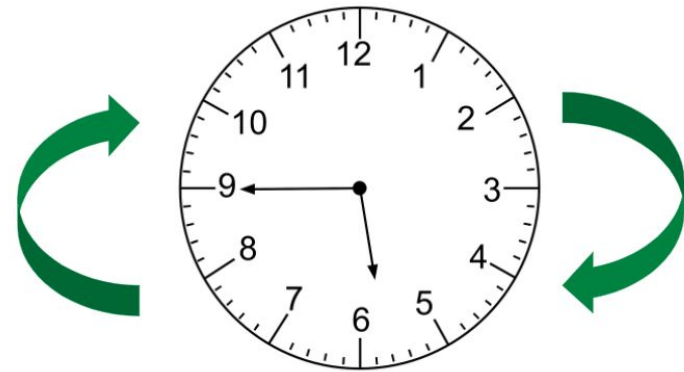
Anticlockwise



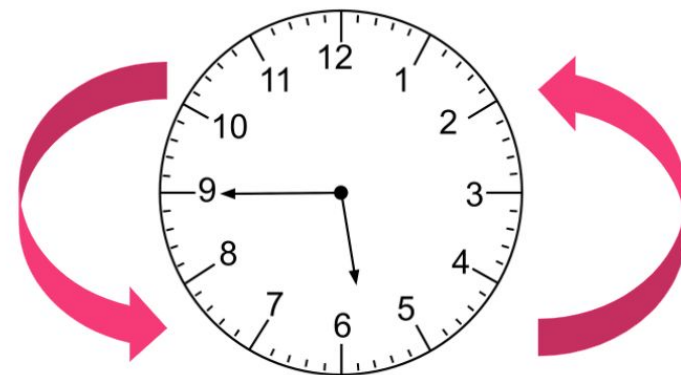
Summary

Moments can be clockwise or anticlockwise

- Clockwise moments cause a rotation in the same direction of a clock hand



- Anticlockwise moments cause a rotation in the opposite direction of a clock hand



Which Direction will an object rotate because of a clockwise moment?

Option 1

Same as a clock hand

Option 2

Up

Option 3

Opposite to a clock hand

Option 4

Down



Which Direction will an object rotate because of an anticlockwise moment?

Option 1

Same as a clock hand

Option 2

Up

Option 3

Opposite to a clock hand

Option 4

Down



Reminder: Calculating Moments

$$\begin{array}{ccccc} \text{Moment} & = & \text{Force} & \times & \text{Perpendicular distance} \\ (\text{Nm}) & & (\text{N}) & & (\text{m}) \\ (\text{Ncm}) & & & & (\text{cm}) \end{array}$$

Clockwise Moment = Anticlockwise Moment



For an object to be balanced:

Option 1

Left side moment = Right side moment

Option 2

Clockwise moment is larger than anticlockwise moment

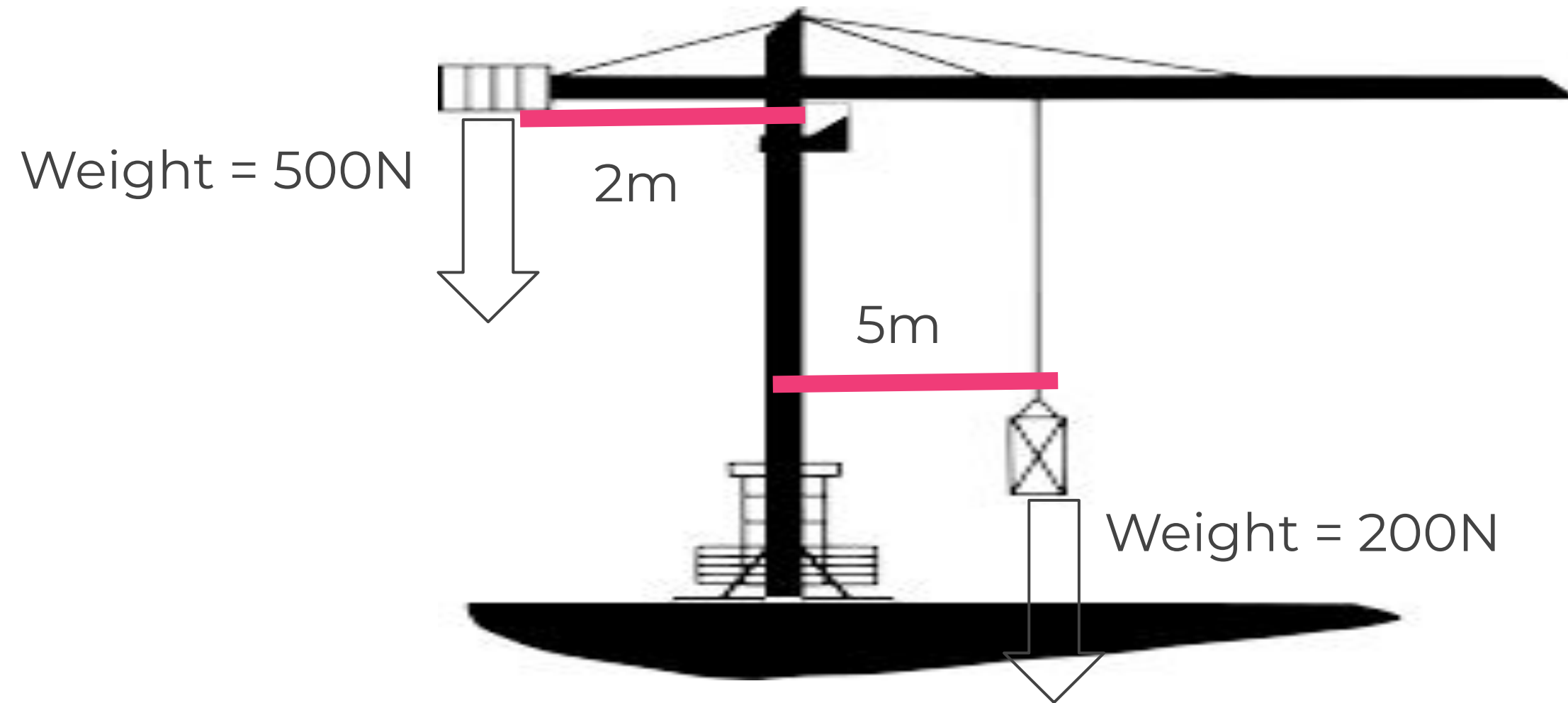
Option 3

Clockwise moment = Anticlockwise moment

Option 4

There are no forces on the object

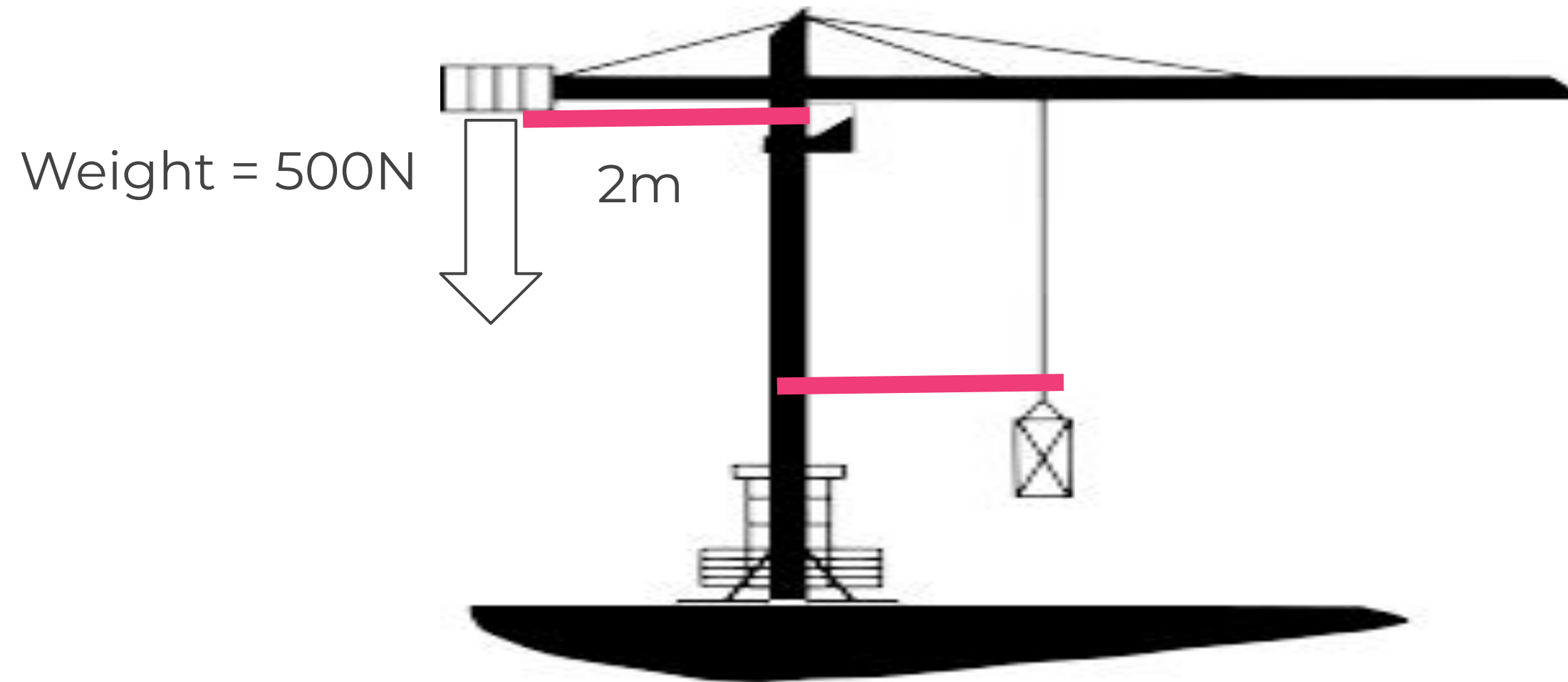




Is this crane balanced?

Clockwise Moment = Anticlockwise Moment



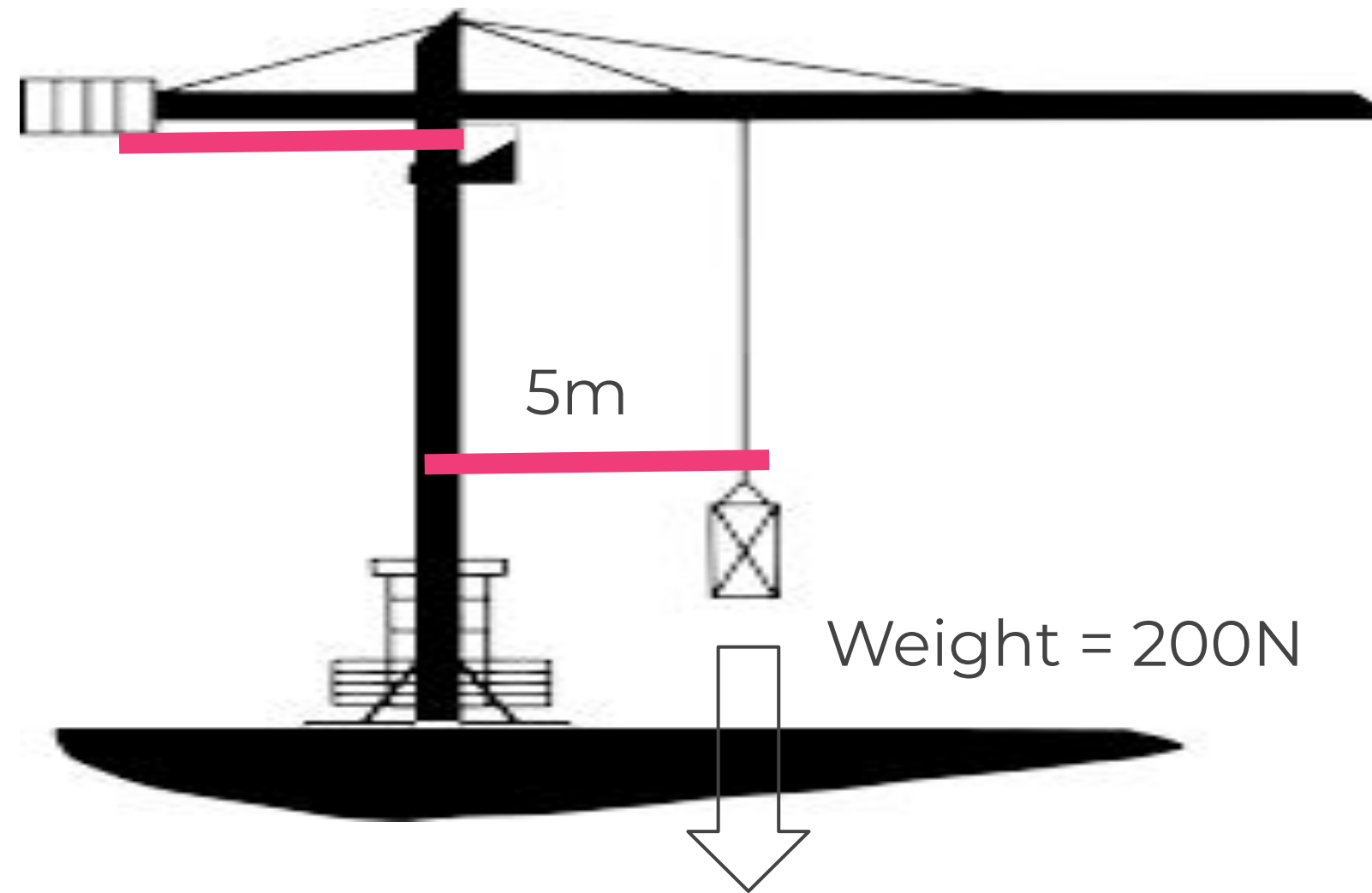


Anticlockwise moment = Force x perpendicular distance

$$= 500 \times 2$$

$$= 1000\text{Nm}$$



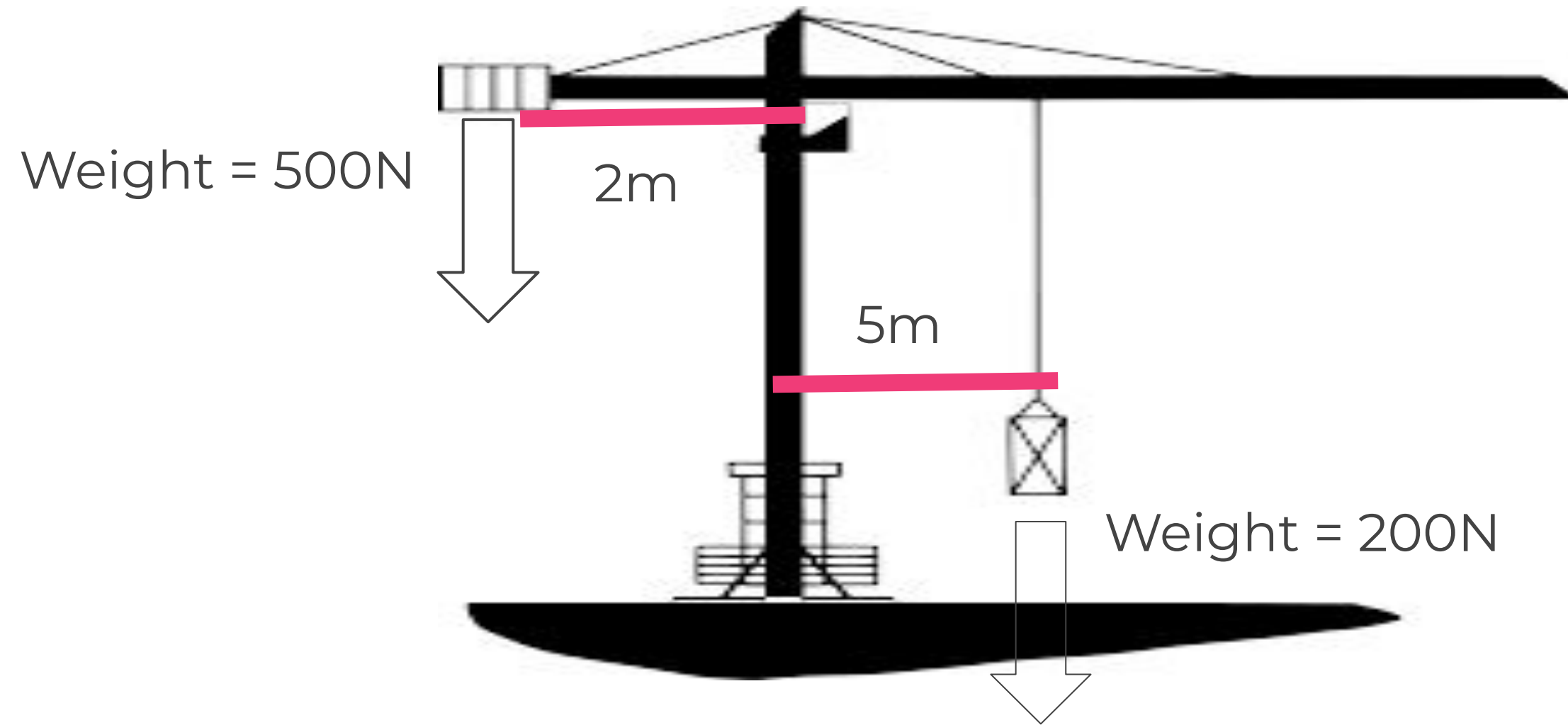


Clockwise moment = Force x perpendicular distance

$$= 200 \times 5$$

$$= 1000\text{Nm}$$





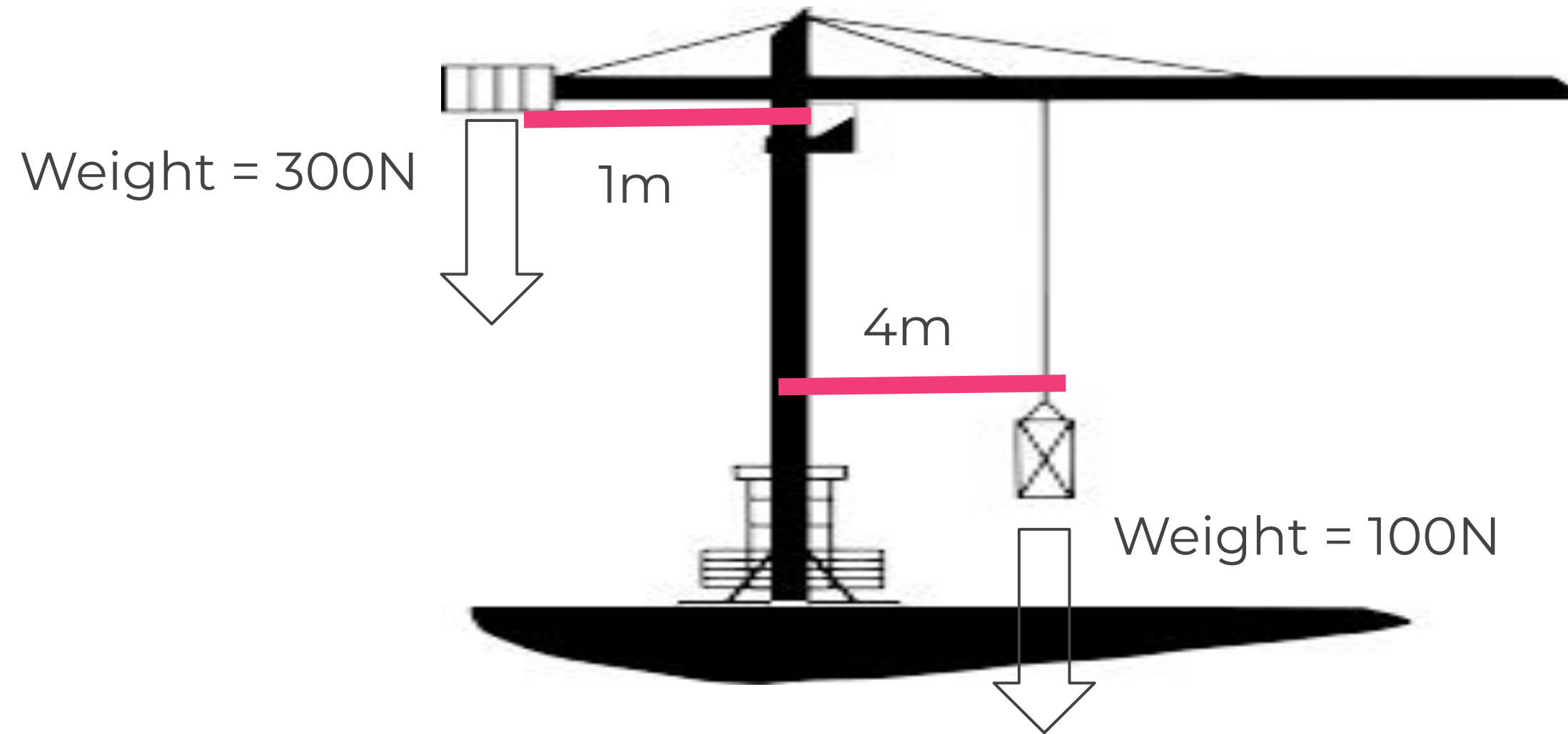
Anticlockwise moment = 1000Nm

Clockwise moment = 1000Nm

Clockwise Moment = Anticlockwise Moment

Balanced!





Your Turn: Is this crane balanced?

Clockwise Moment = Anticlockwise Moment



Balance and Moments

See video for diagram

The seesaw is balanced.

What is the moment of child A?



Balance and Moments

See video for diagram

To be balanced, moment of child A = moment of child B

Moment of child B = Force x perpendicular distance

Moment of child B = 280×90

Moment of child B = 25200 Ncm \rightarrow Moment of Child A = 25200 Ncm



Your Turn: Balance and Moments

See video for diagram

40 350

The seesaw is balanced.

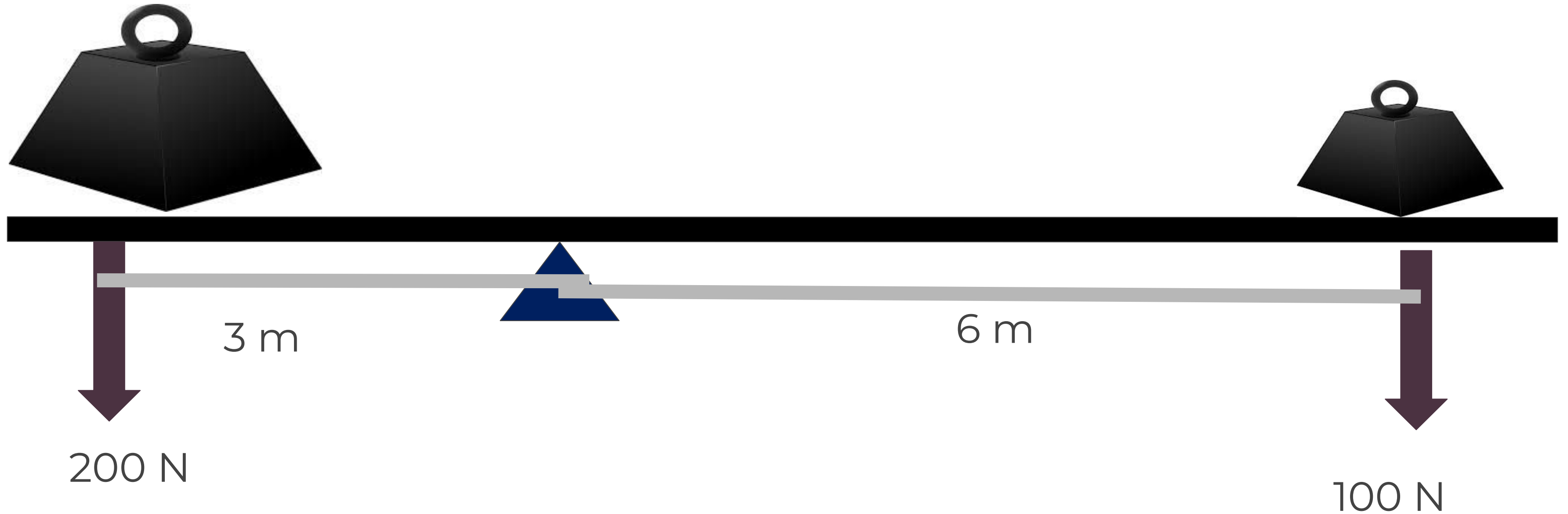
What is the moment of child A?



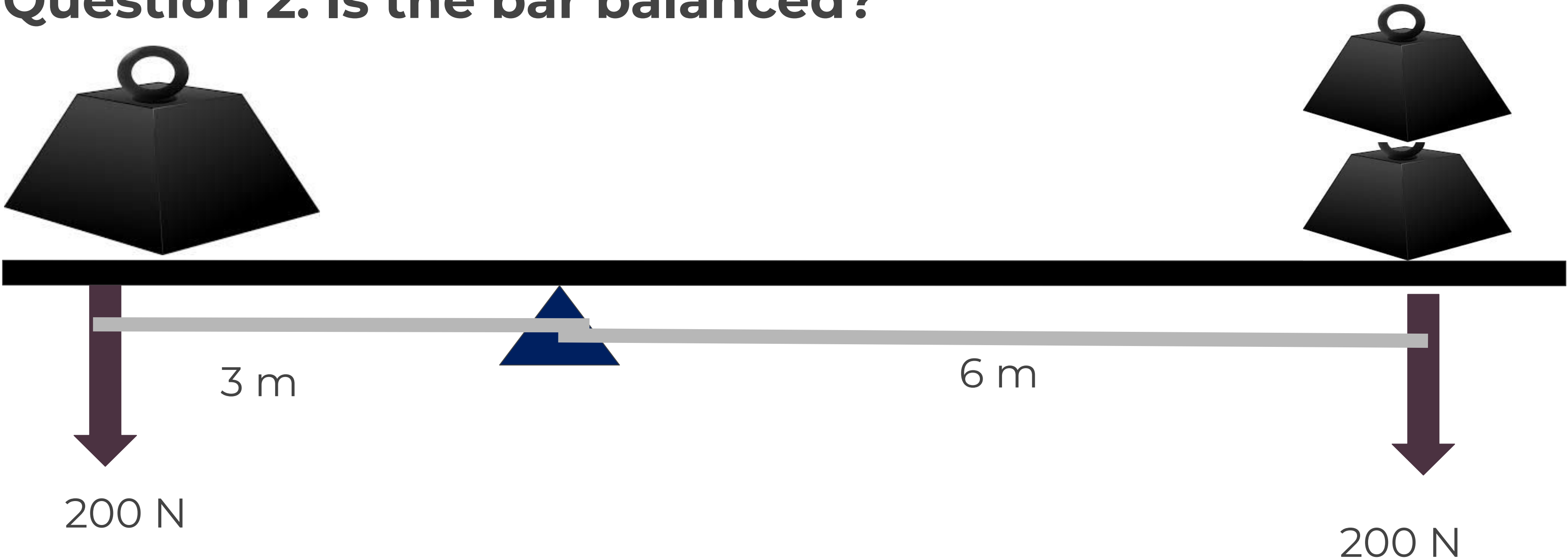
More Practice



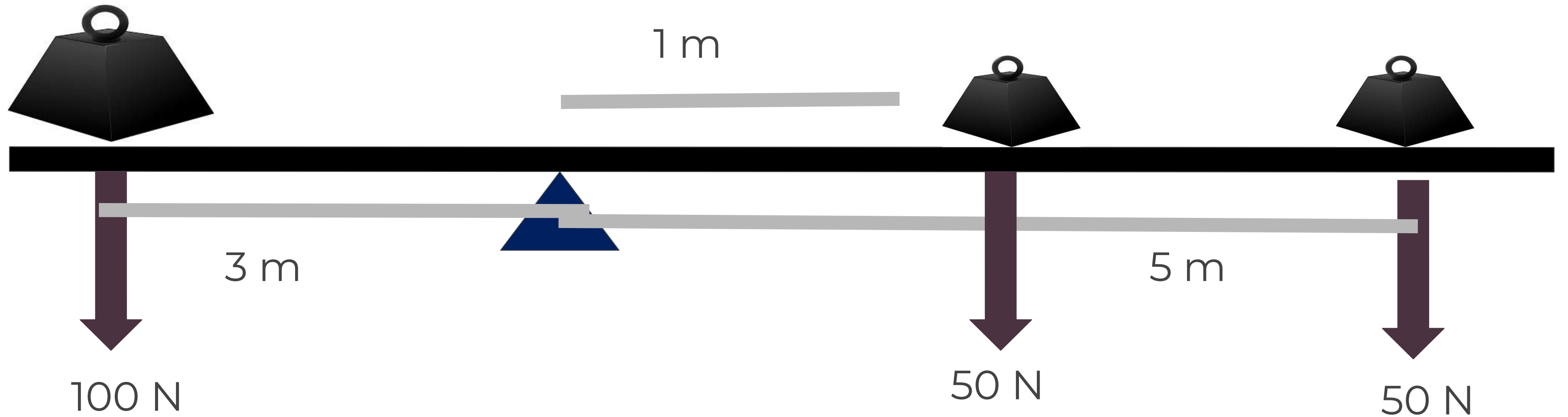
Question 1: Is the bar balanced?



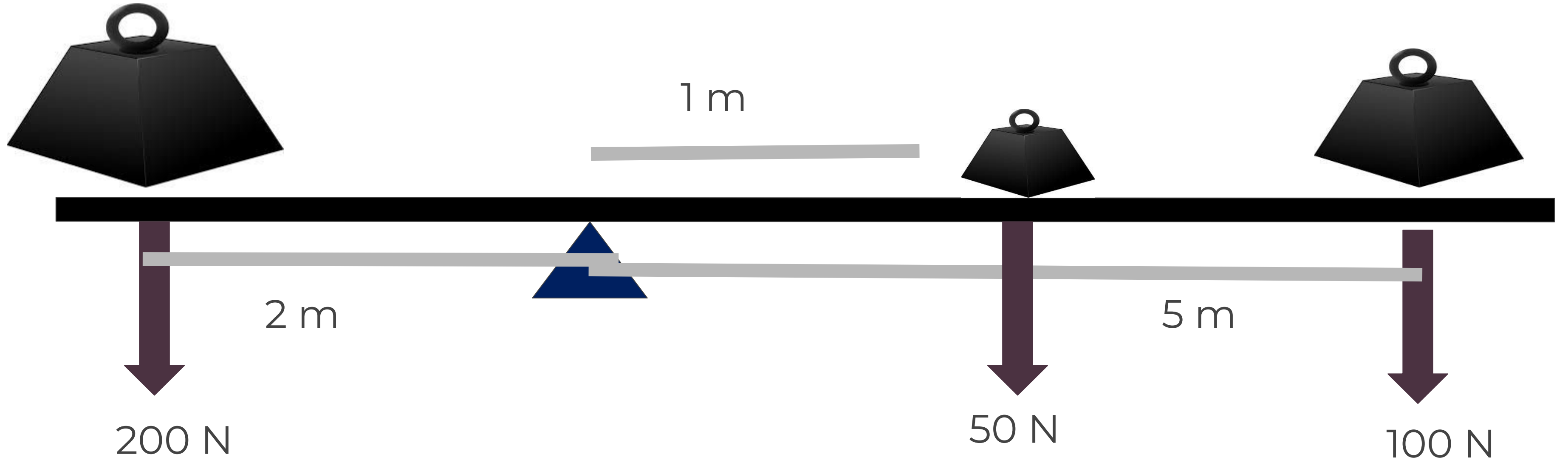
Question 2: Is the bar balanced?



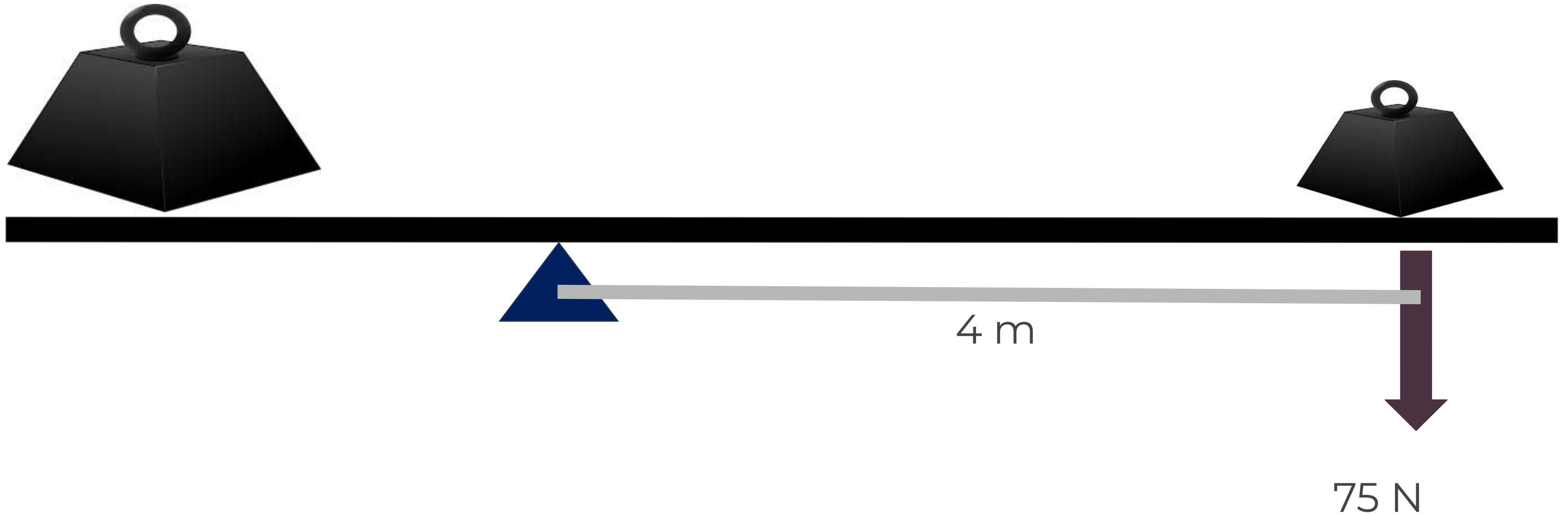
Question 3: Is the bar balanced?



Question 4: Is the bar balanced?



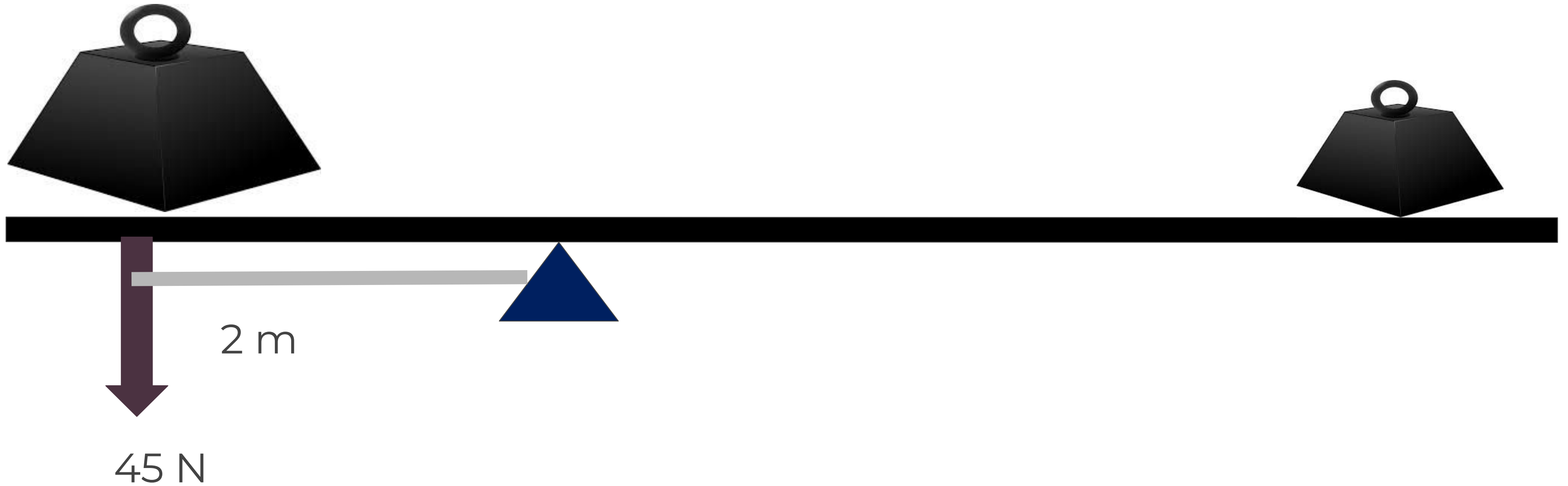
Question 5: The bar is balanced. What is the anticlockwise moment?



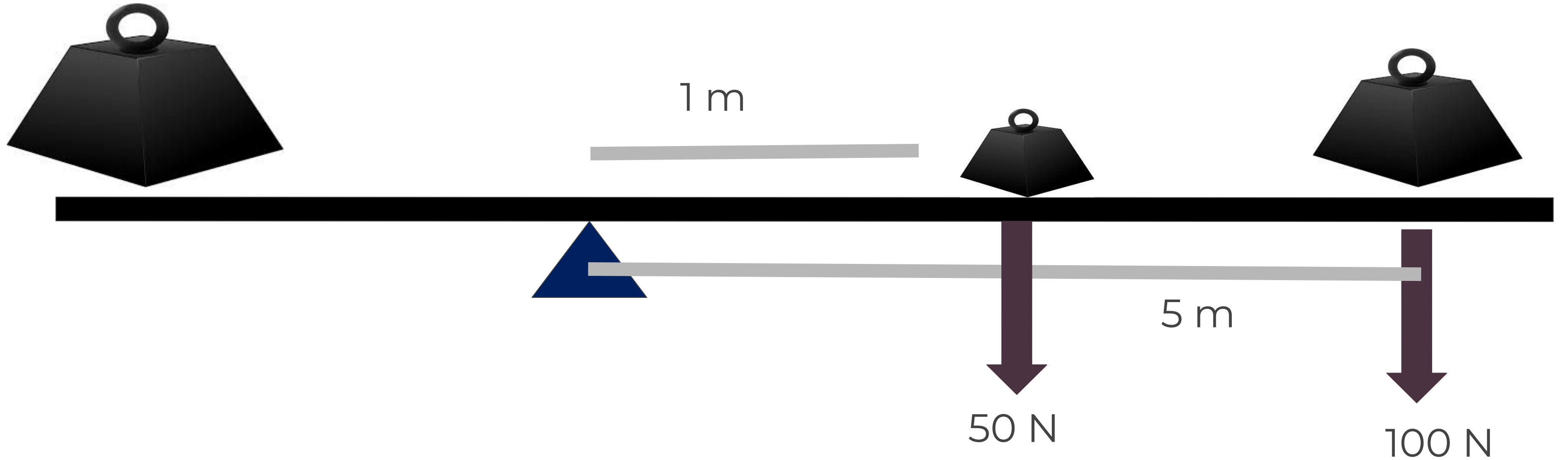
Question 6: The bar is balanced. What is the clockwise moment?



Question 7: The bar is balanced. What is the clockwise moment?



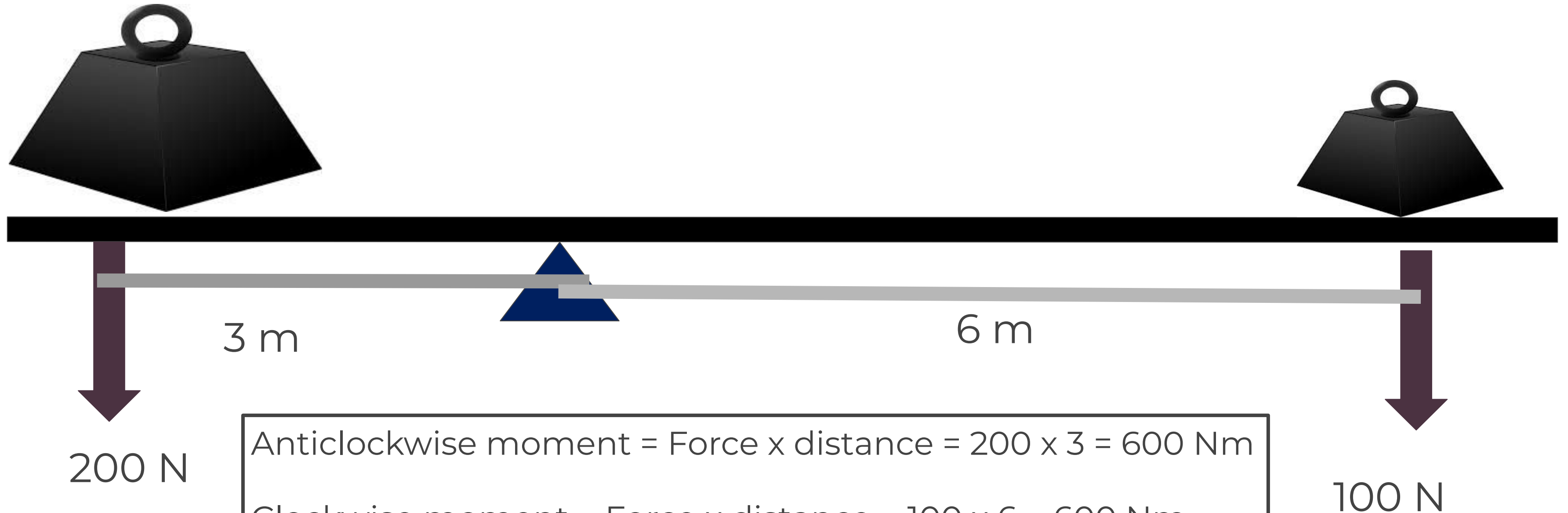
Question 8: The bar is balanced. What is the anticlockwise moment?



Answers



Question 1: Is the bar balanced?



Anticlockwise moment = Force x distance = $200 \times 3 = 600 \text{ Nm}$

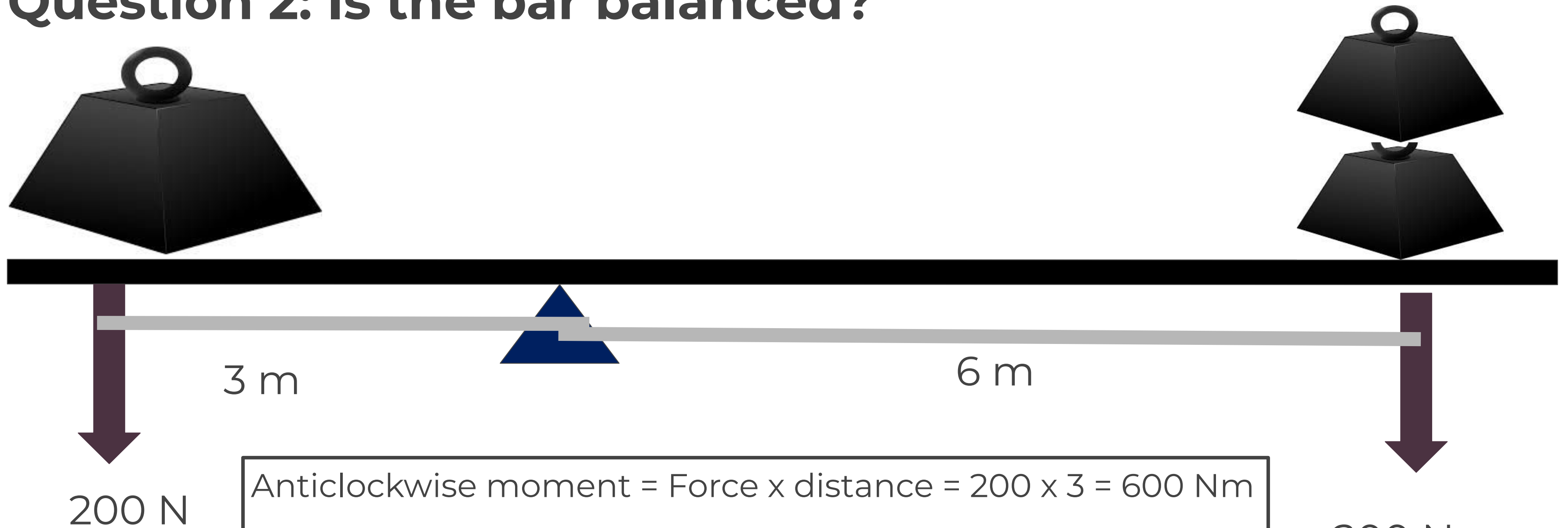
Clockwise moment = Force x distance = $100 \times 6 = 600 \text{ Nm}$

So Clockwise moment = Anticlockwise Moment

Balanced!



Question 2: Is the bar balanced?



Anticlockwise moment = Force x distance = $200 \times 3 = 600 \text{ Nm}$

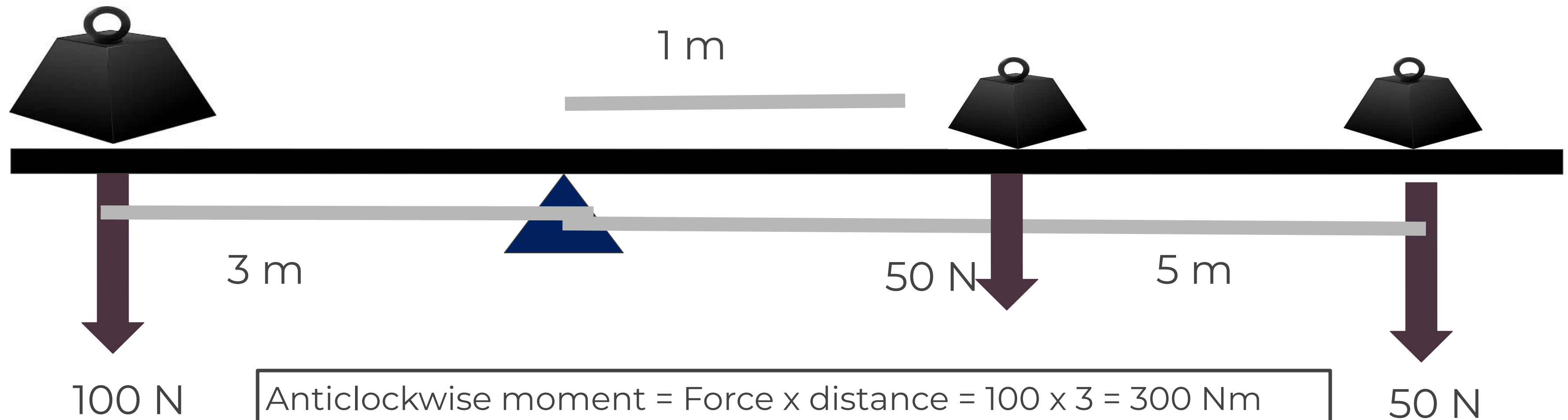
Clockwise moment = Force x distance = $200 \times 6 = 1200 \text{ Nm}$

So Clockwise moment does not equal Anticlockwise Moment

Not Balanced!



Question 3: Is the bar balanced?



Anticlockwise moment = Force x distance = $100 \times 3 = 300 \text{ Nm}$

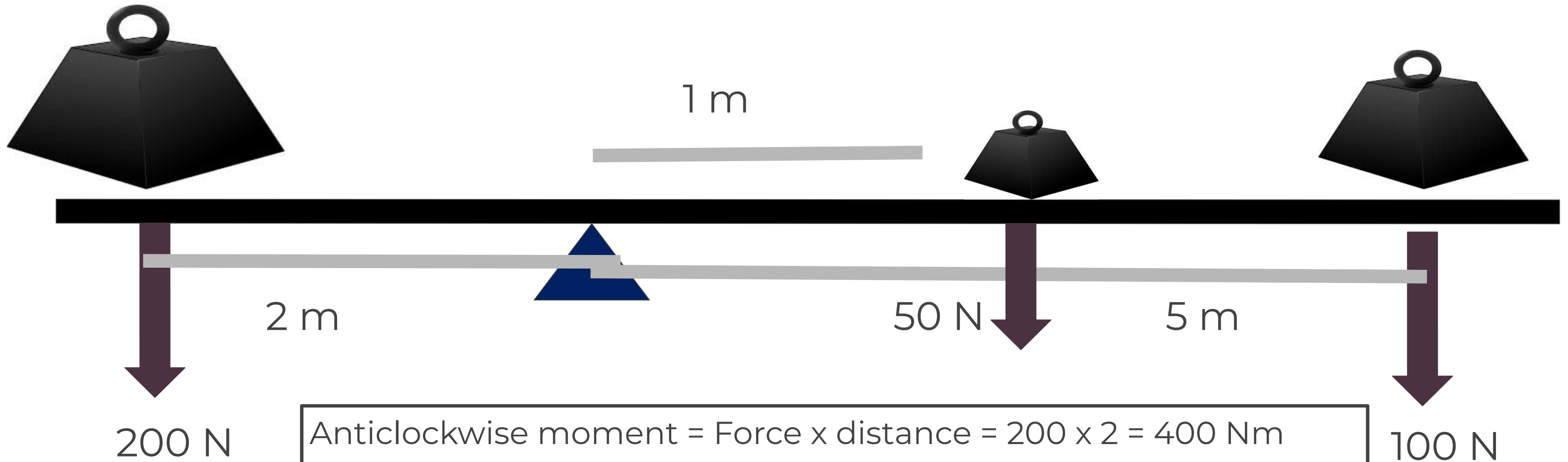
Clockwise moment = Force x distance = $50 \times 5 + 50 \times 1 = 300 \text{ Nm}$

So Clockwise moment = Anticlockwise Moment

Balanced!



Question 4: Is the bar balanced?



Anticlockwise moment = Force x distance = $200 \times 2 = 400 \text{ Nm}$

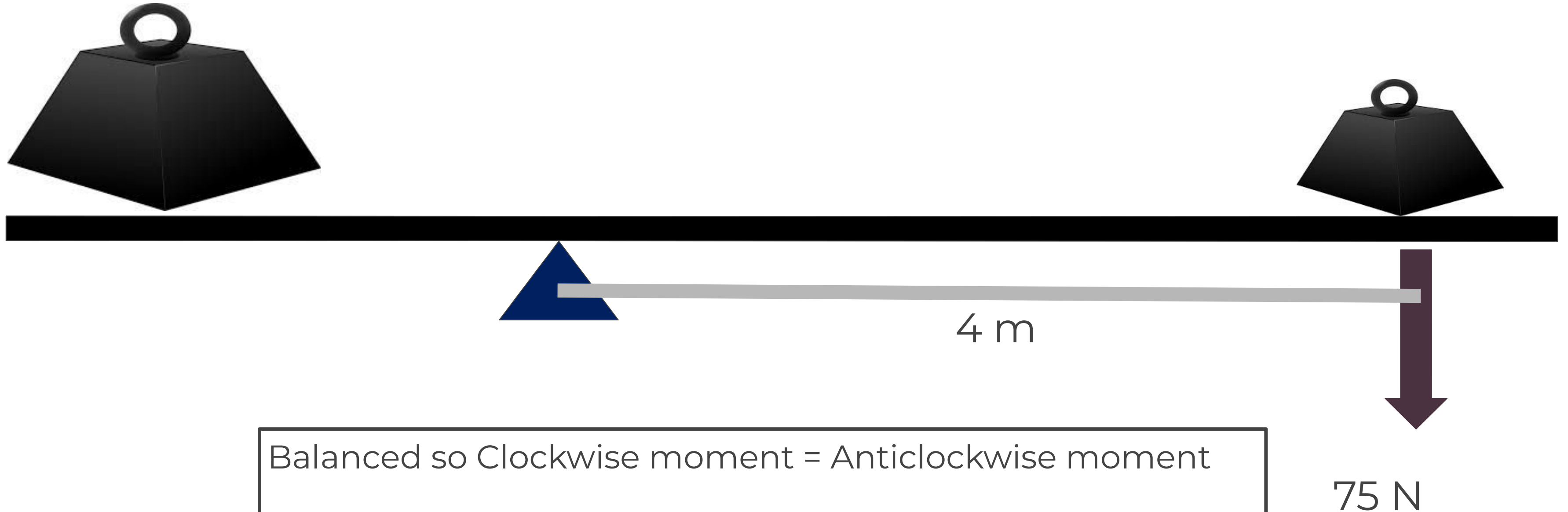
Clockwise moment = Force x distance = $50 \times 1 + 100 \times 5 = 550 \text{ Nm}$

So Clockwise moment does not equal Anticlockwise Moment

Not Balanced!



Question 5: The bar is balanced. What is the anticlockwise moment?



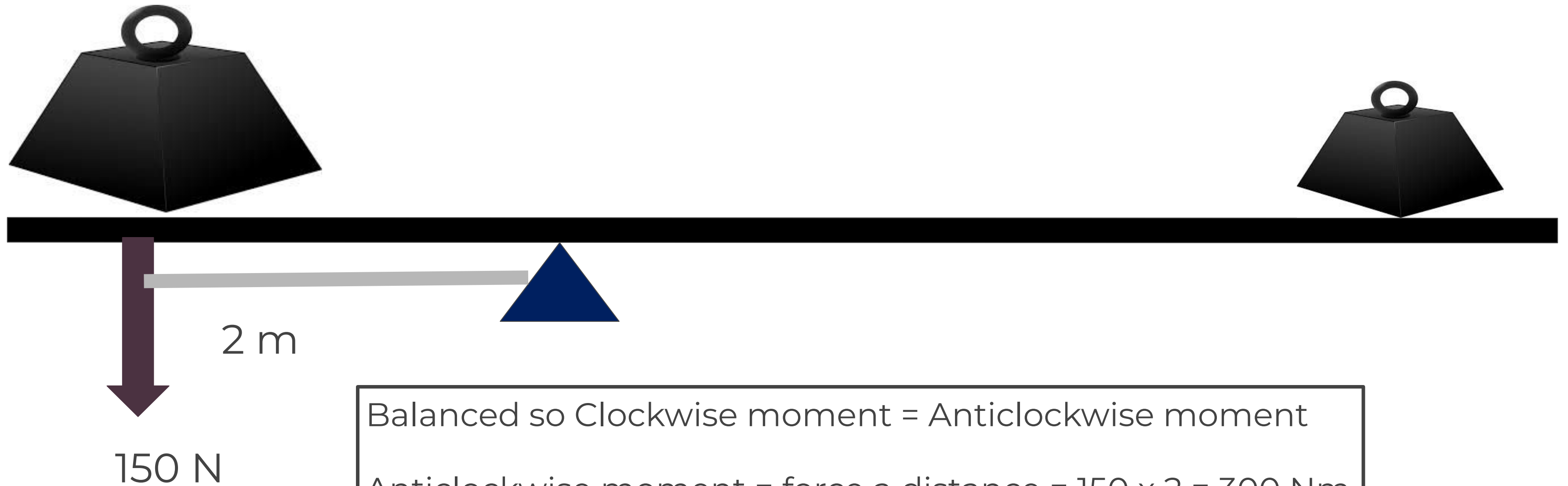
Balanced so Clockwise moment = Anticlockwise moment

Clockwise moment = force \times distance = $75 \times 4 = 300 \text{ Nm}$

So Anticlockwise moment = 300 Nm as well



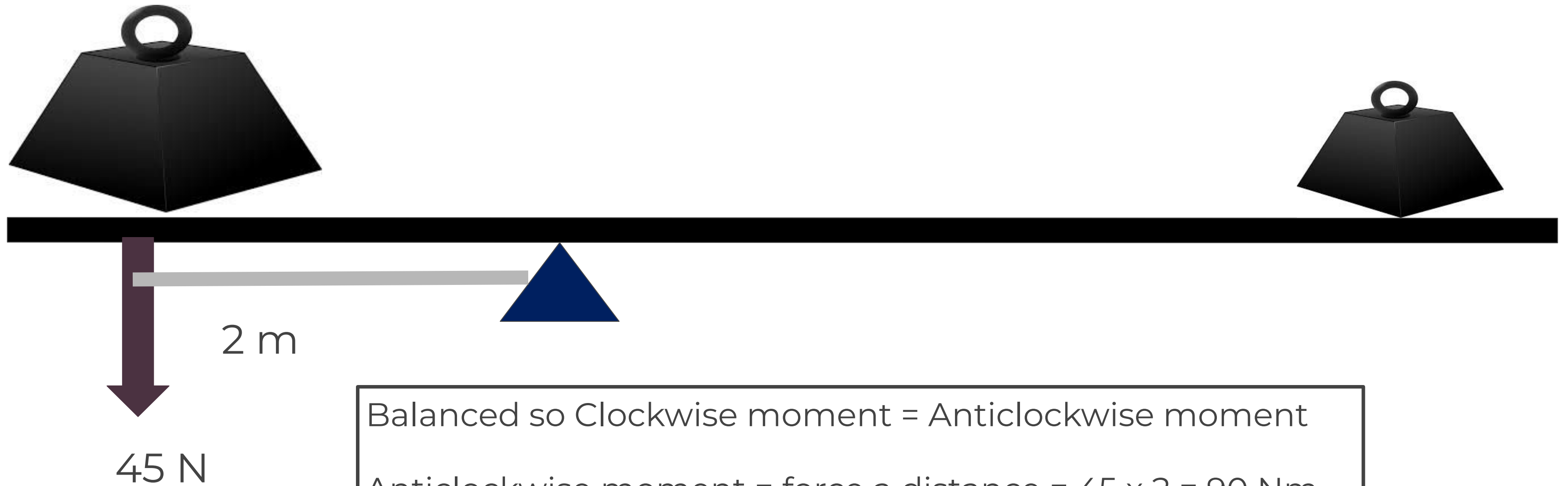
Question 6: The bar is balanced. What is the clockwise moment?



Balanced so Clockwise moment = Anticlockwise moment
Anticlockwise moment = force \times distance = $150 \times 2 = 300 \text{ Nm}$
So Clockwise moment = 300 Nm as well



Question 7: The bar is balanced. What is the clockwise moment?



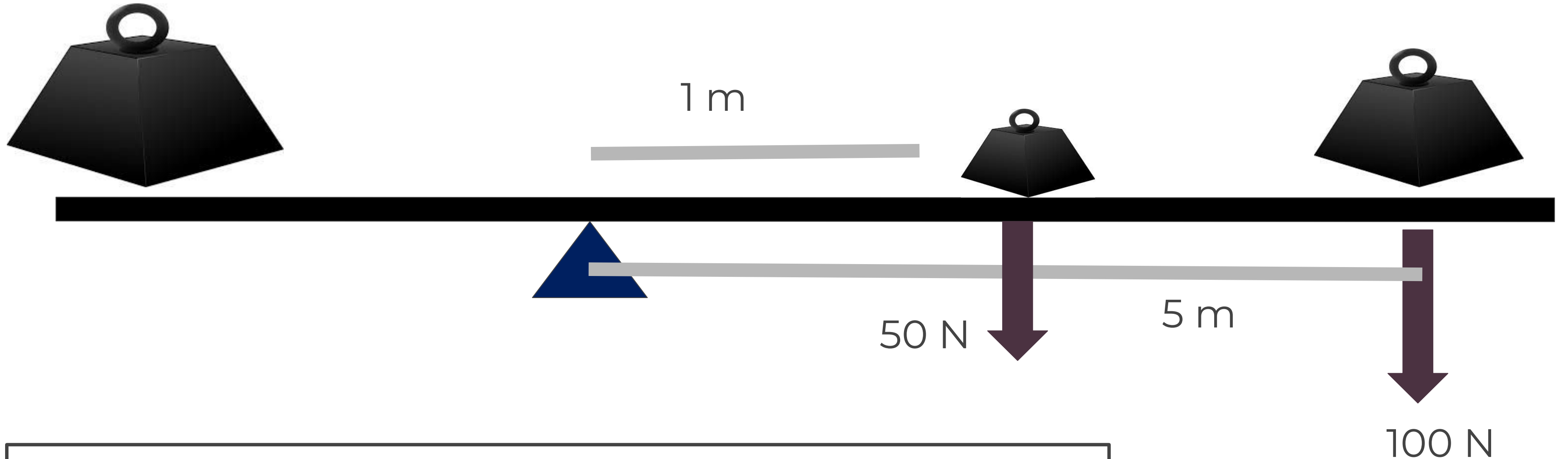
Balanced so Clockwise moment = Anticlockwise moment

Anticlockwise moment = force \times distance = $45 \times 2 = 90 \text{ Nm}$

So Clockwise moment = 90 Nm as well



Question 8: The bar is balanced. What is the anticlockwise moment?



Balanced so Clockwise moment = Anticlockwise moment

Clockwise moment = force \times distance = $50 \times 1 + 100 \times 5 = 550 \text{ Nm}$

So Anticlockwise moment = 550 Nm as well

